CHALIMBANA UNIVERSITY

DIRECTORATE OF DISTANCE EDUCATION

DTL 1502: INTRODUCTION TO INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT)

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Acknowledgement

Chalimbana University would like to acknowledge and thank the following people sincerely for writing this module.

Authors:

Dr. William Phiri

Module Overview

In this subject, you will be introduced to the basics that you need in order to use Computers and information technologies as Teaching Methodology students. You will be equipped with the necessary skills needed in the provision of information according to the dictates of modern society.

The subject is both demanding and interesting. You will be expected to interact with a number of Computer users and Computer devices especially those in business environment to appreciate the contents of this module. You are advised to effectively use this module as we will have limited face to face interaction during residential school.

The main Objectives covered in this course are as outlined in the table of contents.

Learning Outcomes

On completion of this module, you will be able to:

- Demonstrate understanding of various ICTs and their role in enhancing effective management of chiefdoms.
- Use ICT to increase entrepreneurial productivity among chiefdoms.
- Acquire entrepreneurial knowledge, skills and values required to explore business opportunities in the local communities and chiefdoms.
- Appreciate the importance of integrating ICT in Chiefdoms and Education
- Describe the roles of ICT in Education and Develop Royal Highnesses' knowledge and skills in education research, entrepreneurship

Duration

You are expected to complete this module in one academic year according to Chalimbana University and Chalimbana University specifications.

Assessment Criteria

For the entire Introduction to ICTs module, you will be assessed through written assignments, projects, presentations and examination as tabulated below:

Continuous Assessments ……..……50%

2 Assignments of equal weight	20%
ICT Labs/Project	20%
Presentations	10%

Final examination ……50%

Total marks…… ……...100%

How to use this module

This module should be studied together with the recommended readings given in each unit. Each unit will comprise of learning outcome that you should use as yardsticks as you study. A variety of self-assessment activities will help grasp the theory and practical part of this subject. Familiarize yourself with the icons used in this module to signpost different activities and emphasis. Consistent use of computers will be necessary for you to gain the practical aspect required in this subject.

Help?

When you need help, you can use these contacts details:
Phone number: 0762875443
You can also visit the University to meet specialists at the Directorate of Distance Education, Chongwe, Lusaka, Chalimbana University.

Prescribed Books

Driscoll, T. (2017). Computer Studies and Information Technology. London: MacMillan Education Ltd
Hatherly, A. (2016). ICT and the Greatest Technology: A Teacher's Mind. Early Childhood Folio, Vol. 13, Annual 2009
Phiri, W. (2019). Applied Statistics and Introduction to ICTs. Ndola: Mission Press.

Recommended Readings

Crawford, R. (2010) ICT. Bradford: Pearson Education
Florian, L. & Hegarty, J. (2004). ICT and Special Educational Needs: A Tool for Inclusion. Open University Press.
Hayes, M. & Whitebread, D. (2006). ICT in the Early Years. Open University Press, Internet and youtubesvidos
Murray, K. (2007).Microsoft Office System.New. Delhi: Microsoft Press

Contents

UNIT 1

INTRODUCTION TO INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT)

1.1 Introduction

In this opening unit, we begin by considering the definition of Information Communication Technology and roles of computers in our society. We shall also identify the main users of computers and discuss the different types of computers used in industry today. We shall then devote sometime examining how to operate a computer system. Let us start our study of ICT by trying to understand the importance computer system**.**

Learning Outcomes

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

- Demonstrate understanding of various ICTs and their role in enhancing management of chiefdoms
- Use ICT to increase entrepreneurial productivity in chiefdoms.
- Acquire entrepreneurial knowledge, skills and values required to explore business opportunities in the local communities and chiefdoms.
- Appreciate ICT.

Learning requirements:

You must have access to:

- E-Library and E-Journal
- Computers and connected peripheral devices

Time Frame

You will be expected to spend a minimum of 36 hours of study time in this unit

1.2 Information and Communications Technology (ICT)

ICT is the combination of information communication and technology. ICT covers all communication equipment that includes manipulation, creation; storing and sorting. It also refers as to technologies that provide access to information through communications. It is similar to Information Technology (IT), but focuses primarily on communication technologies. This includes the internet, wireless networks, cell phones, and other communication mediums. In short, it is not restricted to computers but ICT incorporates cell phones, cameras, and other hand held devices such as personal digital assistants (PDAs).

1.3 Definition of a Computer

A Computer is an electronic device that accepts data (input), stores it, and processes it using programs to produce the required output or results. The results are generally called **information.** A computer is a very fast device used to perform numerous tasks. It can

perform millions of calculations in a few seconds as compared to man who will spend many months for doing the same task. In addition to being very fast, computers are very accurate. The calculations are 100% error free.

This machine can be used to solve the problems related to various fields. At one instance, it may be solving a complex scientific problem and the very next moment it may be playing a card game.

Today's world is an information-rich world and it has become a necessity for everyone to know about computers. Purpose of this tutorial is to introduce you about computer and its fundamentals.

1.3.1 Functions of a Computer

1. Takes data as input.
2. Stores the data/instructions in its memory and use them when required.
3. Processes the data
4. Converts it into useful requested information.
5. Generates the output

1.3.2 Benefits of Computers

- Computer is a very fast device. It is capable of performing calculation of very large amount of data. The computer has units of speed in microsecond, nanosecond, and even the picosecond. It can perform millions of calculations in a few seconds as compared to man who will spend many months for doing the same task.
- In addition to being very fast, computers are very accurate. The calculations are 100% error free.
- Memory is a very important characteristic of computers. A computer has much more storage capacity than human beings. It can store large amount of data. It can store any type of data such as images, videos, text, audio and many others.
- Unlike human beings, a computer is free from monotony, tiredness and lack of concentration. It can do repeated work with same speed and accuracy.
- A computer is very flexible in performing the jobs to be done. This machine can be used to solve the problems related to various fields. At one instance, it may be solving a complex scientific problem and the very next moment it may be playing a card game.
- A computer is a reliable machine. Modern electronic components have long lives.
- Computers are designed to make maintenance easy.
- Computers perform tasks automatically. The use of computers for data processing in an chiefdom leads to reduction in paper work and results in speeding up a process. As data is in electronic files can be retrieved as and when required, the problem of maintenance of large number of paper files gets reduced. Though the initial investment for installing a computer is high, it substantially reduces the cost of each of its transaction.
- Computer-based learning is a term that can be used to describe virtually any kind of learning program using computers as a central staple.

In other words, it refers to the use of computers as a key component of the educational environment.

There are various merits of using computer-based learning programs in education, these including: The ability for pupils to learn from their homes and study without the assistance of an instructor (teacher)

- Allowing pupils to research for their study materials, e.g. use of electronic encyclopedias and the Internet.
- Communication with Security Officers, sponsors, parents and friends through E-mail other means
- Production of learning resources, e.g. notes and assignments.
- The saying "practice makes perfect" becomes a reality with use of ICT because learners are able to practice a skill, or listen or watch a presentation many times at their own pace, place and time.
- Storing of school documents for administrative purposes.

1.3 Classification of Computers

Computers can be classified in three main categories; according to their purpose, data held and functionality;

1.3.1 Classification according to purpose

Computers are designed for different purposes.

i) **General-purpose -** These are designed to perform a range of tasks. They have the ability to store numerous programs and can be used for various applications, ranging from scientific as well as business purpose applications. A downside is that they generally lack speed and efficiency even though they are versatile. Such computers are used in schools and homes.

ii) **Special/Specific-Purpose -** These are designed to handle a specific problem or perform single specific tasks. The instructions for that specific task are built into the machine. Therefore, they cannot be used for other applications only if their instructions and circuits are redesigned. These lack versatility, but they can provide results very quickly and efficiently. These computers are used for satellite tracking, air traffic control and airline reservations.

1.3.2 Classification According to Type of Data-Handled Techniques

Different types of computers process data in a different manner. The basic data handling principle classifies computers into three categories:

i) **Analog**

These are computers that work on the principle of measuring, in which measurements are translated into desired data. They represent data as a variable across a continuous range of values. The measuring parameters vary continuously in real time such as temperature, pressure and voltage. For example, a petrol pump may have an analog

computer that converts the flow of pumped petrol into two measurements - the quantity of petrol and the price for that quantity. One of the characteristics is that they give approximate results and one main feature is that they are very fast in operations as all calculations are done in "Parallel mode".

ii) **Digital Computers**

These computers use distinct values to represent data internally. Such computers process data (Including text, sound, graphics and video) into a digital value (0s and 1s). In these computers if the input is analog and desired output is digital, the analog quantities must be converted into digital quantity for processing. If analog output is desired, the digital output has to be converted into analog quantity.

Digital computers are able to give more accuracy at a faster rate. The accuracy is determined by the size of the registers and memory.

iii) **Hybrid Computers**

These incorporate the features of analog computers and the counting feature of digital computers. For computational purposes they use the analog components and for the storage of intermediate results, digital memories are used. To bind these powers, hybrid computers use analog-to-digital and digital-to-analog converters.

1.3.3 Classification According to Functionality

Based on physical size, performance and application areas, and computers can be generally divided into four major categories: ***micro, mini, mainframe,*** and ***super computers.***

i) **Micro Computers -** These are small, low cost digital computers which consist of a microprocessor, storage unit, an input channel and an output channel, all of which may be on one chip inserted into or several PC boards. Micro computers are generally the smallest of the computer family. Examples of microcomputers include **Desktop, Laptop** and **Hand-held** computers.

- **Desktop Computer -** Desktop computer or Personal Computer (PC) is the most common microcomputer. It's intended for standalone use by an individual. Consists of a system unit, display monitor, keyboard, internal hard disk and other peripheral devices.
- **Laptop -** A portable computer that can be carried around. They are small computers enclosing all the basic features of a normal desktop computer with a rechargeable battery that is self-contained in them.
- **Hand-held Computers -** Also known as **Personal Digital Assistant (PDA)**, are computers that can conveniently be stored in a pocket (of sufficient size) and used while the user is holding them. The generally use a pen or electronic stylus instead of a keyboard for input. Monitor is small and is the only apparent form of output. They have small cards instead of disk drives to store data or programs. They less powerful as compared to desktop computers due to limited memory.

ii. Super-Computer

Supercomputers are one of the fastest computers currently available. Supercomputers are very expensive and are employed for specialized applications that require immense amount of mathematical calculations (number crunching). For example, weather forecasting, scientific simulations, (animated) graphics, fluid dynamic calculations, nuclear energy research, electronic design, and analysis of geological data (e.g. in petrochemical prospecting).

iii. Mainframe Computer

Mainframes are very large Computers that are commonly used in large universities, factories, large scientific installations and other big chiefdoms where large volumes of data are handled. The users are connected to the mainframe through terminals, locally situated or remotely. It is a multi-user computer system which is capable of supporting hundreds of users simultaneously. Normally, mainframes require specialized personnel to operate it, e.g. System analysts, programmers and maintenance engineers.

iv. Mini-Computer

Mini-computers are usually used by medium-sized chiefdoms that do not require the power of a mainframe.

Minis may also be connected to other minis, mainframes or Personal Computers in a Computer network in order to share data or information.

Users also connect to mini through terminals.

v. Micro-Computer

These are also called Personal Computers (PCs), and are normally operated as stand-alone machines by end-users. Because of being relatively cheap, Microcomputers are the most widely used Computer System. These can be battery powered and therefore very handy for use even when travelling and in rural areas.

PCs are single user computer system having moderately powerful microprocessor. At home, the most popular use for personal computers is playing games and surfing Internet

1.4 Functional Block Diagram

A functional block diagram consists of three basic units:

i. Input/output devices
ii. System Unit
iii. Storage Unit

1.4.1 Block Diagram of Computer

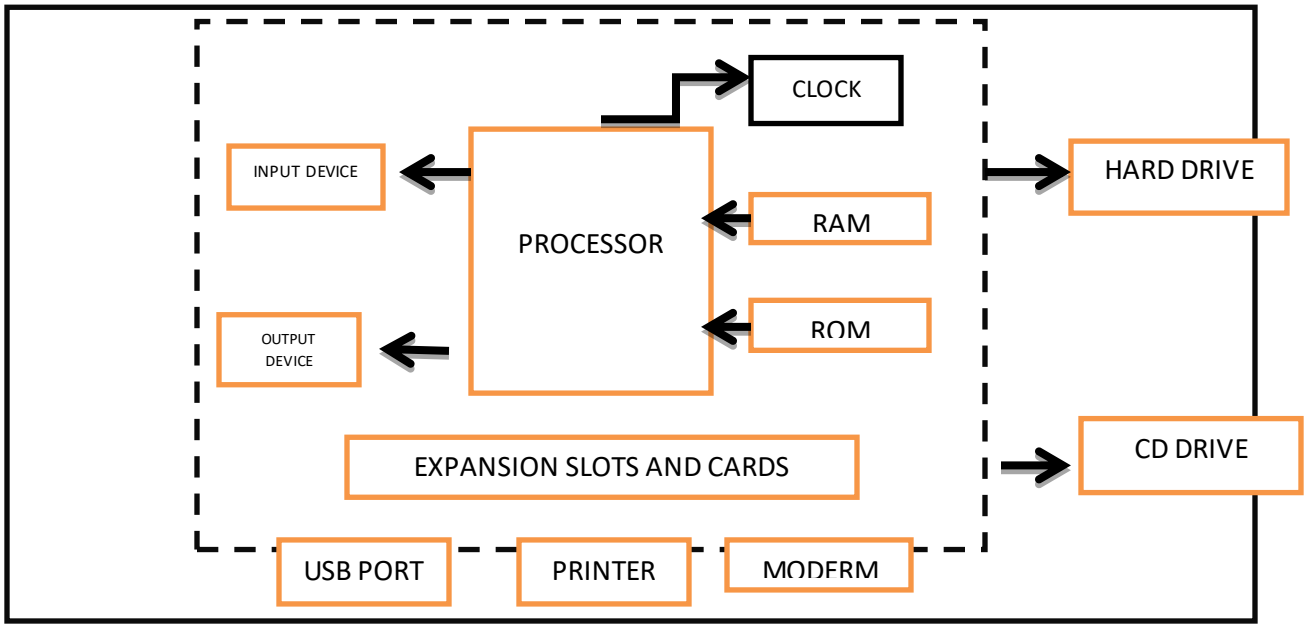


Figure 1.1: Block Diagram of Computer

Computer hardware system consists of different types of devices. Each device is connected directly or indirectly to the motherboard. These are classified into three basic categories:

1.4. 1.1 Input and Output Devices

A computer would be useless if you could not interact with it because the machine would not be able to receive instructions or deliver results of its work. User enters the commands and data through the keyboard or mouse, these data are translated into a form that computer can process. Once data has been processed, output devices convert it into human understandable format. Commonly used input/output devices are keyboard, mouse, monitor and printer.

1.4.2 System Unit

Also referred to as system cabinet contains the most of the electronic components that makes up a computer system. Important component is processor, which controls and manipulates data to produce information. Clock is used to synchronize the whole circuitry of the system.

1.4.3. Storage Unit

Attached hard disk inside the cabinet is mainly used as storage device, as it can store more data and faster than CD drive. But still CD (Compact disc) and DVD (Digital Video Disc) are used to store and transfer data from one pc to another.

1.5 Central Processing Unit (CPU)

CPU is the most important component of a computer. It typically consists of a control unit, arithmetic and logical unit and a primary storage. CPU is the brain of a computer and all

processing takes place in the CPU. The central processing unit consists of three main subsystems, the Arithmetic/Logic Unit (ALU), the Control Unit (CU), and the Registers. The three subsystems work together to provide operational capabilities to the computer.
Figure 1.5. Shows the parts of the CPU below;

1.5.1 Block diagram of a Central Processing Unit (CPU**)**

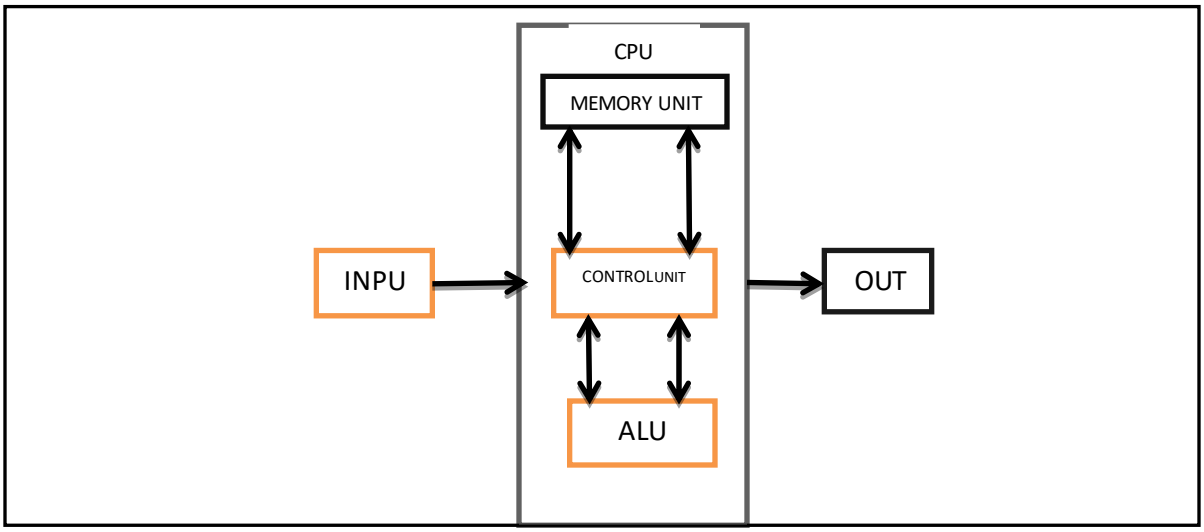


Figure 1.5.1 Central Processing Unit

1.5.2 How it Works

- CPU consists of three basic units: control unit, Arithmetic Logical Unit (ALU) and memory unit.
- Input is given through the input devices to CPU.
- Control unit controls communication within ALU and memory unit.
- Decides which circuit is to be activated.
- For reading instruction it uses Fetch-execute mechanism.
- Control unit gets instruction from memory.
- Control unit decides what to do of that instruction and transfers it to the ALU.
- ALU performs various arithmetic operations like addition, subtraction, multiplication, division and logical operations like AND, OR, NOT, NAND etc. on that instruction.
- Results of ALU are stored in the memory or resistor for its further operations.
- After completing the instruction, stored results are passed to the output devices.
- To synchronize all these operations CPU uses its own system clock.

1.5.3 What it does?

- Executes stored instructions called as program.
- Tells rest of the computer system what to do.
- Executes arithmetic calculation and data manipulation.

- Holds data and instruction which are in the current use.
- Responsible for storing and retrieving information on disks and other media

1.6 RAM (Random Access Memory):

Definition

A small scale size IC's memory chip used to store and access data in any order (i.e. in random order), so the name Random Access Memory.

Description

- Also called as temporary or volatile memory.
- Holds the program and data, which are currently processing.
- Data is lost as soon as computer is turned off or power failure.
- Data stored in this memory can be altered or changed.

Types of RAM

SRAM (Static RAM):

- Fast and has less access time.
- Consists of flip-flop using either transistor or MOS (Mosfet).
- For each bit it requires one flip-flop.
- Status of each bit remains as it is unless there is write operation or power is off.
- e.g. Cache memory.

Advantages

- Refreshing circuit is not required.

Disadvantages

- RAM is costly and has low package density.
- It requires more space.

1.6.1 DRAM (Dynamic RAM):

- Slower and higher access time
- Data is stored in the form of capacitors.
- Capacitors charges when data is 1 and doesn't charge if data is 0.
- Because of leakage current in capacitor, they need to be refreshed to hold the data in memory cells.
- Refreshing is the process in which the contents of each memory cell is read and written hundred times a second.
- This maintains the data of memory cells in capacitor.

e.g. Main memory.

Advantages

- Cheaper than static RAM.

Disadvantages

- Requires refreshing circuit.

1.6.2 ROM (Read Only Memory)

Definition

- A memory storage device, whose contents can be read and accessed but cannot be modified, so the name Read Only Memory.

Description

- Also called as non-volatile memory.
- Holds the permanent programs to tell system how to use circuit board.
- Data is not lost even the computer is switched off or power failure.
- Data in this memory is read only.

1.6.2.1 Types of ROM

1.6.2.1.1 **MROM (Mask-programmed ROM):**

- It is programmed at the factory.
- Program or data is permanently installed at the time of manufacturing.

1.6.2.2 **PROM (Programmable ROM):**

- Can be custom-programmed by the user only once using special circuitry PROM programmer.
- This circuit uses high voltages to permanently eliminate or create inner links.

1.6.2.3. EPROM (Erasable-Programmable ROM):

- Can be programmed by the user using strong ultraviolet light and special circuitry.

1.6.2.4 EEPROM (Electrically Erasable PROM):

- Can be erased and reprogrammed by electrical signals.
- Manufacturing process is complex and expensive.
- Rarely used.

1.7 Telecommunication Gadgets

Telecommunications gadgets include some of the following;

- Telephones lines
- Wireless signals
- Telephone networks

Activity

1. Outline and explain the functions of a computer
2. Identify the major components of computer
3. With the use of examples, discuss input and output devices
4. In what ways can you use computers in your chiefdoms?

Unit Summary

This unit has given you an overview of information and communications technology (ICTs). We defined what a computer is, its functions and the types of computers. Components of a computer were also explained including the Central Processing Unit and its functions. Finally we looked at the computer storage and different types of storage systems where discussed. In the next unit we shall focus our attention on computer networks.

UNIT TWO

COMPUTER NETWORKS

2.1 Introduction

Welcome to the second unit in this module. Our focus is to discuss computer networks, the different types of computer networks and how they function to enhance chiefdomal performance in our chiefdoms. Computer networking is the process of inter connecting two or more computers so that the users can communicate with each other, share resources and overcome other limitations of stand-alone systems. The network can be established with a variety of combinations of computers such as a network of only microcomputers, microcomputers and one or more minicomputers, and a set of microcomputers connected to a mainframe computer. The computers in a typical network are autonomous in the sense that they have processing capability independent of the network

Learning Outcomes

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

- Explain the importance of networking
- Describe network infrastructure and how to connect them
- State the use of various networks
- identify suitable network for an chiefdomal setup in the chiefdom

Time Frame

In this unit, you are required to spend a minimum of 2 hours of study time.

2.2 Definitions

A computer network is an interconnection of computers which allows computers to exchange data. It is also called data network (Phiri, 2019). It is a link between two or more computers.

2.3 Reasons for Networking

Let us look at some for the reasons for networking;

- To share data within and among chiefdoms
- For example, a centralized database can be used to store all the land records of a chiefdom. The same data in the database can be accessed by everyone within and outside the chiefdom.
- To share tasks
- Co-workers can collaborate on tasks to speed up processing.
- Increased Storage Capacity:
- As there is more than one computer on a network which can easily share files, the issue of storage
- Increased Cost Efficiency:

- There are many types of software available in the market which are costly and take time for installation. C
- Capacity gets resolved to a great extent. A standalone computer might.

2.2 Types of Computer Networks

By now you must be familiar with the main types of computer networks. Basically, there are two types of computer networks;

1. Wireless
2. Wired Network.

2.2.1 Wireless Network

In simple terms, it is the connection between two or more devices without cables. Wireless Networks do not use any form of cables. The transmission of data (your files, music, printing to the printer, etc.) occurs over radio waves. The following are the examples of wireless network devices:

i. Radio
ii. Mobile phone
iii. Television Set Etc.

2.3.2 Wired Network.

This simply means the connection between two or more devices via cables. Examples of wired network devices are:

i. Telephone
ii. Cable television
iv. Fiber-optic etc.

2.4 Building a Computer Network

There are many ways in which computers can be networked. The type of computer network formed is generally determined by the distance which the network will cover.

On the basis of distance, there are three basic computer networks:

1. Local Area Network (LAN)
2. Metropolitan Area Network (MAN)
3. Wide Area Network (WAN)

2.5.1 Network Topologies

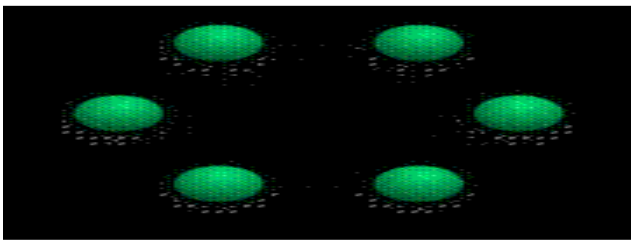
The design of network requires selection of a particular topology and architecture for the interconnection of network components. Topology refers to the way the computers are physically connected into the network. There are five basic topologies: Bus, Ring, Star, Tree, and Mesh. There are two main types of processing set ups. Centralized, decentralized and hybrid

2.5.1 Ring Topology:

The picture shown is a classical ring topology and consists of a physical ring and a logical ring. Each computer is linked to two others to form a closed loop. Each node in this ring will act as a repeater by regenerating and cleaning up a signal before passing it to the next node. In a ring network communication takes place by the use of a token which is passed from computer to computer around the ring and it is only the computer that has the token that can send data.

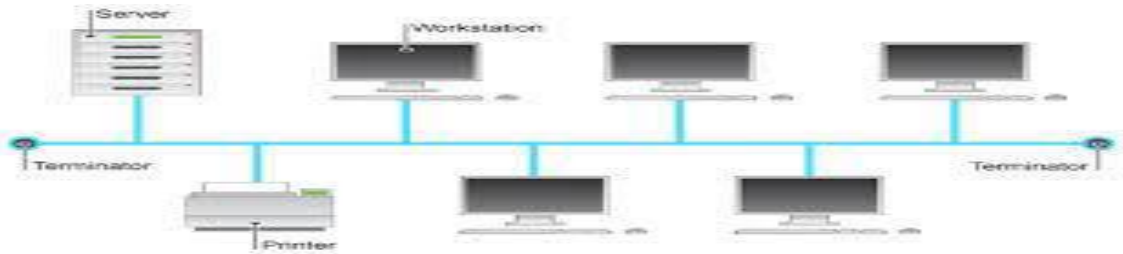
A ring network is unidirectional, i.e.: data can only go in one direction. Once a computer has the token it can send its message. Each successive computer on the ring will examine the message to check if they are the message's destination. Once the message has been received the token is put back on the network for the next node that requires its use. No matter what the size of the network or the distance covered there can only be one token on a ring network. Ring networks are known as deterministic because network access is determined by which workstation has the token. The failure of one computer can have an impact on the entire network.

2.5.2 Mesh Topology



A mesh topology is the most robust topology. Not only does it have the capabilities of a star but each of the nodes has a direct connection to all other nodes. This provides alternative links should there be failure on the network

2.5.3 Bus Topology



A bus topology is commonly referred to as a "linear bus" because all of the nodes are physically connected in a straight line. A bus topology has a single backbone cable to which computers and other devices are connected. This backbone is also known as a segment or a trunk. An Ethernet bus network, such as 10Base2, has a single communications channel with each node connected

to the main cable. The bus must be terminated at either end by terminators. These absorb the signal and stop it being sent back along the cable to corrupt any messages. If the bus is not terminated the signal will reflect back and possibly collide with other data. When a node transmits its data it goes in both directions. If a node recognizes that the message is addressed to it will take action, otherwise it will ignore the message.

On a bus topology only one computer can send data on the bus at any one time. Therefore, the more computers added to the bus the more likely that collisions will take place and this will have an adverse effect on network performance, i.e.: the network will be slower. All nodes on a bus have to contend with each other to be able to send messages and sometimes collisions will occur on this type of network. One way to deal with collisions is to use an access control protocol. One commonly used protocol is called Carrier Sense Multiple Access / Collision Detection (CSMA/CD).Collisions are an unavoidable feature of contention based networks and can become a problem if too many stations are added. A happy medium is required where the line is not idle nor is it constantly experiencing collisions. Computers on a bus network transmit data or listen for data but they are not responsible for moving data from one computer to the next. This means that if a computer fails the network will not be affected. However, if there is a fault with the backbone cable then the network will cease to function.

2.5.4 Star topology

In the star topology, cables from each computer are connected to a central device known as a hub. Signals are transmitted from the sending computer through the hub to all computers on the network. This topology has its origins in the early days of computing when terminals were connected to a central mainframe computer. The star network topology has the advantage of centralizing resources and management, however, more cable is required than for other topologies. The star topology also has a central point of failure, that is, if the hub at the center of the topology fails then the whole network will be down. If one of the computers (or the cable that connects it to the hub) fails on a star network, only the failed computer will not be able to send or receive network data.

The rest of the network will continue to function normally. This type of topology is the most commonly used. Most star topologies are Ethernet networks, which mean that they use CSMA/CD as a means of media access. Hubs have generally been replaced in star topologies by switches, which have the advantage of creating multiple collision domains and effectively creating collision free networks.

2.6. Hybrid topology is an interconnection of two or more **basic network topologies**, each of which contains its own **nodes**. The resulting interconnection allows the nodes in a given basic topology to communicate with other nodes in the same basic topology as well as those in other basic topologies within the hybrid topology. Advantages of a hybrid network includes increased flexibility as new basic topologies can easily be added or existing ones removed and increased fault tolerance.

2.6.1 Types of Hybrid Network Topologies

There are different types of hybrid network topologies depending on the basic topologies that make up the hybrid and the adjoining topology that interconnects the basic topologies. The following are some of the Hybrid Network Topologies:

2.6.1.1 Star-Wired Ring Network Topology

In a **Star-Wired Ring hybrid topology**, a set of **Star topologies** are connected by a **Ring topology** as the adjoining topology. Joining each star topology to the ring topology is a wired connection. Information from a given star topology reaching a connecting node in the main ring topology like *A* flows either in a **bidirectional** or **unidirectional** manner. A bidirectional flow will ensure that a failure in one node of the main ring topology does not lead to the complete breakdown of information flow in the main ring topology.

2.6.1.2 Hierarchical Network Topology

Hierarchical Network topology is structured in different levels as a hierarchical tree. It is also referred to as **Tree network topology**. Connection of the lower levels like *level 2* to higher levels like *level 1* is done through wired connection. The top most level, *level 0*, contains the **parent (root)** node. The second level, *level 1* contains the **child nodes** which in turn have child nodes in level 3. All the nodes in a given level have a higher parent node except for the node(s) at the top most level. The nodes at the bottom most level are called **leaf nodes** as they are peripheral and are parent to no other node. At the basic level, a tree network topology is a collection of star network topologies arranged in different levels. Each level including the top most can contain one or more nodes

Activity

With the use of relevant examples, distinguish line, centralized and decentralized network topologies.

Unit Summary

This unit has looked at computer networks, types of computer networks, how to build a network in chiefdoms and network topologies. Our next unit will shall look at computer hardware gadgets, input and output devices.

UNIT 3

COMPUTER HARDWARE GADGETS, INPUT AND OUTPUT DEVICE

3.1 Introduction

In the previous unit, we looked at computer networks. In this unit we shall look at computer gadgets, input and output devices. In unit one we defined and identified what computer gadgets are and input and output devices. This unit will give details on theses gadgets and how they can be applied in our chiefdoms. These components of a computer are important without which operation a computer would be a futile activity. Let us now look at the unit objectives for this unit below.

Learning Outcomes

- Students should able to identify the difference between an input device and Output devices
- Students should be able to know which hard ware and software is suitable for computer or device
- Student know how to take care of any hardware in any institution
- Students should be able to know where this devices.

Time Frame

You are required to spend a minimum of 3 hours study time in this unit.

3.2 All types of computer parts

Hardware represents the tangible components of a computer i.e. the components that can be seen and touched. These include Keyboards, Mouse, printers, Monitor, Hard disks, Motherboard etc.

Hardware and software are mutually dependent on each other. They closely work together to make a computer produce a useful output. Software cannot be utilized without supporting hardware and hardware cannot function without control of a set of programs i.e. software to operate or control the hardware.

3.3 Computer - Input Devices

Following are a few important input devices which are used in a computer:

Keyboard, Mouse, Joy Stick, Light pen, Track Ball, Scanner, Graphic Tablet, Microphone, Magnetic Ink Card Reader (MICR), Optical Character Reader (OCR), Bar Code Reader, Optical Mark Reader (OMR)

The pictures below show some of the input devices outlined above;

Figure 3.2.1 Input Devices
Let us now look at the devices in detail below;

Keyboard

The keyboard is the most common and widely used input device.It is made up of buttons called 'keys'. The keys are arranged into sections:

- alphabet keys
- Function or F keys (F1, F2, F3)
- Numeric keys (one set above the alphabet keys and a numeric keypad on the right)
- Arrow keys
- Command keys (insert, delete, home, end, page up/down)

Most keyboards are called 'QWERTY' keyboards. This name comes from the first six letters on the top row of the alphabet keys.

Using a keyboard for too long can lead to health problems such as repetitive strain injury (RSI). To try to overcome this, different styles of keyboard have been developed, for example, the ergonomic keyboard. They are supposed to put your hands into a much more natural position than a traditional keyboard.

Advantages

- Most computers come with a keyboard supplied
- People are used to using keyboards to enter data, they need very little training

- A skilled typist can enter data very quickly
- Specialist keyboards are available e.g. ergonomic, gaming keyboards

Disadvantages

- It is easy to make mistakes when typing in data
- If you can't touch type, it can be time consuming to enter data
- Keyboards are not suitable for creating diagrams
- Disabled people often find keyboards difficult to use
- Excessive use can lead to R.S.I.

Mouse

Everyone is familiar with a computer mouse; along with the keyboard, it is one of the most common input devices you will use.

A mouse is also called a 'pointing device' because it enables you to control what happens on the screen by moving the mouse on your desk and pointing, clicking and selecting items on the screen.

A mouse usually has two buttons, a right and left one and also a central wheel which allows you to scroll up and down the page (some mice have three or four buttons). The left and right button has different functions. Left clicking usually lets you put your cursor at a certain point on the page or let you choose a menu item. Right clicking brings you up a list of relevant menu items from which you can select a task.

Many of the older styles of mice used a ball which moved against two internal rollers to record the direction that the mouse was being moved in. Recent versions of mice use 'optical' or 'wireless' technology to track mouse movement.

Advantages

- Ideal for use with desktop computers
- Usually supplied as part of a new computer system
- Most computer users are familiar with them and require little training
- Works well in conjunction with a keyboard for data entry

Disadvantages

- They need a flat space close to the computer
- The rollers in mice that use balls can become clogged with grease and grime and lose their accuracy until cleaned.

- Overuse can lead to RSI

Touchpad

A touchpad is an input device which is usually found on a laptop computer.

Because a laptop is meant to be portable, people aren't always able to attach a traditional mouse, it might be too much hassle or there might not be enough room to use one. A touchpad can be used in place of a mouse.

By dragging your finger over the surface of the touchpad, sensors underneath detect the movement direction and speed. The sensors only react to a fingertip and not a pencil or other object. There are usually two buttons next to the touchpad which are used to replace the left and right mouse button.

Advantages

- Useful for laptops when using a mouse isn't practical
- The pad's position is fixed compared to the keyboard, unlike with a traditional mouse
- Very short finger movements are required to move the cursor

Disadvantages

- Takes practice and skill to control the position of the cursor using the touchpad
- Gloves cannot be worn i.e. in a cleanroom environment
- Moist, sweaty or calloused fingers can disrupt the signals picked up by the sensors.

Joystick

Joysticks were originally used by pilots as part of an aero plane's controls and the technology was developed to let computer gamers experience a more realistic game environment.

You can move joysticks in many directions and the joystick tells the computer which direction it has been moved into. They also have one or more buttons whose position when pushed can be read by the computer.

Joysticks can also be used for controlling machines such as cranes, trucks and powered wheelchairs.

Advantages

- They give a better gaming experience for racing or flying styles of computer games

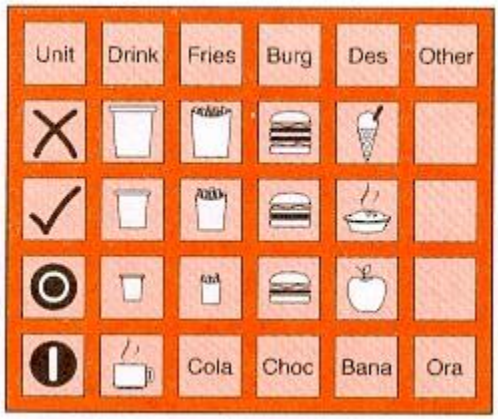
Disadvantages

- Some people find joysticks more difficult to control than a traditional mouse.
- Joysticks are not particularly robust and can break easily if too much force is used on them.

Concept Keyboard

A concept keyboard is a flat board that contains a grid of buttons. Each button can be programmed to do whatever you want.

An overlay sheet with pictures or symbols is placed on the grid so that the user can tell what pressing on different areas will do.



Concept keyboards are used when fast input is needed and are ideally suited to selecting from a limited range of choices such as fast food restaurants. Checkout tills such as McDonalds use symbols to make ordering faster and easier. Primary schools often use them with young children. The overlay image could be a picture of a farmyard. Pressing on an animal would cause the computer to make the right animal noise.

Concept keyboards are particularly useful for people who would find using an ordinary keyboard difficult. It is also very handy in locations where an ordinary keyboard might be damaged e.g. by spillage or dust.

Advantages

- Much faster for making non-text selections such as menu choices on the till of a fast-food outlet.
- The keyboard is waterproof which can be useful where there is dirt or the risk of splashes

Disadvantages

- Poor for text or numeric input - although some keyboards do include a numeric keypad so the operator can enter the amount sold.
- Limited to the options shown on the keyboard.

Touch Screen

A touch screen is the only device which works as both an input and an output device. You view the options available to you on the screen (output) and you then use your finger to touch the option that you have chosen (input).

Touch screens work particularly well with a menu driven interface. For example, a cashpoint (ATM) at a bank would first of all ask which service you want. You touch the option 'withdraw cash' on the screen. You are then presented with another choice, 'how much cash do you want to withdraw?'. Once you have chosen how much, you then get other options such as 'do you want a receipt?'

Touch screens are easy to use and are often found in public places such as cashpoints at banks, ticket collection terminals at theatres or airports, information centres at museums.

Touch screens are not commonly used to input large amounts of data because they are not very accurate and they would be tiring on the hands to use for long periods of time.

Advantages

- Easy to use - intuitive, don't need much training
- No extra peripherals such as a mouse are needed
- Software can alter the screen while it is being used, making it more flexible than a concept keyboard which has a permanent overlay.

Disadvantages

- Not suitable for inputting large amounts of data
- Not very accurate - selecting detailed objects can be difficult with fingers
- Tiring to use for long periods
- More expensive than alternatives such as a mouse
- Not robust - can soon become faulty if misused.

Scanner

Scanners can be used to convert images or text on paper into a digital format that can be used by the computer.

A scanner works by shining a beam of light onto the surface of the object that you are scanning. This light is then reflected back onto a sensor that detects the colour of the light. This is then used to build up the digital image.

Items that are scanned are usually stored in an image format. However, special software - Optical Character Recognition - can be used to convert text on the paper into text which can be edited with a word processor. However, the text doesn't always get converted very well and you could end up with a lot of mistakes.

There are two types of scanner:

- Flatbed scanners
- Handheld scanners

The most popular type is the flatbed scanner. This is probably the one that you use at school. They can scan larger images and are more accurate than handheld scanners.

Handheld scanners are usually only a few inches wide and are held in the hand whilst they are rolled across the document to be scanned. The images produced are generally not as large or as high quality as those captured with a flatbed scanner.

Advantages

- Flatbed scanners are very accurate and can produce reasonably high quality images
- Any image which is digitised by the scanner can then be included on electronic documents
- Images once digitised can be enhanced with a graphics application

Disadvantages

- Images can take up a lot of memory space
- Images lose some quality in the scanning and digitising process
- The quality of the final image is dependent on the quality of the original image

Digital Camera

A digital camera records images electronically on a memory card rather than on film as did the older models of camera. The images can be downloaded from the memory card onto a computer and then printed, stored or manipulated with a photo editing application.

Most digital cameras let you view the image as soon as you have taken the picture; if you don't like what you see, it can be deleted.

The quality of the image is dependent on the resolution or the number of pixels. Most digital cameras range from 4 - 12 Megapixels (millions of pixels in the image). The more pixels, the better the quality and clarity of the image.

Many digital cameras are now capable of taking short video clips along with sound.

Advantages

- No film is needed, no developing costs to view the pictures
- Images can be viewed immediately and unwanted images can be deleted
- Images can be edited, enlarged or enhanced
- Images can be incorporated into documents or added to web sites
- Extra memory sticks can be purchased to store images

Disadvantages

- Digital cameras are generally more expensive than ordinary cameras which use film
- Images often have to be compressed to avoid using too much memory
- When the memory is full, the images must be downloaded to a computer or deleted before any more can be taken.

Graphics Tablet

Graphics tablets are often used by graphics designers and illustrators. Using a graphics tablet, a designer can produce much more accurate drawings on the screen than they could with a mouse or other pointing device. Drawings created using a graphics tablet can be accurate to within hundredths of an inch.

a graphics tablet consists of a flat pad (the tablet) on which you draw with a special pen. As you draw on the pad, the image is created on the screen.

Advantages

- It is much more natural to draw diagrams with a pencil type implement (the stylus) rather than with a mouse
- A great level of accuracy can be achieved

Disadvantages

- Not really suitable for general selection work such as pointing and clicking on menu items
- Graphics tablets are much more expensive than a mouse

Microphone

A microphone can be used to input sound.

The sound is detected by the microphone and an electrical signal is transmitted to the computer. Special hardware is used to convert this analogue data into digital data so it can be stored and manipulated.

In the last few years a number of voice recognition systems have been developed. These packages let the user dictate the text into a computer and then convert the speech to text.

Dictating like this can be much quicker than typing but the software isn't perfect and it can interpret a word incorrectly.

Automated Input Devices

An input device is a piece of hardware that is used to enter data into a computer. There are many different kinds of input devices - so many in fact that we have had to split this section into two seperate mini websites. This one is about automatic input devices. The second mini website is about manual input devices.

Magnetic Ink Character Recognition

Each day, banks process millions of cheques. It would take them far too long to manually enter the data from each cheque. They use a technique called 'Magnetic Ink Character Recognition' (MICR) which enables them to process 300 cheques per minute with 100% accuracy. At the bottom of each cheque are a series of numbers which record:

- the cheque number
- the bank or building society sort code
- the customer's account number

These numbers are written in a special ink which contains iron particles. This ink is magnetized and commonly called 'magnetic ink'. It can be read by a special machine called a Magnetic Ink Character reader (MICR).

The MICR will only recognise numbers printed in a standard font using the magnetic ink. This provides a high level of security because any attempt to alter the magnetic ink printout with normal ink by writing over it will be ignored.

Both the Reader and the magnetic ink are expensive and so are generally only used by banks.

Optical Mark Reader (OMR)

Have you ever looked closely at the National Lottery ticket selection form? Or have you ever had

to do a multiple choice test at school where you had to use a pencil to show your answer (like our picture on the right)?

These forms are scanned by a special piece of equipment called an 'Optical Mark Reader' (OMR). they detect the presence of your pencil mark by reflecting light onto it. Less light is reflected where a mark has been made.

The OMR then interprets the pattern of marks and sends the results to the computer for storage, analysis and reporting.

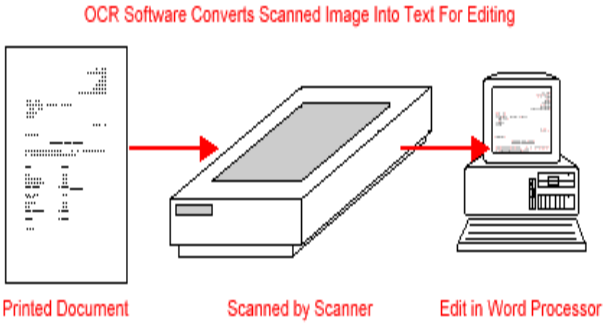
Advantages 

- A fast method of inputting large amounts of data - up to 10,000 forms can be read per hour depending on the quality of the machine used.
- Only one computer needed to collect and process the data
- OMR is much more accurate than data being keyed in by a person

Disadvantages

- If the marks don't fill the space completely, or aren't in a dark enough pencil, they may not be read correctly
- Only suitable for recording one out of a selection of answers, not suitable for text input
- The OMR reader needs the answers to be on the prepared forms which will all be identical to one another. You can't just pick up a blank sheet of paper and mark your answers on it.

Optical Character Recognition (OCR)



An OCR system consists of a normal scanner and some special software. The scanner is used to scan text on a document or piece of paper into the computer. The OCR software then examines the page and changes the letters into a form that can be edited or processed by a normal word processing package.

The ability to scan the characters accurately depends on how clear the writing is. Scanners have been improved to be able to read different styles and sizes of text as well as neat handwriting. Although they are often up to 95% accurate, any text scanned with OCR needs careful checking because some letters can be misread. OCR is used to automatically recognise postcodes on letters at sorting offices.

Advantages

- Cheaper than paying someone to manually enter large amounts of text
- Much faster than someone manually entering large amounts of text
- The latest software can recreate tables and the original layout

Disadvantages

- Not 100% accurate, there are likely to be some mistakes made during the process
- All documents need to be checked over carefully and then manually corrected
- If the original document is of poor quality or the handwriting difficult to read, more mistakes will occur
- Not worth doing for small amounts of text

Barcode Reader

Most items that are for sale in shops have a barcode printed somewhere on the packaging. The barcode is a series of vertical bars of varying widths that give information about:

- the country of manufacture
- the name of the manufacturer
- a product code

The barcode does NOT contain the price of the item - this is held on the company database. A barcode reader is an automatic input device which is used to scan or 'read' the barcode by using a visible red light. The reflected light is translated into digital data that is interpreted by the computer to identify the product and price from the database.

The main advantage of using a barcode system is that any price change only needs to be made to the database and not every single product package.

Barcodes are also used on books to show the book's ISBN number - have a look at any textbook that you have in your bag. They are also used on library tickets so that when your ticket is scanned, the database brings up your account and any books which you still have out on loan are displayed

Magnetic Stripe Reader

Magnetic strips are usually found of the back of most credit cards, cheque guarantee cards, loyalty cards, membership cards etc. The magnetic strip can hold personal details about the card number such as account number and name. The strip can contain up to 60 characters, stored magnetically.

To read the data on the card, it is 'swiped' through a Magnetic Stripe Reader machine and the data is read and fed back to the computer.

Advantages

- Simple to use
- Cheap to produce
- Data can be altered if necessary
- Security has been improved by the use of PIN numbers which must be entered into a machine to confirm that you are the rightful card owner

Disadvantages

- Very limited storage capacity for data
- Data can be easily destroyed by strong magnetic fields
- Not always secure as thieves can obtain the readers and read the data on the card.

Biometric Devices

There is an increasing trend towards using biometric data from people in order to identify them. Finger print and retinal identification are being used in many places now and even facial recognition systems are starting to be introduced.

Special devices are needed to capture the biometric data which is then passed onto the computer for processing and identification. Biometric authentication methods can be used to identify you at ATMs to withdraw cash, in computer networks to allow you to log on and many schools are now introducing 'fingerprint registration'!

Sensors

Sensors are used to detect physical quantities outside a computer such as light, temperature and pressure. They collect data automatically and usually at regular intervals. This data is can either be transmitted immediately to the computer or can be stored for a period of time and a batch of readings sent in one go.

In order to process input from sensors, a device called an 'Analogue to Digital Converter' (ADC) must be connected between the computer and the sensor. This device converts the analogue signals from the sensors to digital data that the computer can process.

Monitors

Monitors, commonly called as Visual Display Unit (VDU), are the main output device of a computer. It forms images from tiny dots, called pixels that are arranged in a rectangular form. The sharpness of the image depends upon the number of pixels.

There are two kinds of viewing screen used for monitors.

Cathode-Ray Tube (CRT)

Flat- Panel Display

Cathode-Ray Tube (CRT) Monitor

The CRT display is made up of small picture elements called pixels. The smaller the pixels, the better the image clarity or resolution. It takes more than one illuminated pixel to form a whole character, such as the letter 'e' in the word help.

A finite number of characters can be displayed on a screen at once. The screen can be divided into a series of character boxes - fixed location on the screen where a standard character can be placed. Most screens are capable of displaying 80 characters of data horizontally and 25 lines vertically. There are some disadvantages of CRT −

- Large in Size
- High power consumption

Flat-Panel Display Monitor

The flat-panel display refers to a class of video devices that have reduced volume, weight and power requirement in comparison to the CRT. You can hang them on walls or wear them on your wrists. Current uses of flat-panel displays include calculators, video games, monitors, laptop computer, and graphics display.

The flat-panel display is divided into two categories −

- **Emissive Displays** − Emissive displays are devices that convert electrical energy into light. For example, plasma panel and LED (Light-Emitting Diodes).

- **Non-Emissive Displays** − Non-emissive displays use optical effects to convert sunlight or light from some other source into graphics patterns. For example, LCD (Liquid-Crystal Device).

Activity

1. List the different input devices and give there advantages and disadvantages.

Unit Summary

In this unit we have looked at the different types of input devices including Keyboard Mouse, Joy Stick, Light pen, Track Ball, Scanner, Graphic Tablet, Microphone, Magnetic Ink Card Reader (MICR), Optical Character Reader (OCR), Bar Code Reader Optical Mark Reader (OMR) and types of monitors. There advantages as well as disadvantages were given. Lets us now turn to the next unit. Our focus will be

UNIT 4

PRINTERS

4.1 Introduction

A printer is a computer external output device that helps to print out the information that has been processed in computer. It is also referred to as a computer peripheral. It must be connected and configured to a computer for it to bring out the desired output. This unit looks at the different types of printers. I urge you to read on and attempt all the given activities in this exciting unit.

Learning Outcomes

- Connect a printer
- Network a printer
- Differentiate between Impact and Non-impact printers
- Identity which printer is good for individual user and chiefdomal use.

Time Frame
In this unit you are required to spend a minimum of 1 hour study time in this unit

4.2 Printers

Printer is an output device, which is used to print information on paper. There are two types of printers;

- Impact Printers
- Non-Impact Printers

4.2.1 Impact Printers

Impact printers print the characters by striking them on the ribbon, which is then pressed on the paper.
Characteristics of Impact Printers are the following −

- Very low consumable costs
- Very noisy
- Useful for bulk printing due to low cost
- There is physical contact with the paper to produce an image

These printers are of two types −

- Character printers
- Line printers

4.2.2. Character Printers

Character printers are the printers which print one character at a time.

These are further divided into two types:

- Dot Matrix Printer(DMP)
- Daisy Wheel

4.2.2.1 Dot Matrix Printer

In the market, one of the most popular printers is Dot Matrix Printer. These printers are popular because of their ease of printing and economical price. Each character printed is in the form of pattern of dots and head consists of a Matrix of Pins of size (5*7, 7*9, 9*7 or 9*9) which come out to form a character which is why it is called Dot Matrix Printer.

Advantages

- Inexpensive
- Widely Used
- Other language characters can be printed

Disadvantages

- Slow Speed
- Poor Quality

4.2.2.2 Daisy Wheel

Head is lying on a wheel and pins corresponding to characters are like petals of Daisy (flower) which is why it is called Daisy Wheel Printer. These printers are generally used for word-processing in offices that require a few letters to be sent here and there with very nice quality.

Advantages

- More reliable than DMP
- Better quality
- Fonts of character can be easily changed

Disadvantages

- Slower than DMP
- Noisy
- More expensive than DMP

4.2.3 Line Printers

Line printers are the printers which print one line at a time.

These are of two types −

- Drum Printer
- Chain Printer

4.2.4 Drum Printer

This printer is like a drum in shape hence it is called drum printer. The surface of the drum is divided into a number of tracks. Total tracks are equal to the size of the paper, i.e. for a paper width of 132 characters, drum will have 132 tracks. A character set is embossed on the track. Different character sets available in the market are 48 character set, 64 and 96 characters set. One rotation of drum prints one line. Drum printers are fast in speed and can print 300 to 2000 lines per minute.

Advantages

- Very high speed

Disadvantages

- Very expensive
- Characters fonts cannot be changed

4.2.4 Chain Printer

In this printer, a chain of character sets is used, hence it is called Chain Printer. A standard character set may have 48, 64, or 96 characters.

Advantages

- Character fonts can easily be changed.
- Different languages can be used with the same printer.

Disadvantages

- Noisy

4.3 Non-impact Printers

Non-impact printers print the characters without using the ribbon. These printers print a complete page at a time, thus they are also called as Page Printers.

These printers are of two types −

- Laser Printers
- Inkjet Printers

Characteristics of Non-impact Printers

- Faster than impact printers
- They are not noisy
- High quality
- Supports many fonts and different character size

4.3.1 Laser Printers

These are non-impact page printers. They use laser lights to produce the dots needed to form the characters to be printed on a page.

Advantages

- Very high speed
- Very high quality output
- Good graphics quality
- Supports many fonts and different character size

Disadvantages

- Expensive
- Cannot be used to produce multiple copies of a document in a single printing

4.3.2 Inkjet Printers

Inkjet printers are non-impact character printers based on a relatively new technology. They print characters by spraying small drops of ink onto paper. Inkjet printers produce high quality output with presentable features.

They make less noise because no hammering is done and these have many styles of printing modes available. Color printing is also possible. Some models of Inkjet printers can produce multiple copies of printing also.

Advantages

- High quality printing
- More reliable

Disadvantages

- Expensive as the cost per page is high
- Slow as compared to laser printer

Note: Some types of hardware can act as both input and output devices such as a touch screen, communication devices such as **modems** which enable computers to communicate through telephone lines or cable television systems and **Network Interface Cards(NICs)** which let users connect a group of computers to share data and devices. It is worthwhile at this point to look at history of computers

Activity

1. Distinguish between impact and non-impact printers.
2. In your view which printer is more suitable for chiefdomal use compared to those that are suitable for individual use?

Unit Summary

Well done! You have come to the end of unit four. In this unit we looked at printer, in our discussion we established that there are two types of printers including impact and non-impact printers. Examples of each type of printer were given. It should be noted also that printers are used in different setups and for different purposes. Therefore, the printer specification when buying these gadgets should be able to match with the needs of the target users.

UNIT 5

STORAGE DEVICES

5.1 Introduction

Focus in this unit is to discuss storage devices that can be employed to store data and information in our chiefdoms. Imagine working on an important document that has taken you a long time to develop, then due to technical factors you find that you cannot retrieve this document upon completion of developing it. Frustration is what you would characterize this situation. Storage devices therefore are critical when it comes to saving important data in chiefdoms.

Learning Outcomes

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

- Practice storing data on different devices
- Copy ,cut and paste information in any storage devices
- Demonstrate how to burn a CD
- Explain how to back up data in case of emergency

Time Frame

In this unit, you are required to spend a minimum of 2 hours of study time.

Content

Devices that are capable of storing, reading and writing data or information on storage media are called as storage devices. Storage devices are faster than non-volatile storage devices E.g.: RAM, Cache Memory etc.

5.2 Storage

Computer storage or memory can be of two types: primary and secondary. Primary memory provides very fast access and is used for storing frequently used programs and data. But, primary storage is expensive and also volatile. Hence it is used for storing data and instructions mostly temporarily. Large files and databases are stored on secondary storage devices. Data and instructions from the secondary storage are moved into the primary memory for the CPU to access them. A revolution is taking place in data storage technologies. The storage devices are getting smaller and, at the same time, the storage capacity is getting larger.

The popular secondary storage devices are magnetic disk, magnetic tape and CD-ROM.

i) **Magnetic Tape** - Magnetic tape appears similar to the tape used in music cassettes. It is a plastic tape with magnetic coating on it. The data is stored in the

form of tiny segments of magnetized and demagnetized portions on the surface of the material. Magnetized portion of the surface refers to the bit value '1' whereas the demagnetized portion refers to the bit value '0'. Tapes are ideally suited for large storage for serial processing of data. They are generally used for backing up large volumes of data required for serial processing. They are low cost and reliable storage devices. They can store fairly large volumes of data and are ideal for batch processing applications, storing historical data and backing up of important files. The amount of data or the number of binary digits that can be stored on a linear inch of tape is the recording density of the tape. The magnetic tape is divided into vertical columns (frames) and horizontal rows (channels or tracks). The data is stored in a string of frames with one character per frame and each frame spans multiple tracks (usually 7 or 9 tracks). Thus, a single bit is stored in each track, that is, one byte per frame. The remaining track (7th or 9th) stores the parity bit. When a byte is written to the tape, the number of 1s in the byte is counted, the parity bit is then used to make number of 1s even (even parity) or odd (odd parity). When the tape is read again, the parity bit is checked to see if any bit has been lost. In case of odd parity, there must be an odd number of 1s represented for each character and an even number of 1s in case of even parity. Magnetic tape drive uses two reels, supply reel and take-up reel. Both reels are mounted on the hubs and the tape moves from the supply reel to the take-up reel.

The magnetic oxide coated side of the tape passes directly over the read/write head assembly, thus making contact with the heads. As the tape passes under the read/write head, the data can be either read and transferred to the primary memory or read from primary memory and written onto the tape.

ii) **Magnetic Disks** - Magnetic disks are made of rigid metals or synthetic plastic material. The disk platter is coated on both the surfaces with magnetic material and both the surfaces can be used for storage. The magnetic disk provides direct access and is popular for both small and large computer systems. The magnetic disk comes in two forms: hard disks and floppy disks.

iii) **Hard Disk** - also called the hard drive or fixed disk, is the primary storage unit of the computer. It consists of a stack of disk platters that are made up of aluminium alloy or glass substrate coated with a magnetic material and protective layers. They are tightly sealed to prevent any dust particle, which causes head crash, from getting inside. Hard disk can be external (removable) or internal (fixed) and can hold a large amount of data. The capacity that is the amount of information that a hard disk can store is measured in bytes. The hard disk speed is measured in terms of access time (typically in milliseconds). A hard disk with lower access time is faster than a hard disk with higher access time; the lower the access time, the faster the hard disk.The access time is determined by two factors: the seek

time and the rotational delay. The seek time is the time required to locate the track on the recording surface. Rotational delay involves positioning the read/write arm at the right track of the surface for reading/writing.

iv) **Floppy Disk** - A floppy disk is a round, flat piece of Mylar plastic coated with ferric oxide (a rust like substance containing tiny particles capable of holding a magnetic field) and encased in a protective plastic cover (disk jacket). It is a removable disk and is read and written by a floppy disk drive (FDD), which is a device that performs the basic operation on a disk, including rotating the disk and reading and writing data onto it. The disk drive's read/write head alters the magnetic orientation of the particles, where orientation in one-direction represents '1' and orientation in the other represents '0'. floppies were introduced in the early 1970s and became very popular with the arrival of microcomputers. Earlier, 5¼-inch floppy disks were used. Later, a new format of 3½-inch floppy disk came into existence, which has larger storage capacity and supports faster data transfer as compared to 5¼-inch floppy disks.

v) Optical storage

Optical storage technology uses light as the medium for representing data. Laser beams are used to store and retrieve data. Commonly used optical storage devices include CD-ROM, CD-R, CD-RW and DVD.

- CD-ROM - Compact-disk Read-Only Memory (CD-ROM) is the most exciting development that has taken place in secondary storage in recent years. CD-ROM can store huge quantity of data, of about 650 MB, which is equivalent to 200,000 pages of ordinary text on a single disk. It is relatively inexpensive and is used in both small and large computer systems. A special feature of CD-ROM is its ability to store different kinds of data such as text, pictures, animation, sound, video and graphics. This makes it valuable for certain industries like travel, entertainment and motion pictures.
- CD-R - This is Compact Disk -Recordable. It can be used to write data on it once. The data on it can be retrieved as and when needed.
- CD-RW - Compact Disk Re-writable (CD-RW) is an optical disk that can be rewritten many times. The data stored on it can be read, erased and re-written as frequently as needed.
- DVD - Digital Versatile Disk (earlier known as Digital Video Disk.) is a large capacity secondary storage device. It stores seven times CD capacity on a single side. Double-sided or dual layer DVDs are also available with much larger storage capacity. DVD uses a 5-inch disc for storage. That is, it is of the same size as a CD ROM. Single layer, single-sided DVD has a storage capacity of 4.7 GB. With double-layer, double sided disc, it can store 17 GB of data on a single disk. (Single sided DVDs can store 4.7GB for single layer

and 8.5GB for dual-layer disks. Double sided DVDs can store 9.40GB for single layer and 17GB for dual-layer disks). With such huge storage capacity, DVDs are used to store full-length commercial motion pictures, video albums etc. And its viewing quality is much better than tape storage. DVD system delivers a picture with over twice the definition of traditional storage like VHS.

vi) **USB** - As an independent memory device, flash memory takes two main forms: as a memory card (often used in digital cameras and other portable devices), and as a USB drive, sometimes called a thumb drive or USB flash drive. USB drives are about the size of an adult's thumb, and act as portable storage. (The name "drive" is a misnomer; there are no moving parts or disks in flash memory). They plug into the computer through a USB port. As USB ports become standard in most computers, it is easy to use a thumb drive to save data or transfer data between computers.

3.3 Other types of secondary storage devices include;

- Memory Card: An electronic flash memory device offering an easy, fast and reliable way for storing and transferring digital data.
- Compact Flash Is the most common digital camera memory.
- SD (Secure Digital) Card- used in portable devices like digital video cam recorder, mobile phones, handheld computers etc.
- Micro SD Card -It is one of the smallest memory cards available.
- Multi Media Card.
- Memory Stick
- Portable Hard Disk
- A pocket size storage device, which is connected to the computer or a laptop via a USB cable. Available in 2.5 inch and 3.5 inch in size.

Activity

1. Discuss primary and secondary sources of storage
2. Explain the different types of storage devices giving advantages and disadvantages.

Unit Summary

In this unit we have looked at different storage devices. Primary and secondary data storage systems were discussed. Secondary storage devices include magnetic disk, magnetic tape and CD- Rom. In the next unit we shall look at software applications.

UNIT 6

SOFTWARE

6.1 Introduction

Software refers to computer programs: sequences of instructions for the computers processor that control everything that the computer does. Without software, a computer would be useless. It is responsible for controlling, integrating, and managing the hardware components of a computer as well as to accomplish the specific tasks. In other words, software tells the computer what to do and how to do it. Software can be categorized as system software and application software. System software is a generic term for referring to any computer program whose purpose is to help the user to run the computer system, whereas application software employs the capabilities of a computer directly to a task that the user wishes to perform.

Learning Outcomes

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

- Define and explain systems software
- Differentiate between operating and application software
- Identify and employ technical and appropriate considerations when acquiring software in our chiefdoms
- Explain and apply programming languages and principles
- Identify and explain the role of computers in Electronic Data Processing (EDP) in our chiefdoms
- Explain and apply computer files and structures in chiefdoms
- Explain and apply LANs and WANs in organisations such as a school
- Explore on-line and real time processing of information in chiefdoms

Time Frame:

In this unit you are required to spend a minimum of 2 hours study time

6.2 System Software

System software consists of several programs, which are directly responsible for controlling, integrating, and managing the individual hardware components of a computer system. Some examples of system software are operating systems, device drivers, language translators, and system utilities.

6.2.1 Operating System

Operating system is the first layer of software loaded into computer memory when it starts up. As the first software layer, all other software that gets loaded after it depends on it for various common core services. These common core services include disk access, memory management, task scheduling, and user interfacing. In addition, the operating system ensures that different programs executing at the same time do not interfere with each other. It provides a software platform on top of which other programs can run. In simple words, the operating system organizes and controls the hardware. Examples of operating systems are Windows XP, UNIX, and Linux. The basic functions of an operating system are:

- Process Management: It handles the creation, deletion, suspension, resumption, and synchronization of processes.
- Memory Management: It handles allocation and de-allocation of memory space as required by various programs.
- File Management: It is responsible for creation and deletion of files and directories. It also organizes, stores, retrieves, names, and protects all the files.
- Device Management: It manages all the devices of the computer system such as printers and modems. If any device fails, it detects the device failure and notifies the same to the user.
- Security Management: It protects system resources and information against destruction and unauthorised use.
- User Interface: It provides the interface between the user and the hardware.
- Device Drivers: Device drivers are system programs, which are responsible for proper functioning of devices. Every device, whether it is a printer, monitor, mouse or keyboard, has a driver program associated with it for its proper functioning. Whenever a new device is added to the computer system, a new device driver must be installed before the device is used. Note that each device has its own set of specialised commands that only its driver understands. A device driver is not an independent program; it assists and is assisted by the operating system for the proper functioning of the device.

6.2.2 Application Software

The most often seen software by a user is the application software. It is used to accomplish specific tasks rather than just managing a computer system. For a user, the computer system has no specific use without application software. Application software may consist of a single program, such as Microsoft's Notepad (for writing and editing simple text). It may also consist of a collection of programs, often called a software package, which work together to

accomplish a task, such as database management software. Application software ranges from games, calculators, and word processors (document creating programs), to programs that "paint" images on screen (image editors).

- Word Processors: A word processor is software used to compose, format, edit, and print electronic documents. Word processing is one of the earliest applications for office productivity and the personal computer. It involves not only typing, but also checking the spelling and grammar of the text and arranging it correctly on a page. A variety of different typefaces is available for a variety of effects. It is possible to include pictures, graphs, charts, and many other things within the text of the document. It also allows for changes in margins, fonts, and colours. Nowadays, virtually all personal computers are equipped with a word processing program, which has the same function as a typewriter for writing letters, reports or other documents, and printing. Examples of some well-known word processors are Microsoft Word and WordPerfect.
- Spreadsheets: One of the first commercial uses of computers was in processing payroll and other financial records. So the programs were designed to generate reports in the standard "spreadsheet" format used by bookkeepers and accountants. A spreadsheet application is a rectangular grid, which allows text, numbers, and complex functions to be entered into a matrix of thousands of individual cells. The spreadsheet provides sheets containing cells each of which may contain text and/or numbers. Cells may also contain equations that calculate results from data placed in other cells or series of cells. Microsoft Excel and Lotus 1-2-3 are examples of spreadsheet applications.
- Image Editors: Image editor programs are designed specifically for capturing, creating, editing, and manipulating images. These graphics programs provide a variety of special features for creating and altering images. In addition to offering a host of filters and image transformation algorithms, some image editors also enable the user to create and superimpose layers. Examples of these programs are Adobe Photoshop, Adobe Illustrator, and CorelDRAW.
- Database Management Systems: Database management software is a collection of computer programs that allow storage, modification, and extraction of information from a database in an efficient manner. It supports the structuring of the database in a standard format and provides tools for data input, verification, storage, retrieval, query, and manipulation.

6.2.3 Acquisition of Software

Different kinds of software are made available for use to users in different ways. The user may have to purchase the software, can download for free from the Internet, or can get it bundled along with the hardware. Nowadays with the advent of Cloud computing, many application software is also available on the cloud for use through the Internet, e.g. Google Docs. The different ways in which the software are made available to users are:

- **Retail Software:** is off-the-shelf software sold in retail stores. It comes with printed manuals and installation instructions. For example, Microsoft Windows operating system.

- **OEM Software** stands for "**Original Equipment Manufacturer**" software. It refers to software which is sold, and bundled with hardware. Microsoft sells its operating system as OEM software to hardware dealers. OEM software is sold at reduced price, without the manuals, packaging and installation instructions. For example, Dell computers are sold with the "Windows 7" OS pre-loaded on them.
- **Demo Software** is designed to demonstrate what a purchased version of the software is capable of doing and provides a restricted set of features. To use the software, the user must buy a fully- functional version.
- **Shareware** is a program that the user is allowed to try for free, for a specified period of time, as defined in the license. It is downloadable from the Internet. When the trial period ends, the software must be purchased or uninstalled.
- **Freeware** is software that is free for personal use. It is downloadable from the Internet. The commercial use of this software may require a paid license. The author of the freeware software is the owner of the software, though others may use it for free. The users abide by the license terms, where the user cannot make changes to it, or sell it to someone else.
- **Public Domain Software** is free software. Unlike freeware, public domain software does not have a copyright owner or license restrictions. The source code is publicly available for anyone to use. Public domain software can be modified by the user.
- **Open-Source Software** is software whose source code is available and can be customized and altered within the specified guidelines laid down by the creator. Unlike public domain software, open-source software has restrictions on their use and modification, redistribution limitations, and copyrights. Linux, Apache, Firefox, Open Office are some examples of open-source software.

6.3 Programming Languages

Computers work on a set of instructions called computer program, which clearly specifies the ways to carry out a task. A computer, takes instructions, in the form of computer programs, and carries out the requested task. We, as human beings, use natural languages such as English, Spanish, or French to communicate. Similarly, a user communicates with the computer in a language understood by it. The instructions, provided in the form of computer programs, are developed using computer or programming languages. A Programming Language consists of a set of vocabulary and grammatical rules, to express the computations and tasks that the computer has to perform. Programming languages are used to write a program, which controls the behavior of computer, codify the algorithms precisely, or enables the human-computer interface. Each language has a unique set of keywords (words that it understands) and a special syntax for organizing program instructions. The programming language should be understood, both by the programmer (who is writing the program) and the computer. Programming languages fall into three categories:

1) Machine Language: It is the native language of computers. It uses only 0s and 1s to represent data and the instructions written in this language, consist of series of 0s and 1s. A program written in machine language is a collection of binary digits or bits that the computer reads and interprets. It is a system of instructions and data executed directly by a computer's CPU. It is also referred to as machine code or object code. Some of the features of a program written in machine language are as follows:

- The computer can understand the programs written in machine language directly. No translation of the program is needed.
- Program written in machine language can be executed very fast (Since no translation is required).
- Machine language is defined by the hardware of a computer. It depends on the type of the processor or processor family that the computer uses, and is thus machine-dependent. A machine- level program written on one computer may not work on another computer with a different processor.
- Computers may also differ in other details, such as memory arrangement, operating systems, and peripheral devices; because a program normally relies on such factors, different computer may not run the same machine language program, even when the same type of processor is used.
- Most machine-level instructions have one or more opcode fields which specify the basic instruction type (such as arithmetic, logical, jump, etc), the actual operation (such as add or compare), and some other fields.
- It is difficult to write a program in machine language as it has to be written in binary code. For e.g., 00010001 11001001. Such programs are also difficult to modify.
- Since writing programs in machine language is very difficult, programs are hardly written in machine language.

2) Assembly Language: It correspondences symbolic instructions and executable machine codes and was created to use letters instead of 0s and 1s to run a machine. This representation is usually defined by the CPU manufacturer, and is based on abbreviations (called mnemonics) that help the programmer remember individual instructions, registers, etc. Some of the features of a program written in assembly language are as follows:

- Assembly language programs are easier to write than the machine language programs, since assembly language programs use short, English-like representation of machine code. For e.g.:
  ADD 2, 3
  LOAD A
  SUB A, B

- The program written in assembly language is the source code, which has to be converted into machine code, also called object code, using translator software, namely, assembler.
- Each line of the assembly language program is converted into one or more lines of machine code. Hence assembly language programs are also machine-dependent.
- Although assembly language programs use symbolic representation, they are still difficult to write.
- Assembly language programs are generally written where the efficiency and the speed of program are the critical issues, i.e. programs requiring high speed and efficiency.

3) High-level Language: These languages are written using a set of words and symbols following some rules similar to a natural language such as English. The programs written in high-level languages are known as source programs and these programs are converted into machine-readable form by using compilers or interpreters. Some of the features of a program written in high-level language are as follows:

- Programs are easier to write, read or understand in high-level languages than in machine language or assembly language. For example, a program written in C++ is easier to understand than a machine language program.
- Programs written in high-level languages is the source code which is converted into the object code (machine code) using translator software like interpreter or compiler.
- A line of code in high-level program may correspond to more than one line of machine code.
- Programs written in high-level languages are easily portable from one computer to another.

Note: Together, machine and assembly language are also known as low-level languages.

6.4 Basic Programming Principles

Programming languages are used to carry out arithmetic or logical operations. All programming languages share key characteristics, although individual programming languages can have their own unique features. Thus, the knowledge of the key characteristics learned from one programming language can be applied to other programming languages.

6.5 Syntax, Sentence, Key Word

Computer programming languages have what is known as syntax, these are the rules that govern the structure of sentences of the programs written in the language. In a programming language, a sentence consists of words, numbers, and punctuation. There

are two types of words in a programming language: keyword (or reserved word) and user-defined word. A keyword represents a specific meaning of the language (e.g., a specific instruction). A user-defined word is defined by the programmer to name a variable or a module. A word used in a programming language must not contain a space and is usually case is sensitive.

6.6 Variable

A variable is the name of a piece of CPU memory that holds data. A variable name is defined by the programmer and must be a user-defined word. Clearly, variable names are case sensitive; that is, **A variable** is different from **variable**. In addition, a name of a variable must be a single user-defined word without a space. A variable has its data type, such as integer, character, etc. The data held by the variable are called the value of the variable. The original value of a variable could be a default value depending on its data type (such as 0 for an integer and space for a character). The value of a variable can be changed through operations, but can never be lost unless the computer program is terminated.

6.7 Arithmetic Operation

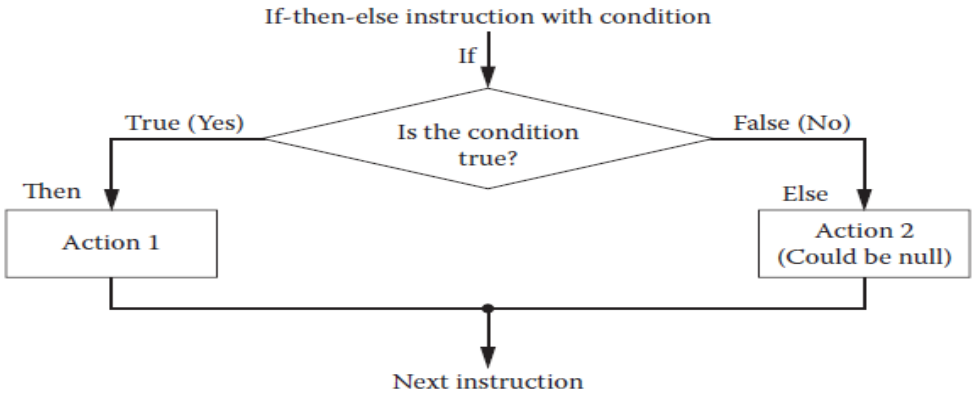
Arithmetic operations in procedural programming are similar to day-to-day arithmetic Calculations, but use reverses expression. For instance, instead of A+B=C, C=A+B is used in programming; this means: "Let C equal to A plus B." Multiplication is denoted by the asterisk symbol "*", and division is denoted by the slash symbol "/".

6.8 Execution Sequence

A computer program consists of a set of instructions. During the execution of the procedure of a program, instructions are executed one after another in a sequence (so-called execution sequence) in which they are encountered, but not in the order in which they are listed in the program. Logical instructions (e.g., if-statement and loops) can control the execution sequence of the program, as explained next.

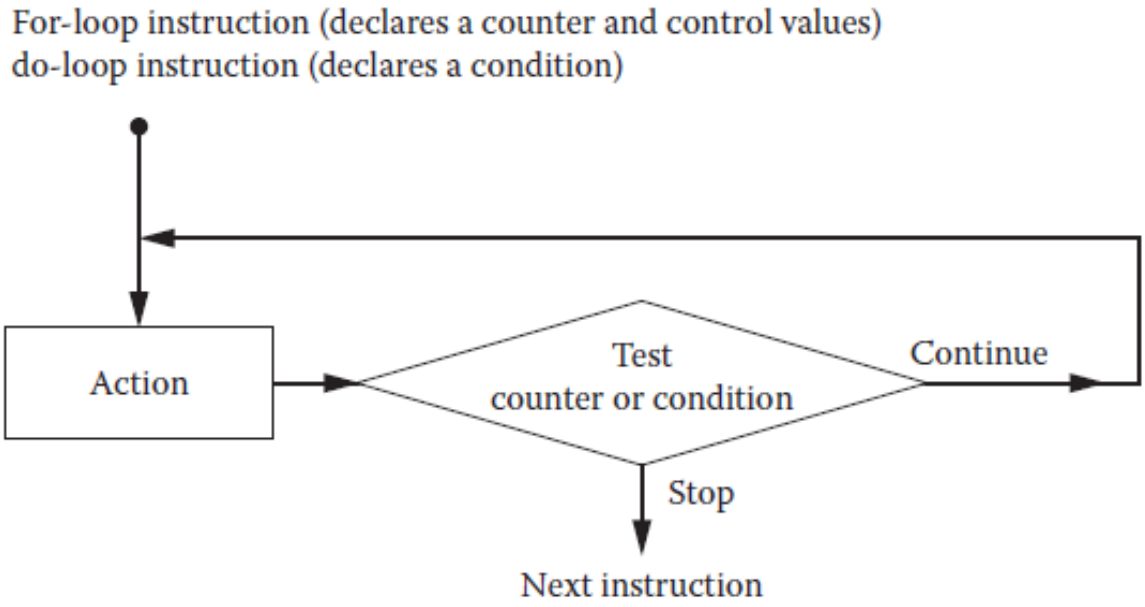
6.9 If-then-else Logic

An if-then-else statement controls the computer execution sequence based on a condition that is defined by the current value of a particular variable(s). The if-then-else logic is illustrated



6.10 Loop

A loop is a group of instructions that are specified once but are executed several times in succession. A loop statement defines such an iteration procedure. Loop is actually a variation of if-then-else logic. The common loops include for-loop and do-loop. The variable used in a loop to control the execution of the loop is called a counter. This construct allows repeated execution of a set of codes without repeating codes in the program. It saves the trouble of writing the same codes again and again in the program.



6.11 Module

A large program must be divided into modules to make the program easy to debug. Also, a module can be reused. Here, a module could be a paragraph of instructions, an independent function, or a class, depending upon the specific language in discussion. An instruction in a

module can call another module to accomplish a specific task carried out by the called module. A module has its name, which is a single user-defined word. The communication between the calling module and the called module can be implemented by passing the values of special variables termed arguments or parameters.

Unit Activity

https://www.youtube.com/watch?v=ny3cI-5q7ks

Follow the video lecture using the above link and answer the questions asked at the end of the lecture.

Unit Summary

The unit walked us through systems software, differences between operating and application software, steps taken before acquiring a software, elaboration of programming languages and principles and the use of computerised information systems. Others covered in this unit included but not limited to role of computers in Electronic Data Processing (EDP),computer files and structures, LANs and WANs and on-line and real time processing.

UNIT 7

THE ROLES OF INFORMATION AND COMMUNICATIONS TECHNOLOGY IN THE DEVELOPMENT OF CHIEFDOMS

7.1 Introduction

Our focus in this unit is to discuss the role of Information and Communications Technology in the development of chiefdoms. The role of ICTs in chiefdoms education, society and the nation at large will be explained. We shall also look at some the challenges that an chiefdom may face in implementing ICTs and how these challenges can be countered.

Learning Outcomes

- Discuss the roles of computers in education
- Explain the roles of ICT in our society
- State of ICT to students
- Identify the roles of ICTs to Managers in Chiefdoms

Time Frame:

In this unit, you are required to spend a minimum of 2 hours study time.

7.2 The Role of ICTs

ICTs stand for information and communication technologies and are defined, for the purposes, as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information." These technologies include computers, the Internet, broad casting technologies (radio and television), and telephony.

The use of computers for data processing in an chiefdom bears a number of benefits that, leads to reduction in paper work and results in speeding up a process. As data is in electronic files can be retrieved as and when required, the problem of maintenance of large number of paper files gets reduced. Computer-based learning is a term that can be used to describe virtually any kind of learning program using computers as a central staple. It refers to the use of computers as a key component of the educational environment. There are various merits of using computer-based learning programs in education, these including:

- the ability for students to learn from their homes and study without the assistance of an instructor(teacher)
- Allowing students to research for their study materials, e.g. use of electronic encyclopedias and the Internet.
- Communication with Security Officers, sponsors, parents and friends through E-mail other means
- Production of learning resources, e.g. notes and assignments.

- The saying "practice makes perfect" becomes a reality with use of ICT because learners are able to practice a skill, or listen or watch a presentation many times at their own pace, place and time.
- Storing of documents for administrative purposes.

7.4 The Effectiveness of ICTs in Chiefdom Education

ICTs are a potentially powerful tool for extending educational opportunities, both formal and non-formal, to previously underserved constituencies—scattered and rural populations, groups traditionally excluded from education due to cultural or social reasons such as ethnic minorities, girls and women, persons with disabilities, and the elderly, as well as all others who for reasons of cost or because of time constraints are unable to enroll on campus.

- Anytime, anywhere. One defining feature of ICTs is their ability to transcend time and space. ICTs make possible asynchronous learning, or learning characterized by a time lag between the delivery of instruction and its reception by learners. Online course materials, for example, may be accessed 24 hours a day, 7 days a week. ICT-based educational delivery (e.g., educational programming broadcast over radio or television) also dispenses with the need for all learners and the instructor to be in one physical location. Additionally, certain types of ICTs, such as teleconferencing technologies, enable instruction to be received simultaneously by multiple, geographically dispersed learners (i.e., synchronous learning).
- Access to remote learning resources. Subjects from Chiefdomsand learners no longer have to rely solely on printed books and other materials in physical media housed in libraries (and available in limited quantities) for their educational needs. With the Internet and the World Wide Web, a wealth of learning materials in almost every subject and in a variety of media can now be accessed from anywhere at any time of the day and by an unlimited number of people. This is particularly significant for many schools in developing countries, and even some in developed countries, that have limited and outdated library resources. ICTs also facilitate access to resource persons, mentors, experts, researchers, professionals, business leaders, and peers—all over the world.
- ICTs help prepare individuals for the workplace. One of the most commonly cited reasons for using ICTs in the classroom has been to better prepare the current generation of students for a workplace where ICTs, particularly computers, the Internet and related technologies, are becoming more and more ubiquitous. Technological literacy, or the ability to use ICTs effectively and efficiently, is thus seen as representing a competitive edge in an increasingly globalizing job market.

7.5 Roles of ICT Education in Society and Chiefdoms

7.5.1 Educational Leap Frogging;

Continuous learning isn't just happening in the developed world. With low-priced computers, tablets, and cell phones in the hands of children in resource-challenged communities, many kids who are engaging in technological leapfrogging will have the opportunity to skip past outdated formal school systems, too. This is especially relevant in the case of children living in poverty, who may be denied an opportunity to improve their condition through education because they start working very early to help sustain their families or do not live near schools.

The ability to interstitially access educational content during pauses throughout their daily routine, or at night, or even as a running "soundtrack" that accompanies them during their tasks are all novel opportunities offered by a classroom that can follow you wherever you go.

7.5.2 A New Crop of Older, Lifelong Learners (and Educators).

A by-product of the continuous learning phenomenon is the fact that the grandparents of children growing up with a touch screen in their hands. People in their 60s today are being pulled into learning more than ever, motivated to adoption by the need to stay in touch with their grandkids.

The availability of tablets and other touch-enabled devices has radically reduced the perceived complexity of computers, helping older users to more easily communicate with their middle-aged children and grandkids via email, Facebook, Twitter, and Skype.

This is a demographic group that often has the time availability to take online courses for fun, but the same time availability also offers another untapped opportunity: Retirees represent a huge potential talent pool of educators who could address the scarcity of qualified Subjects from Chiefdomsin many areas of the world—especially if they teach remotely, via M-Learning.

7.5.3 Breaking Gender Boundaries, Reducing Physical Burdens

In parts of the globe where, because of centuries of cultural practices, young women may still not be allowed to access a formal education, M-Learning promises to be able to put girls and women of all ages in contact with high-quality education privately and on their own time. Along similar lines M-Learning also helps bring educational material within the reach of people with extreme disabilities, who may not be physically able to get to a classroom or campus on a regular basis. In both of these cases, new freedoms can be exposed. As a result, these groups can take control of their educational and professional destinies.

7.5.4 A New Literacy Emerges: Software Literacy

M-Learning could usher in a boom of interest in learning software programming languages, which could very well become a new lingua franca. This is already happening; numerous startup web-based businesses today such as Codecade may teach people via interactive lessons how to understand and write software programs. Not even a year old, Codacademy has more than a million "students" and has raised about $3 million in venture-capital funds.

This scenario is particularly relevant in emerging economies, where gaining software development expertise can introduce new opportunities for economic growth, or give communities what they need to address unmet local needs. Consider the boom of homegrown startups in Kenya that has been shaping m-Health solutions to solve some of the many health care issues affecting the country, or the success of an chiefdom like Ushahidi, which has been financing a social high-tech accelerator called I HUB in Nairobi precisely to promote software literacy and local entrepreneurship.

7.5.6 Education's Long Tail

M-Learning solutions are poised to tap into the vast amount of existing educational materials that could be made accessible via mobile channels. This is especially true with YouTube, Vimeo, and other video-sharing services already providing a critical mass of tips, tutorials, and full-fledged lessons that can be re-aggregated by theme and packaged as educational material. The recent TED-Ed initiative attests to the opportunity offered by the clever repurposing of existing quality lessons.

Others have leveraged the video-sharing social platforms to distribute educational materials created in an ad hoc way. It's a model made famous by Salman Khan, an MIT graduate who, with his eponymous academy, "flips" the traditional education model by having pupils absorb lessons at home, and practice and discuss what they've learned at school instead.

The range of m-Learning materials does not need to be limited to higher education but can easily encompass valuable, practical know-how, from grandmothers showing how to prepare traditional recipes to companies demonstrating how to install solar panels on mud huts.

The nature and complexity of educational materials can also vary greatly and not necessarily require a video-capable Smartphone: Humanitarian chiefdoms like MAMA have put to good use simple text messages to help mothers in developing economies learn about pregnancy, childbirth, and caring for their infants.

These examples illustrate how the power of m-Learning lies in its ability to offer solutions for numerous niche audiences.

7.6 Benefits for Chiefdoms

- ICT facilitates sharing of resources, expertise and advice
- Greater flexibility in when and where tasks are carried out
- Gains in ICT literacy skills, confidence and enthusiasm.
- Easier planning and preparation of work activities and designing materials
- Enhancement of professional image projected to colleagues.
- Easier communication with Security Officers
- Opportunities to address their work to an external audience

7.7 Benefits for Chiefdom Subjects

The invention or development of a new physical body or mental tool creates both opportunities and challenges. In brief summary, a new tool typically: Helps us to "better" solve some problems and accomplish some tasks that we are currently addressing without the new tool. Here, the term "better" may have meanings such as: in a more cost effective manner; faster; more precisely; more reliably; with less danger; and so on. It also helps us to solve some problems and accomplish some tasks that cannot be solved without the new tool. Other benefits of ICTs to students are outlined below:

- Higher quality lessons through greater collaboration between Subjects from Chiefdoms in planning and preparing resources.
- More focused teaching, tailored to students' strengths and weaknesses, through better analysis of attainment data
- Improved pastoral care and behavior management through better tracking of students
- Gains in understanding and analytical skills, including improvements in reading
- Comprehension.
- Development of writing skills (including spelling, grammar, punctuation, editing and re-drafting), also fluency, originality and elaboration.
- Encouragement of independent and active learning, and self-responsibility for learning
- Flexibility of 'anytime, anywhere' access (Jacobsen and Kremer, 2000)
- Development of higher level learning styles.
- Students who used educational technology in school felt more successful in school, were more motivated to learn and have increased self-confidence and self-esteem
- Students found learning in a technology-enhanced setting more stimulating and student-centered than in a traditional classroom
- Broadband technology supports the reliable and uninterrupted downloading of web-hosted educational multimedia resources
- Opportunities to collaborate on assignments with people outside or inside school

- Students are generally more ‘on task’ and express more positive feelings when they use computers than when they are given other tasks to do.

7.8 Challenges

7.8.1 Availability of Infrastructure to Support ICT in Chiefdoms

Before any ICT-based programmer is launched, their Royal Highnesses, policy-makers and planners must carefully consider the following:

- In countries within this South Asian region, large areas are still without a reliable supply of electricity and the nearest telephones are miles away. Power situation in rural and remote-rural areas even in some advanced countries in this region is undependable, and this affects the functioning of any ICT initiative. Power cuts with different power cut schedules each week play havoc with the timetables. Power outages and fluctuations add to the high maintenance costs of computer hardware.
- Policy-makers should also look at the ubiquity of different types of ICT in the country in general, and in the educational system (at all levels) in particular. For instance, a basic requirement for computer-based or online learning is access to computers in schools, communities, and households, as well as affordable Internet service.
- Insufficient access to computers is one of the main obstacles to the spread of ICT usage in school education. This is more so in the case of rural areas where the school is often the only access point for computers. Moreover, system software is expensive and prone to upgrades and requires resources put aside for new versions and upgrades. Operating System (OS) itself adds to the cost burden of the hardware. Although this will require massive investments in the infrastructure, it is nevertheless essential in order to guarantee equal access and to overcome the digital divide.
- Capacity Building of Security Officers. In most of schools in the subcontinent, the Subjects from Chiefdoms are overloaded, less motivated and inadequately trained, and often deal with inconvenient working conditions. The use of ICTs in the classroom or in distance education does not diminish the role of the teacher; neither does it automatically change teaching practices. In such an atmosphere, building the capacity of Subjects from Chiefdoms so that they are equipped to deal with using ICTs in classrooms is a challenge.
- Resistance to Change: Resistance is commonly witnessed while attempting to introduce ICTs into schools, very often from the Subjects from Chiefdoms themselves, since they may be of the opinion that they shall become redundant once technology comes in or due to their perception that it is too late for them to

adapt to a new environment. Educators themselves may be skeptical about the effectiveness of using ICTs in school education.

- Lack of Awareness. There is a general lack of awareness about the utility of ICTs in education, as well as about the ICTs at our disposal and how they can be accessed and utilized economically and effectively. This lack of awareness and knowledge about ICTs and their use in education, even on the part of policy makers, administrators and educators, makes it particularly difficult to deploy ICTs in the field of school education.
- Another critical issue with the usage of ICT in schools is the implementation of new technologies without having analyzed their appropriateness, applicability and impact on various environments and contexts. In most countries, particularly the least developed ones, they must learn from the experiences of others, but must also use technology to respond to their own needs and not just follow trends
- Internet Usage- while the Internet contains tremendous potential for education, as described in the sections earlier, it also has its own pitfalls. For one, providing all the students with Internet access is a very expensive proposition for most Government schools. This is more so in the case of rural centers and remote areas, where Internet connections are bound to be erratic, if available at all.
- A different challenge altogether when it comes to Internet usage is the effort involved in monitoring the students' usage of the Internet to ensure that they do not visit educationally irrelevant and socially undesirable sites, thus detracting from the intended objective.
- Language Barriers - English is the dominant language of the Internet. An estimated 80 percent of online content is in English. A large proportion of the educational software produced in the world market is in English. For developing countries in the South Asian region where English language proficiency is not high, especially outside metropolitan areas, this represents a serious barrier to maximizing the educational benefits of the World Wide Web.
- Monitoring and evaluation- Many of the issues and challenges associated with ICTs in education initiatives are known by policymakers, donor staff, and educators. However, data on the nature and complexity of these issues remains limited because of the lack of good monitoring and evaluation tools and processes. Where evaluation data is available much of the work is seen to suffer from important biases.
- Government Participation- Government cooperation is necessary for ICT programs to have substantial impact and be sustainable. In the attempt to reevaluate the education delivery system and curriculum of countries to include ICT, Governments have to consider the social context in which they are implementing this new phenomenon. The realities of individual countries and the disparities within and across their geographies, including their limitations say, the

language barrier, should be considered and the availability of ICT should be made according to the needs and desires of the countries in order to facilitate appropriate learning and local ownership of knowledge.

Unit Activity

1. Critically discuss the significance of ICTs in chiefdoms today
2. What some of the considerations for governments to consider in the provision of ICTs in chiefdoms.

Unit Summary

This unit has looked at the critical role of ICTs in chiefdoms, Subjects from Chiefdoms and its benefits for students. We also discussed the challenges faced when implementing ICTs in chiefdoms and some measures too on how to counter these challenges where explained.

UNIT 8

UNDESIRABLE PRACTICES IN ICTS IN CHIEFDOMS.

8.1 Introduction

In unit 7, we looked at the role of ICTs in development of chiefdoms. In this unit, our focus will be discussing some of the undesirable practices in the use of ICTs in our chiefdoms. It is important for you to familiarize yourself with the contents of this unit and at the end of the unit try to attempt the unit activity in order to assess your level of comprehensive on this topic. I therefore welcome you to this interesting topic.

Learning Outcomes

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

- Discuss ethics in ICT
- Explain the dangers of using ICTs in a wrong way
- Discuss the consequences of coping data without authorization
- State the dangers of communication to strangers on the net
- Students should know the basic Ten Commandments in ICT

Time Frame

In this unit, you are required to spend a minimum of 2 hours study time.

8.2 What is Computer Ethics?

Ethics deals with placing a "value" on acts according to whether they are "good" or "bad". Every society has its rules about whether certain acts are ethical or not. These rules have been established as a result of consensus in society and are often written into laws.

When computers first began to be used in society at large, the absence of ethical standards about their use and related issues caused some problems. However, as their use became widespread in every facet of our lives, discussions in computer ethics resulted in some kind of a consensus. Today, many of these rules have been formulated as laws, either national or international. Computer crimes and computer fraud are now common terms. There are laws against them, and everyone is responsible for knowing what constitutes computer crime and computer fraud.

Therefore computer ethics is a set of moral principles that regulate the use of computers. Some common issues of computer ethics include intellectual property rights (such as Copyrighted electron).

8.3 The Ten Commandments

The **Ten Commandments of computer ethics** have been defined by the **Computer Ethics Institute**. Here is our interpretation of them:

1) Thou shalt not use a computer to harm other people: If it is unethical to harm people by making a bomb, for example, it is equally bad to write a program that handles the timing of the bomb. Or, to put it more simply, if it is bad to steal and destroy other people's books and notebooks, it is equally bad to access and destroy their files.

2) Thou shalt not interfere with other people's computer work: Computer **viruses** are small programs that disrupt other people's computer work by destroying their files, taking huge amounts of computer time or memory, or by simply displaying annoying messages. Generating and consciously spreading computer viruses are unethical.

3) Thou shalt not snoop around in other people's files: Reading other people's e-mail messages is as bad as opening and reading their letters: This is invading their privacy. Obtaining other people's non-public files should be judged the same way as breaking into their rooms and stealing their documents. Text documents on the Internet may be protected by **encryption**.

4) Thou shalt not use a computer to steal: Using a computer to break into the accounts of a company or a bank and transferring money should be judged the same way as robbery. It is illegal and there are strict laws against it.

5) Thou shalt not use a computer to bear false witness: The Internet can spread untruth as fast as it can spread truth. Putting out false "information" to the world is bad. For instance, spreading false rumors about a person or false propaganda about historical events is wrong.

6) Thou shalt not use or copy software for which you have not paid: Software is an intellectual product. In that way, it is like a book: Obtaining illegal copies of copyrighted software is as bad as photocopying a copyrighted book. There are laws against both. Information about the copyright owner can be embedded by a process called watermarking into pictures in the digital format.

7) Thou shalt not use other people's computer resources without authorization: Multiuser systems use **user ID's** and **passwords** to enforce their memory and time allocations, and to safeguard information. You should not try to bypass this authorization system. **Hacking** a system to break and bypass the authorization is unethical.

8) Thou shalt not appropriate other people's intellectual output: For example, the programs you write for the projects assigned in this course are your own intellectual output. Copying somebody else's program without proper authorization is **software piracy** and is unethical. **Intellectual property** is a form of ownership, and may be protected by copyright laws.

9) Thou shalt think about the social consequences of the program you write: You have to think about computer issues in a more general social framework: Can the program you write be used in a way that is harmful to society? For example, if you are working for an animation house, and are producing animated films for children, you are responsible for their contents. Do the animations include scenes that can be harmful to children? In the United States, the **Communications Decency Act** was an attempt by lawmakers to ban certain types of content from Internet websites to protect young children from harmful material. That law was struck down because it violated the free speech principles in that country's constitution. The discussion, of course, is going on.

10) Thou shalt use a computer in ways that show consideration and respect: Just like public buses or banks, people using computer communications systems may find themselves in situations where there is some form of queuing and you have to wait for your turn and generally be nice to other people in the environment. The fact that you cannot see the people you are interacting with does not mean that you can be rude to them.

8.4 Types of ethical issues in I.T

There are a great variety of ethical issues in I.T. that need to be considered, and some of the different types will be considered in this section.

Ethical dilemmas

There are various ethical dilemmas in relation to I.T. that need to be addressed. What are and are not ethical issues in I.T.? In regard to hackers, for example, are they testing the system or performing an immoral action? Will genetic engineering improve the quality of peoples' lives or start to destroy it? How do we recognize when an ethical dilemma exists? There are, indeed, many grey ethical areas.

Plagiarism

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

Plagiarism is the taking of the ideas, writings, drawings, words, or other similar intellectual property created by others and presenting it as your own. It is generally not a legal issue, like copyright infringement, but it is an ethical one. For example,

you can reuse writings in the public domain without worrying about the legal problem of infringing a copyright, but presenting them as your own without proper credit to their true origin is an act of plagiarism. And plagiarism is unethical (Bowyer, 2001, p.267).

Bowyer also refers to 'self-plagiarism', whereby the author reuses his/her own words from a previous publication in a newer publication without referencing the older publication. There are software packages that operate to detect plagiarism from the Internet, but it would be highly beneficial if more work was undertaken in this area.

Piracy

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

Hacking

Hackers break into, or 'hack' into a system. Hacking can be undertaken for a variety of reasons, such as the wish to damage a system or the wish to understand how a system works, so that money can be made out of it. Alternatively, there might be a desire to alert people to the fact that a system is insecure and needs improving. Due to this some argue that there are 'hacker ethics'. Mikkkeee (und.) says that:

The ethics behind hacking and the actions taken by hackers constitute a philosophical manifesto that transcends our understanding of the art (Mikkkeee, und. p.1).

Hacking can present a moral dilemma. This is because 'reformed hackers' sometimes offer their expertise to help organisations protect themselves against other hackers. Hackers cannot just wander into a system, as they could into an unlocked door. Instead, it requires a lot of skill. With this skill hackers can demonstrate that a system is insecure and needs improving. In this way, it could be argued that hackers play a valuable role. However, many such as Mikkkeee, argue that hacking might lead to some improvements, but that it causes such a lot of disruption that it is not worth it in the long-run. Mikkkeee suggests that there should be a National Data Protection Commission to monitor information, propose legislation and monitor abuse.

Computer crime

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

Viruses

Clearly writing and spreading virus programs are unethical acts, they have very serious consequences, and cause systems to crash and organisations to cease operating for certain periods. One of the most concerning consequences of such actions is when viruses interrupt the smooth functioning of an organisation such as a hospital, which could in extreme cases even cause people to die. Logic bombs are also sometimes planted.

There is obviously a lot of anti-virus software on the market now though that helps to deal with this ever-growing problem.

Ergonomics/health issues

There are many ergonomic/health issues related to I.T. Responsible/ethically-minded employers will, hopefully, give due consideration to this, as indeed should all employers. This includes issues such as the importance of taking adequate breaks from using the computer and ensuring that the screens comply with the regulations. Also, ensuring that the positioning of the chair and the computer is appropriate for the user and providing foot rests, when required. Some organisations will give special advice to their employees on these matters. When I worked at Clifford Chance, an international law company, for example, they had specialised staff who would come round to each employee individually, and discuss their ergonomic needs, if the employee requested this. Having enough light and having plants in the room can also be important factors. As Kallman and Grillo say:

Ergonomics is concerned with the physical work environment. The question is, how far should an chiefdom go to be "ergonomically sound"? For example, what is required to provide data entry clerks with a healthful work area? How can a firm create an environment that results in minimal eyestrain, guards against back problems, prevents repetitive-motion syndrome, and protects against exposure to possibly harmful CRT (cathode-ray tube) emissions? (Kallman and Grillo, 1996, p.27).

Without such ethical/moral awareness and taking the necessary action, many workers will suffer health problems directly from I.T., such as back problems, eyestrain and eye infections and repetitive strain injury (RSI).

Gender

There are also ethical issues in regard to gender and computers, given the fact that females are often discriminated against in various ways in this new I.T. age. As I emphasised in my article *Females, computer and libraries:*

The computing world is very male-dominated…For various reasons, such as early socialisation, the male-dominated computer environment, and an apparent lack of confidence, females tend to focus on the softer subjects. They either do not study and move into areas such as computing, mathematics and engineering at all, or if they do many subsequently become discouraged and disillusioned and leave. Males

dominate the computing world and even more disturbingly the numbers of women going into IT are falling (Rikowski, 2003, p.6).

Unit Activity

1. Discuss the dangers of Using ICTs in a wrong way
2. Apply the ten commandments of ICTs to a real life scenario with the use of expels.
3. Identify and discuss some of the ways in which ICTs may be wrongly utilized.

Unit Summary

In this unit, we have looked at the wrong usage of ICTs in chiefdoms, the ten commandants of using ICTs and the type of ethical issues in IT. Go back to the contents of the unit before proceeding to the next unit in case you didn't fully understand the contents of this unit and try to attempt the given activity.

UNIT 9

WEBSITES

9.1 Introduction

Welcome to unit, so far we have covered a number of important issues in the units that have been covered so far. In this unit, we shall focus our attention to looking at websites. Topics to be covered include website as an educational tool, web-browsing, surfing the web, and internet etiquette. I encourage you to follow me in this exciting journey.

Learning Outcomes

- Demonstrate knowledge on how to search for different sites
- Discuss how to effectively use the internet
- Explain how to bookmark different site
- Upload and download information

Time Frame

In this unit, you are required to spend a minimum of 2 hours of study time.

9.1 A Website as an Education Tool

9.1.1 Web Services

Web services allow exchange of information between applications on the web. Using web services, applications can easily interact with each other.

The web services are offered using concept of Utility Computing.

9.1.1.1 World Wide Web (WWW)

WWW is also known as W3. It offers a way to access documents spread over the several servers over the internet. These documents may contain texts, graphics, audio, video, hyperlinks. The hyperlinks allow the users to navigate between the documents.

9.1.1.2 WWW Operation

WWW works on client- server approach. Following steps explains how the web works:

1. User enters the URL (say, http://www.tutorialspoint.com) of the web page in the address bar of web browser.
2. Then browser requests the Domain Name Server for the IP address corresponding to www.tutorialspoint.com.
3. After receiving IP address, browser sends the request for web page to the web server using HTTP protocol which specifies the way the browser and web server communicates.
4. Then web server receives request using HTTP protocol and checks its search for the requested web page. If found it returns it back to the web browser and close the HTTP connection.

5. Now the web browser receives the web page, it interprets it and display the contents of web page in web browser's window.

9.1.1.3 Video Conferencing

Video conferencing or Video teleconferencing is a method of communicating by two-way video and audio transmission with the help of telecommunication technologies.

9.1.1.4 Hyper Text Transfer Protocol (HTTP)

HTTP is a communication protocol. It defines mechanism for communication between browser and the web server. It is also called request and response protocol because the communication between browser and server takes place in request and response pairs.

9.1.1.5 Email

Email is a service which allows us to send the message in electronic mode over the internet. It offers an efficient, inexpensive and real time mean of distributing information among people.

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9.2 Basic Web-Browsing (Use Web-Browsers, Search Engines, Web Referencing, Etc.)

9.2.1 Search Engine.

Search engine contains software used by the Web browser to open peoples' computers and take information from there. These are examples of Search Engine are yahoo and Google.

The use of Search Engines is to for information on the internet from the Website.

Email: It is the short form for electronic mail. Similar to a letter which is sent via the internet. In other words, it is the transmission of messages over the electronic like the internet

9.2.2 Surf the Web for Information

Web Browsers

Web Browser is application software that allows us to view and explore information on the web. User can request for any web page by just entering a URL into address bar.

Web browser can show text, audio, video, animation and more. It is the responsibility of a web browser to interpret text and commands contained in the web page.

Earlier the web browsers were text-based while now days graphical-based or voice-based web browsers are also available.

Search Engines

Search Engine refers to a huge database of internet resources such as web pages, newsgroups, programs, images etc. It helps to locate information on World Wide Web.

User can search for any information by passing query in form of keywords or phrase. It then searches for relevant information in its database and return to the user.

Video Sharing

Video sharing is an IP Multimedia System (IMS) service that allows user to switch voice calls to unidirectional video streaming session. The video streaming session can be initiated by any of the parties. Moreover, the video source can be the camera or the pre-recorded video clip.

9.3 Internet Netiquette (Rules of Online Etiquette)

Internet

Definition

- Internet is a world-wide global system of interconnected computer networks.
- Internet uses the standard Internet Protocol (TCP/IP).
- Every computer in internet is identified by a unique IP address.

9.3.1 Internet Evolution

The concept of Internet was originated in 1969 and has undergone several technological & Infrastructural changes as discussed below:

- The origin of Internet devised from the concept of Advanced Research Project Agency Network (ARPANET).
- ARPANET was developed by United States Department of Defense.
- Basic purpose of ARPANET was to provide communication among the various bodies of government.
- Initially, there were only four nodes, formally called Hosts.
- In 1972, the ARPANET spread over the globe with 23 nodes located at different countries and thus became known as Internet.
- By the time, with invention of new technologies such as TCP/IP protocols, DNS, WWW, browsers, scripting languages etc. Internet provided a medium to publish and access information over the web.

9.3.2 Domain Names

Domain Name is a symbolic string associated with an IP address. There are several domain names available; some of them are generic such as com, Edu, gov, netetc, while some country level domain names such as au, in, za, us etc.

DNS translates the domain name into IP address automatically. Following steps will take you through the steps included in domain resolution process:

1. When we type www.tutorialspoint.com into the browser, it asks the local DNS Server for its IP address.

   Here the local DNS is at ISP end.
2. When the local DNS does not find the IP address of requested domain name, it forwards the request to the root DNS server and again enquires about IP address of it.

3. The root DNS server replies with delegation that I do not know the IP address of www.tutorialspoint.com but know the IP address of DNS Server.
4. The local DNS server then asks the com DNS Server the same question.
5. The com DNS Server replies the same that it does not know the IP address of www.tutorialspont.com but knows the address of tutorialspoint.com.
6. Then the local DNS asks the tutorialspoint.com DNS server the same question.
7. Then tutorialspoint.com DNS server replies with IP address of www.tutorialspoint.com.
8. Now, the local DNS sends the IP address of www.tutorialspoint.com to the computer that sends the request.

9.3.3 Services on the Internet

There are various Services available that offer exchange of information with individuals or groups. The following table gives a brief introduction to these services:

S.N.	Service Description
1	Electronic Mail- used to send electronic message over the internet.
2	Telnet- used to log on to a remote computer that is attached to internet.
3	Newsgroup- offers a forum for people to discuss topics of common interests.
4	Internet Relay Chat (IRC) - allows the people from all over the world to communicate in real time.
5	Mailing Lists- used to organize group of internet users to share common information through e-mail.
6	Internet Telephony (VoIP)- allows the internet users to talk across internet to any PC equipped to receive the call.
7	Instant Messaging- offers real time chat between individuals and group of people. Eg. Yahoo messenger, MSN messenger.

9.4 Internet Netiquette (Rules of Online Etiquette)

- Students should be aware that they should not reply to unsolicited e-mail.
- Students should not provide personal details, name, address etc. in an e-mail.
- Students should not send personal e-mails from school.
- Students should be taught not to click on 'automatic reply' e-mail addresses on websites.
- Students should be aware of the dangers of viruses from e-mail attachments.
- Students should not share school user names and passwords with others.

Unit Activity

1. Download a web browser of your choice
2. Follow the steps outlined in the text and sample a website, take note of key important information that you find on the website such protocol address
3. Discuss the importance of internet etiquette

Unit Summary

This unit has looked at a number of topics on web browsing and internet etiquette, hypertext transfer, basic web browsing, surf the web for information, intent etiquette and domain names.

UNIT 10

E-LEARNING

10.1 Introduction

With the current emerging trends in technological developments, e- learning an approach to education is one area that turned out critical in the offering of information and communication technology. E- Learning provides a platform that allows students to undergo training without sitting in a physical classroom. It has broken the barriers to accessing education. Therefore, focus is to look at the topic on e-learning and its critical contribution to education. A very interesting topic it is and such I am excited to take you through it.

Learning Outcomes

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

- search different sites for educational purposes
- Use ICTs to acquire knowledge
- Explain the importance of E-learning
- Describe the process of uploading and download information

Time Frame

In this unit, you are required to spend a minimum of 2 hours of study time.

10.1 Introduction to E-Learning

Definition;

E-learning may be defined as the use of new multimedia technologies and the internet to structure the delivery, and improve the quality, of learning and teaching. The following are required for successful implementation of E-learning:

- be based on reliable technology
- be oriented towards pedagogy
- promote individual development, including training for the professions
- meet accessibility requirements, for example as regards disability
- be a social process that stimulates remote access, collaboration and interaction across the community of users
- stimulate chiefdomal change, and continuing professional development among staff

10.2 The Current Position

Not so very long ago, all academics required books, and some scientists required computers. The position has effectively reversed. Now everyone working in Higher Education uses the computer, and some academics require books. Moreover, the student's now entering higher education will in many cases have been acquainted with computer-based learning since childhood. And following graduation, every student will enter a workplace that makes increasingly sophisticated and pervasive use of IT.

If the University is to fulfill its mission of meeting the needs of society and the economy, its investment in IT must be student-centered, and must take student opinion regarding online learning into account. In one sense, E-learning is simply the expression in pedagogic terms of the shift to a computer-based workplace.

10.3 Change & Choice

Communication and Information Technology (C&IT) is marked by rapid change, and the necessity to make choices, some of which can be expensive. For example, one estimate puts the cost of developing pure E-learning materials at 7 to 10 times the cost of developing traditional courses. The dangers of developing on-line courses for a market that is unstable, or not proven to exist, are therefore obvious. Moreover, it is not yet certain in what ways technological change beyond the workstation or laptop computer will affect the learning environment. For example, no-one can yet say with precision what effect the coming proliferation of handheld and wearable devices will have.

10.4 The wider university context

It is vital that E-learning initiatives within modules and programmers are subject to Quality Assurance, as appropriate, and that they fit departmental and faculty plans, as well as the university's wider agenda in learning and teaching. In short, E-learning is now to be viewed as a normal part of university teaching practice, complementing and enhancing traditional methods and resources.

10. 5 Qualifications and Points of Transition

Students will arrive with ever higher expectations of access to technology, and will graduate into a workplace with ever increasing demands for technology-related skills. The University must engage with these moments of transition when planning its IT training. Comprehensive and cost-effective induction in IT for new students must be conducted in order for it to be effective.

10.6 Strategies for effective implementation of E-learning

There are a number of key areas of concern when it comes to a successful implementation of an e-learning programme in chiefdoms. The following section highlights some of them;

Staff Development

Key issues to consider include career development, and reward. This system is intended to make full use of the skills that staff members may not have had time, need or opportunity to develop, but from which the University at large can benefit in its drive to be known as the foremost provider of E-learning.

Managed Learning Environment

This requires network improvement and systems integration across the campus, and development of support mechanisms and resources for the e-learning infrastructure. A learning content management system must be developed to permit co-ordination and integration of learning resources between various internet-based systems. Online systems to support a generic quality standard of module evaluation will access continue to progress.

IT Services.

Support for the development of the necessary infrastructure for E-learning, for example through the Network Improvement Programme.

Library

As the principal provider of access to externally produced eResources, the Library must continue to search for and license appropriate eBooks, eJournals and other materials to support E-learning. The Library's well developed liaison role vis-à-vis the integration of eResources into the university framework will be extended to cover a wider range of services. The plans for an extended and remodeled Library offer the potential for further integrating new technology and learning resources.

Liaison

A closer liaison between the Library and the Learning Enhancement Unit over learning resources issues presents one example. In order to enhance reliable, high speed, off-campus access to E-learning technology is required. Increased flexibility and resource in the work environment so as to support these activities will help in achieving this goal. Provision must also be made for access by students with special needs.

New technologies

It is important to encourage an awareness of new technology as it emerges, and where potential benefits suggest themselves, conduct pilot studies with a view to investment.

These areas may include wireless hubs, video streaming, simulations, virtual reality systems and handhelds.

Appropriate Classroom Technologies.

Appropriate technology to support E-learning, including wireless technology, to keep pace with student demand must be installed.

New programmes.

All new modules and programmes go through a validation process that ensures both academic quality and the commitment of adequate resourcing. In the E-learning sphere, it is hoped to make a comparative evaluation of low-risk projects conducted according to differing models of structure, cost and technical aspects, e.g., making learning materials in-house; engaging with the Interactive University, or similar groupings; outsourcing.

Computer Aided Assessment.

We will build on our premier position in the utilization of CAA as a resource for enhancing learning and assessment. The quality, depth, and design of innovation in the CAA we offered must be enhanced.

Plagiarism Detection.

In dealing with the problem of plagiarism, it is important to ensure the spread of best practice in the detection of plagiarism, so that technology can be used with confidence to deter as well as identify fraud and misuse.

10.6 Mobile Access

Mobile learning is the ability to obtain or provide educational content on personal pocket devices such as PDAs, smart phones and mobile phones. Educational content refers to digital learning assets which includes any form of content or media made available on a personal device.

a. Encourage 'anywhere, anytime' learning
   Mobile devices allow students to gather, access, and process information outside the classroom. They can encourage learning in a real world context, and help bridge school, afterschool, and home environments.
b. Reach underserved children Because of their relatively low cost and accessibility in low income communities, hand held devices can help advance digital equity, reaching and inspiring populations 'at the edges' children from economically disadvantaged communities and those from developing countries.
c. Improve twenty first century social interactions Mobile technologies have the power to promote and foster collaboration and communication, which are deemed essential for twenty first century success.

d. Fit with learning environments Mobile devices can help overcome many of the challenges associated with larger technologies, as they fit more naturally within various learning environments.

e. Enable a personalized learning experience Not all children are alike; instruction should be adaptable to individual and diverse learners. There are significant opportunities for genuinely supporting differentiated, autonomous, and individualized learning through mobile devices

10.7 Benefits:

- Great for people on the go.
- Anytime, anywhere access to content.
- Can enhance interaction between and among students and instructors in chiefdoms.
- Great for just-in-time training or review of content.
- Can enhance student-centered learning.
- Can appeal to tech-savvy students because of the media-rich environment.
- Support differentiation of student learning needs and personalized learning
- Reduce cultural and communication barriers between faculty and students by using communication channels that students like.
- Facilitate collaboration through synchronous and asynchronous communication.

10.8 Advantages of M-Learning

- Behaviorism: Quick feedback or reinforcement can be facilitated through mobile devices.
- Constructivism: Mobile devices enable immersive experiences such as those provided by simulations or games.
- Situated learning: Learners can take mobile devices into authentic learning environments or "context-aware" environments, such as specially equipped museums.
- Collaborative learning: Mobile devices provide a handy additional means of communication and a portable means of electronic information gathering and sharing.
- Informal/lifelong learning: Mobile devices accompany users in their everyday experiences and become a convenient source of information or means of communication that assists with learning.
- Support/coordination: Mobile devices provide just-in-time access to learning resources, news, information, planners, address books, calculators, and so forth

Smart phones and tablet computers are radically transforming how we access our shared knowledge sources by keeping us constantly connected to near-infinite volumes of raw data and information. We enjoy unprecedented instant access to expertise, from informal cooking lessons on YouTube to online university courses. Every day people around the globe are absorbed in exciting new forms of learning,

and yet traditional schools and university systems are still struggling to leverage the many opportunities for innovation in this area.

10.9 Basic Skills in the Use of Mobile Phones in Education

10.9.1 Continuous Learning

Up until now, most people relegated "education" to a finite time in their lives: entering school at around five years old and attending school institutions all the way to university. Education had an expiration date, and then working life began. This model, which has its roots in the industrial era, is quickly becoming less relevant or applicable to the way we live our lives in the connected age.

Education is getting increasingly interspersed with our daily activities. On our phones, tablets, and PCs, we download and digest life or work-related articles with instructions on how to fix our appliances or how to use a new professional software program. Many people across age groups decide to take formal online courses in their spare time, including complex subjects such as artificial intelligence, computer science, and game theory.

Continuous learning will simply be a given for the generations of today's youngsters who are often literally born within reach of a connected personal device.

Unit Activity

1. Consider the following statement, "Not so very long ago, all academics required books, and some scientists required computers. The position has effectively reversed. Now everyone working in Higher Education uses the computer, and some academics require books," Based on this view, discuss the two approaches to learning stating their advantages and disadvantages.
2. Explain the contributions that M-Learning has made towards the advancement in accessing education.

Unit Summary

This unit has looked at the subject on e-learning; the current situation and the university context have been highlighted. The unit further went on to state some of the strategies that can lead to a successful implementation of the e-learning programme. In the next unit, we shall look at ICT infrastructure.

UNIT 11

ICT INFRASTRUCTURE

Introduction

Setting up an IT infrastructure can be seen as a very daunting process simply because, it comprises anything related to the flow and processing of information within a company. However, with a reliable, high quality IT infrastructure, the chiefdom is able to reduce their ICT costs on the other hand increasing their efficiency. This Chapter looks at the Information Technology Infrastructure; it highlights some emerging technologies, business intelligence, and databases in brief, telecommunications and also discusses the internet technologies

Learning Outcomes

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

- What ICT infrastructure is and what it is consist of.
- Databases and its basic concepts and Business Intelligence including data mining techniques.
- Telecommunications and computer networks
- The internet, intranet & Extranets and how they support businesses.

Time Frame

In this unit, you are required to spend a minimum of 3hours study time.

11.1.1 ICT infrastructure and emerging technologies

Information and Communications Technology (ICT) infrastructure refers to the combination of hardware, software, network resources and services required for the existence, operation and management of ICT in chiefdom. It allows a chiefdom to deliver ICT solutions and services to its employees, partners and customers. And it is usually internal and external to a chiefdom and deployed within owned facilities.

The ICT infrastructure consists of all components that somehow play a role in overall ICT and ICT supported operations. It can be used for internal business operations or developing customer ICT or business solutions.

Typically, the components below makes up a standard ICT infrastructure:

- **Hardware**: Servers, computers, switches, printers, scanners, firewalls and routers, and other equipment
- **Software**: Operating System, Enterprise resource planning (ERP), customer relationship management (CRM), productivity applications and more

- **Network**: Inter connection of computers and other hardware devices, internet, and others
- **Users**: Human users, such as network administrators (NA), developers, designers and end users with access to any ICT appliance or service are also part of an ICT infrastructure, specifically with the advent of user-centric ICT service development.

11.2 Databases and Business Intelligence

A Database is a collection of related information stored in an organized way so that specific items can be selected and retrieved quickly. Data is organized into rows, columns and tables, and it is indexed to make it easier to find relevant information. A database need not involve the use of technology. Examples of manual databases include telephone directories, address books, diaries and card index files.

11.2.1 Basic concepts of a Database

Below are few notable database concepts

- **Field**: The data in an electronic database are organized by fields and records. A field is a single item of information, such as a name or a quantity.
- **Record**: In an electronic database, a record is a collection of related fields. See Field.
- **Table**: In an electronic database, data are organized within structures known as tables. A table is a collection of many records.
- **A primary key**: it is a special relational database table column (or combination of columns) designated to uniquely identify all table records. A primary key's main features are: It must contain a unique value for each row of data. It cannot contain null values.
- **Foreign (secondary) key fields**: These fields are used to link tables together by referring to the primary key in another database table.
- **Relationship**: In a relational database, data can be combined from several different sources by defining relationships between tables.
- **Compound key**: In a relational database, it is possible to retrieve data from several tables at once by using record keys in combination, often known as a compound key.

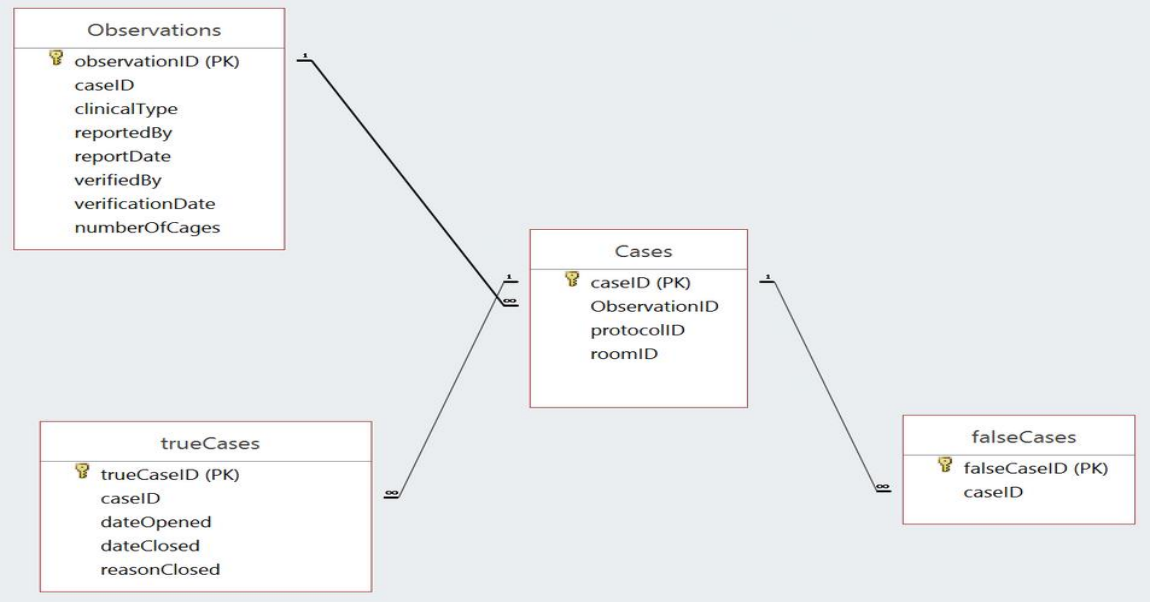


Figure 04:***An example of how key fields are used to link information from different database tables***

Source*:* *https://dba.stackexchange.com*

11.2.2 Database Features

- **A query**: it is a request for data or information from a database table or combination of tables.
- **Update query**: An update query can be used to change records, tables and reports held in a database management system.
- **Structured query language (SQL)**: A form of programming language that provides a standardised method for retrieving information from databases.
- **Filter**: In a spreadsheet or database, a filter can be used to remove data from the screen temporarily. This allows users to work with a specific group of records. Filters do not alter or delete data but simply hide any unwanted items.

11.3 Business Intelligence and Information Management

Business intelligence (BI) is an umbrella term that includes the applications, infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize decisions and performance. BI systems are needed due to the vast amounts of data held in organisational information systems and the need to extract useful information from this in the form of patterns, trends and present this in an understandable way to decision makers.

Figure 05 below shows the main elements of a business intelligence system. Data is gathered from various sources and then held in a special database repository termed a data warehouse in order to support decision-making in the organisation. Repositories of data focused on departmental or subject areas are termed data marts. **Data warehouses** are large database systems containing current and historical data that can be analysed to produce information to support organisational decision making.

Data marts are a smaller, departmental version of a data warehouse which may be easier to manage than a company-scale data warehouse. Data marts do not aim to hold information across an entire company, but rather focus on one department.

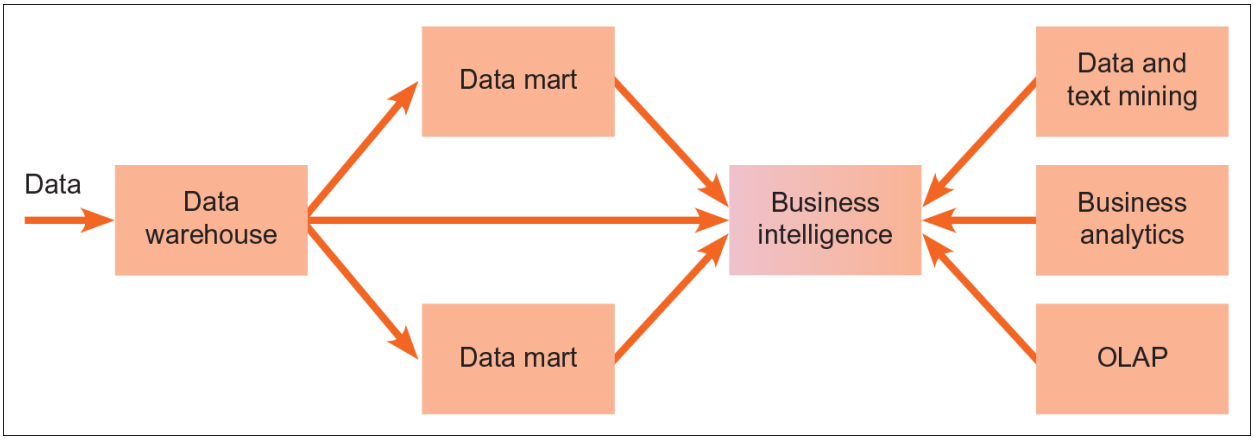


Figure 05: *Elements of a business intelligence system*

Source: Bocij et al (2015), pg. 153

11.3.1 Business analytics

Business analytics (BA) is the practice of iterative, methodical exploration of an chiefdom's data, with an emphasis on statistical analysis. Business analytics is used by companies committed to data-driven decision-making. It is a term that is used to describe various approaches to data driven analysis including reporting tools such as OLAP and visualisation tools such as dashboards.

11.3.2 Online analytical processing (OLAP)

Online analytical processing (OLAP) refers to the ability to analyse in real time the type of large data sets stored in data warehouses. 'Online' indicates that users can formulate their own queries, compared to standard paper reports.

11.3.3 Data mining

Data mining in its broadest sense is a process that uses statistical, mathematical, artificial intelligence and other techniques to extract useful information from large databases. Under this wide definition most types of data analysis can be classified as data mining.

Particular data mining techniques include:

- **Identifying associations:** This involves establishing relationships about items that occur at a particular point in time.
- **Identifying sequences:** This involves showing the sequence in which actions occur, e.g. path or click-stream analysis of a web site.
- **Classification:** This involves analyzing historical data into patterns to predict future behaviour.
- **Clustering:** This involves finding groups of facts that were previously unknown.
- **Modeling:** This involves using forecasting and regression analysis to predict sales.

11.3.4Cube Analysis

- Data in a multidimensional database are broken down for analysis into a number of chosen dimensions. For example, for sales data the common dimensions are time period, product types and geographic location.
- Dimensions can be then broken down into categories. For example, for time these could be months, quarters or years.
- Usually a multidimensional database is formed from data held in a data warehouse specifically for multidimensional analysis.
- The form of the data used in the multidimensional database is termed a **data cube.**

11.3Text mining and web mining

- **Text mining** is the application of data mining to text files. Text held in documents will normally be unstructured in terms of its content and text mining aims to find previously hidden patterns in text within and between documents.
- **Web mining**: Because of the size and popularity of the web many data mining applications are being developed to analyse information from the web and these are classified under the term web mining. Extraction of information from web pages specifically is termed web content mining and involves reading and analysing data from web pages.

11.3 Telecommunications and Networks

Telecommunications refers to the exchange of information by electronic and electrical means over a significant distance. A complete telecommunication arrangement is made up of two or more stations equipped with transmitter and receiver devices. A single co-arrangement of transmitters and receivers, called a transceiver, may also be used in many telecommunication stations. Telecommunications devices include computers, cell phones,

telephones, telegraph, radio, micro-wave communication arrangements, fiber optics, satellites and the Internet.

11.4 Computer Networks

A computer network can be defined as: 'a communications system that links two or more computers and peripheral devices and enables transfer of data between the components'. A network can be use in different environments such as corporates and home and can be built using either wired or wireless technology as explained below:-

i. Wired Networks

Wired networks use Ethernet cables and network adapters. Even though two computers can be directly wired to each other using an Ethernet crossover cable, wired networks also require central devices like switches and routers to accommodate allow connection or more computers.

ii. Wireless Networks

Wireless networks are computer networks that are not connected using any cables. Instead they use radio waves to and wireless network cards to communicate to each other. Wireless network enables enterprises to avoid the costly process of introducing cables into buildings or connection between different equipment located geographically.

11.5 Characteristics of networks

- **Sharing Resources** from one Computer to another Computer over a network.

- **Performance** by measuring the speed of data transmission with number of users, connectivity and the software used.
- **Reliability** makes easy to use an alternative source for data communication in case of hardware failure or connectivity issues.
- **Scalability** increases the system performance by adding more processors.
- **Security** is the main characteristics of Computer network where you can take necessary steps for protecting your data from unauthorized access.

11.6 Types of Networks

Different types of private networks are distinguished based on their sizes (in terms of the number of machines), their data transfer speeds, and their reach. Private networks are networks that belong to a single chiefdom. There are usually said to be three categories of such networks: local area network (LAN), wide area network (WAN), and metropolitan area network (MAN)

11.6.1Local-area network (LAN)

A local area network (LAN) is a setup of computers and associated devices that share a common communications line or wireless link. Typically, a LAN comprises of computers and peripherals connected to a server within a distinct geographic area such as an office or a commercial institution.

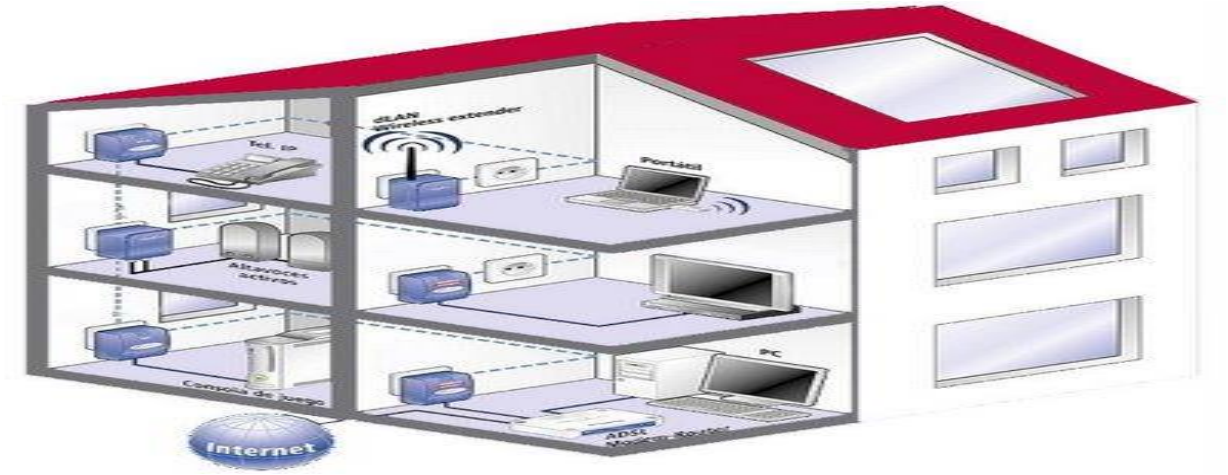


Figure 06: A Local Area Network Set up

11.6.2Wide-area network (WAN)

A wide area network (WAN) refer to a connection of multiple LANs over great geographic distances. The speeds on the WAN varies depending on the cost of the connections, which increases with distance, and may be low. WANs function using routers, which helps in choosing the most appropriate path for data to take to reach a network node. The most well-known WAN is the Internet.

Figure 07: A wide area network

11.6.3 Metropolitan Area Network (WAN)

A metropolitan area network (MAN) is a network that links users with computer resources in a geographic area or region larger than that covered by even a large local area network (LAN) but smaller than the area covered by a wide area network (WAN). The term is applied to the interconnection of networks in a city into a single larger network (which may then also offer efficient connection to a

wide area network). It is also used to mean the interconnection of several local area networks by bridging them with backbone lines. The latter usage is also sometimes referred to as a campus network.

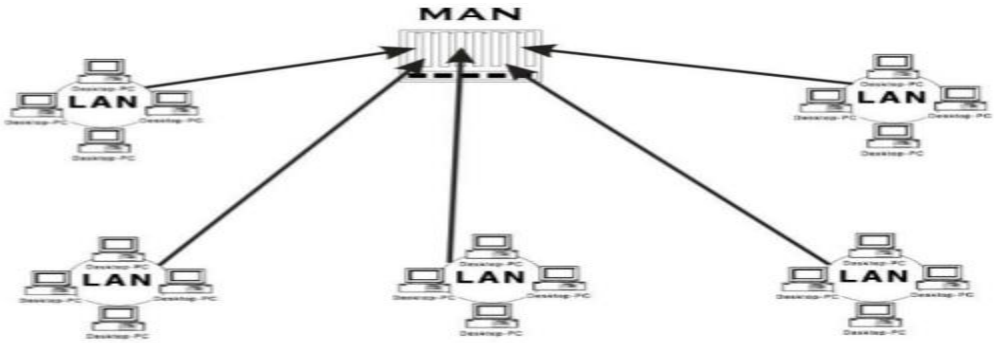


Figure 08: A Metropolitan area network

11.6.4 Telecommunications Network

High speed, high capacity, long-distance communications system comprising of computers, electronic switches, cables, satellites, wireless transmitters and antennas, etc., which link multiple remote sites.

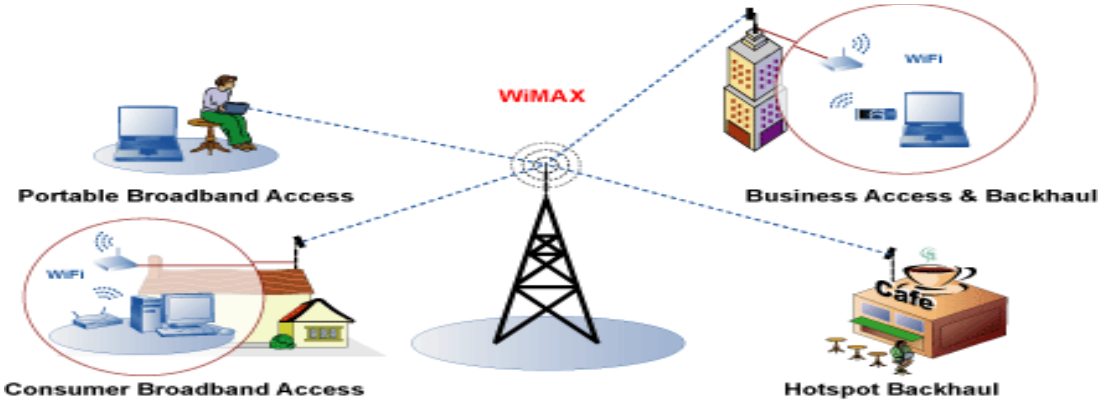


Figure 09: A Telecommunication area network

11.5.5 Intranet and Extranet

Intranet: An intranet is a secure and private enterprise network that shares data o application resources via Internet Protocol (IP).

Extranet: An extranet is a controlled private network allowing customers, partners, vendors, suppliers and other businesses to gain information, typically about a specific company or educational institution, and do so without granting access to the chiefdom's entire network.

11.6.6 The Internet

The internet refers to the physical network that links computers across the globe, it is also called the network of networks or the World Wide Web (WWW). It consists of the infrastructure of network servers and communications links between them that are used to hold and transport information between the client PCs and web servers.

The internet has become very important to every business and individuals to an extent where it is very difficult to imagine how any business could operate during this time without the use of the internet. The advancement of the internet has significantly changed the day to day running of businesses, this include how people communicate with each other and their customers. Information can be easily transmitted to any place in a matter of few seconds.

In as far as marketing and advertising is concerned the internet has become an essential tool. Any business can make itself known to customers through the use of a website or online advertisements. A lot of businesses now use the internet as a means of making customers know their products and services and this as proven to be very valuable especially to businesses that are targeting a younger audience.

11.6.7 Internet Terminologies

- **World Wide Web (www),** a site or area on the World Wide Web that is accessed by its own Internet address is called a Web site.
- **Internet Browser** is a software program that enables you to view Web pages on your computer. Browsers connect computers to the Internet, and allow people to "surf the Web."
- **Internet service provider (ISP)** a provider enabling home or business users a connection to access the Internet. They can also host web-based applications.
- **Backbones** High-speed communication links used to enable Internet communications across a country and internationally.
- A **Web Page** is like a page in a book. Websites often have several pages that you can access by clicking on links. A Web site can be a collection of related Web pages.
- Each Web site contains a **home page** (this is the original starting page) and may also contain additional pages. Different computers will have different home pages. You can set your own webpage.
- **The URL** stands for Uniform Resource Locator, and is used to specify addresses on the World Wide Web. A URL is the fundamental network identification for any resource connected to the web (e.g., hypertext pages, images, and sound files).

Unit Activity

3. Explain what ICT infrastructure is and its components
4. Explain at least three types of networks their characteristics
5. Explain the relationship between Internet, Intranet and Extranet

Unit Summary

Well done, you have come to end of unit 11. In this unit we looked at Information Technology Infrastructure; we highlighted some emerging technologies, business intelligence, and databases in brief, telecommunications and internet technologies. Unit 12 focus on Computer applications such as Microsoft Word, Excel and PowerPoint and how these can be employed in our chiefdoms.

UNIT 12

E-LIBRARY

12.1 Introduction

Rapid advances in information technologies have revolutionized the role of libraries. As a result, libraries face new challenges, competitors, demands, and expectations. Libraries are redesigning services and information products to add value to their services and to satisfy the changing information needs of the user community. Traditional libraries are still handling largely printed materials that are expensive and bulky. Information seekers are no longer satisfied with only printed materials. They want to supplement the printed information with more dynamic electronic resources. Demands for digital information are increasing. This unit brings out issues on the e-library and covers basic skills required for using e-library services, characteristics of a digital e-library, functions of the digital library, purpose of digital libraries, their advantages as well as disadvantages.

Learning Outcomes

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

- Demonstrate understanding on how subscribe with free online libraries
- Students should be able to know how e-libraries reduce the cost of using a tradition library
- Students should know use E-libraries and access information
- Student should be able to know the benefits of using an E-library compared to a traditional one.
- Students should know the basic Ten Commandments in ICT

Time Frame

In this unit, you are required to spend a minimum of 2 hours study time.

Digital libraries come in many forms. They attempt to provide instant access to digitized information and consist of a variety of information, including multimedia.

Definition

A digital library is a library in which collections are stored in digital formats (as opposed to print, microform, or other media) and accessible by computers. The content may be stored locally, or accessed remotely. The first published use of the term may have been in a 1988 report to the Corporation for National Research Initiatives. The term was first popularized by the NSF/DARPA/NASA Digital Libraries Initiative in 1994. Bush (1945) created a vision based on experience ("Digital library.")

12.2 The Digital Library Federation defines digital libraries as:

Chiefdoms that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily available for use by a defined community or set of communities. (Shiri 2003)

The DELOS Digital Library Reference Model defines a digital library as:

"An chiefdom, which might be virtual, that comprehensively collects, manages and preserves for the long term rich digital content, and offers to its user communities specialized functionality on that content, of measurable quality and according to codified policies. ("Digital Library")

12.3. Basic Skills In Using E-Library Sites/Apps (E.G. Registration, Login, Sign-Out, Searching For Books, Etc.)

A digital library is not a single entity. It requires technology link the resources of many collections. The links between digital libraries and their resources are transparent to users. Digital library collections are not limited to document surrogates (bibliographic records. They are the actual digital objects such as images, texts, etc.

12.4 Characteristics of Digital Libraries

Recent developments in library technology and practices have helped bring some of Lancaster's paperless society to reality. The effects that digital technology has brought include: (Jebaraj and Deivasigimani 2003)

- Digital library collections contain permanent documents. The digital environment will enable quick handling and/or ephemeral information. Digital libraries are based on digital technologies. The assumption that digital libraries will contain only digital materials may be wrong. Digital libraries are often used by individuals working alone. The physical boundaries of data have been eliminated. Support for communications and collaboration is as important as information-seeking.
- Compression of data storage is enabling publication and storage of digital information. Telecommunications is facilitating the storage, retrieval, use, and exchange of digital resources.

12.5 Function of Digital Library

A digital library performs a number of important functions. They include some of the following;

- Access to large amounts of information to users wherever they are and whenever they need it.
- Access to primary information sources.
- Support multimedia content along with text

- Network accessibility on Intranet and Internet
- User-friendly interface
- Hypertext links for navigation
- Client-server architecture
- Advanced search and retrieval.
- Integration with other digital libraries.

12.6 Purpose of Digital Library

A digital library saves the following purpose;

- Expedite the systematic development of procedures to collect, store, and organize, information in digital form. Promote efficient delivery of information economically to all users.
- Encourage co-operative efforts in research resource, computing, and communication networks.
- Strengthen communication and collaboration between and among educational institutions.
- Database of digital material that is open to all users over the campus-wide LAN.

12.7 Advantages of a Digital Library

The advantages of digital libraries include;

i. Nearly unlimited storage space at a much lower cost
ii. No physical boundary
iii. Round the clock availability
iv. Enhanced information retrieval.
v. Preservation for some print material
vi. Universal accessibility

12.8 Limitations

i. Lack of screening or validation
ii. Lack of preservation of a fixed copy (for the record and for duplicating scientific research)
iii. Lack of preservation of "best in class"
iv. Difficulty in knowing and locating everything that is available, and differentiating valuable from useless information.

Unit Activity

1. State advantages and disadvantages of e-libraries
2. Give the rationale of the development of e-libraries in institutions.

Unit Summary

There will be continuing expansion of digital library activities. LIS and computer science professionals face challenges that will lead to improved systems. More and more libraries will have departments and programs in the digital library arena. Digital libraries will build upon work being done in the information and data management area. Digital libraries provide an effective means to distribute learning resources to students and other users. Planning a digital library requires thoughtful analysis of the chiefdom and its users, and an acknowledgement of the cost and the need for infrastructure and ongoing maintenance (Adams, Jansen, and Smith 1999). Digital Libraries present opportunities and challenges for the library and information communities and all stakeholders.

UNIT 13

LEARNING MANAGEMENT SYSTEM

Introduction

This unit introduces you to different learning management systems used in institutions of higher learning. Moodle as a generic learning management system will be explained as an example, functions of learning management systems and the use of learning management systems.

Learning Outcomes

- State the function of having LMS
- Explain how LMS can help learners to acquire knowledge
- Discuss how LMS can help to deliver knowledge to the learners

Time Frame

In this unit, you are required to spend a minimum of 2 hours study time

13. 2 Meaning, Functions and Using Learning Management Systems (E.G. Moodle)

A learning management system (LMS) is a software application or Web-based technology used to plan, implement, and assess a specific learning process. Typically, a learning management system provides an instructor with a way to create and deliver content, monitor student participation, and assess student performance. A learning management system may also provide students with the ability to use interactive features such as threaded discussions, video conferencing, and discussion forums.

13.3.1 Functions of the Learning Management System

- The first benefit to using a learning management system is it offers a centralized source of learning. This means that the training, performance, and development content are offered at all times from the same source. Multiple users can access the information at any given time. These systems ensure consistency in the evaluation and delivery of the material, meaning every user sees the same content through the same manner. These systems let the user design customized training modules that can be used to introduce new equipment, update equipment, or modify operating procedures.
- The second benefit to using a learning management system is that you can enhance performance through tracking and reporting tools. Progress of new users can be tracked, records can be reviewed, and users can register for more than one course. Employers are able to offer the courses through web-based training, webinars, and other forms of instructor-led training. Management can then access the records of those who participated to analyze which areas need improvement.

The learner can now put in additional efforts in the areas that are difficult for them, because learning management systems give users the ability to manipulate their learning pace.

- The third benefit to using a learning management system is that it allows users to be evaluated before they take the course, while they are in the course, and when they finish the course. This means that employers can evaluate their retention levels through periodically scheduling assignments. They can then review the records to determine the levels of success. In educational settings, students can review their personal performance based on quizzes and tests that are administered by the professors.
- The fourth benefit to using a learning management system is that the content and information in the course can be easily upgraded. Because the learning management system offers a centralized location for information, it is simple to make a change to the forms, requirements, product descriptions, or specifications. Users will get the same upgraded information at the same time.
- The fifth and final benefit to using a learning management system is that it simplifies the learning process. The systems are easy to use and new users can figure everything out easily. The systems accommodate multiple features including recording and tracking, documentation and administration, as well as classroom learning. These systems are affordable alternatives that offer scalable and personalized platforms for learning. They deliver integrated and enriched learning experiences for the users that expound upon virtual learning and collaboration modules.
- Subjects from Chiefdoms can document, record, and electronically share classroom lessons that have been successful in achieving specific student outcomes with unique and diverse student needs.
- LMS provides all members of the learning community with a comprehensive and secure management system that allows the bidirectional flow of information on demand. Providing access to data and learning information from the home enhances communications between Subjects from Chiefdoms and parents, thereby increasing parental involvement.

13.6.1.3 Use Learning Management System Such as Moodle to Implement Lessons.

Through a LMS, Security Officers, learning facilitators, instructional specialists, and aides are able to articulate learning goals, align content and assessments, and adhere to standards as they relate to selected curricula and instructional programs. Instructional resources, such as textbooks, podcasts, web-based apps, videos, e-books, manipulative, and other instructional resources, can be correlated to specific learning activities.

- A LMS framework can empower educators, parents, and students by means of access to information that can alter and shape a student's personalized learning path
- The LMS enables educators to create, access, tag, and manage banks of test items, as well as catalog and use other evaluation methodologies (e.g., holistic scoring, teacher observable assessment, portfolio/authentic assessment, etc.) To assess and manage desired student competencies.
- A Learning Management System can contextualize the educational experience and provide educators with a vehicle to achieve this necessary balance amongst teaching, learning, and growth.
- Generating accurate, reliable, and timely information about student performance to make the education process visible and personalize learning;
- Increasing parental involvement by improving access to relevant and current information about the student's educational experience;
- Empowering students with the resources necessary to assume an active role in and accept responsibility for their educational experiences;
- Providing staff with the opportunities to work actively and interdependently to bolster cross-curricular communication, enhance productivity, and improve accountability;
- Linking staff development programs and supervision/evaluation activities with student learning and achievement in a comprehensive, nuanced manner;
- Correlating standards to instructional programs and assessment strategies through virtual alignment tools;
- Identifying gaps and misalignment in learning programs, such as adequacy of instructional resources, assessment items, and/or staff proficiencies, by examining programs;
- Enabling community members of all ages to participate more fully in the learning process through the use of online tools

Unit Activity

1. Outline and explain the benefits of using a learning management system
2. Explore the Zynal learning management system and identify its key features and functionalities. How does this system support learning.

Unit Summary

Congratulations you have reached the end of this module. I should commend you for the effort that you have put in so far. In this final unit of the module, we looked at learning management systems. Moodle as learning management system was explored; highlight its uses and functions. I should state that there are other learning management systems that being used by institutions to support learning.

Unit 14

COMPUTER APPLICATIONS

Introduction

Welcome to the last but not the least unit of our module. In the previous unit, we explored management Information Systems that can be used to enhance effective learning in our chiefdoms. This unit however, focuses on "hands-on" practical undertaking of computer applications. Therefore, I urge every royal highness or each user to acquire a personal computer in order to reap maximum benefits in unit 14. Your royal highnesses, let me take this opportunity to welcome each one of you to this interesting and practical unit.

Learning Outcomes

Upon successful completion of this unit, students should be able to:

- Demonstrate understanding and application of Microsoft Word Processor in dealing with word documents
- Explain and apply Microsoft Excel in handling data that are computational
- Apply Microsoft PowerPoint Presentations during awareness and developmental meetings of the chiefdoms.
- Develop basic database of land records and other important information of the chiefdoms.
- Appropriate use and application of publisher in order to disseminate ethical information among subjects of the chiefdoms and the nation.

14.1 Microsoft Word Processor

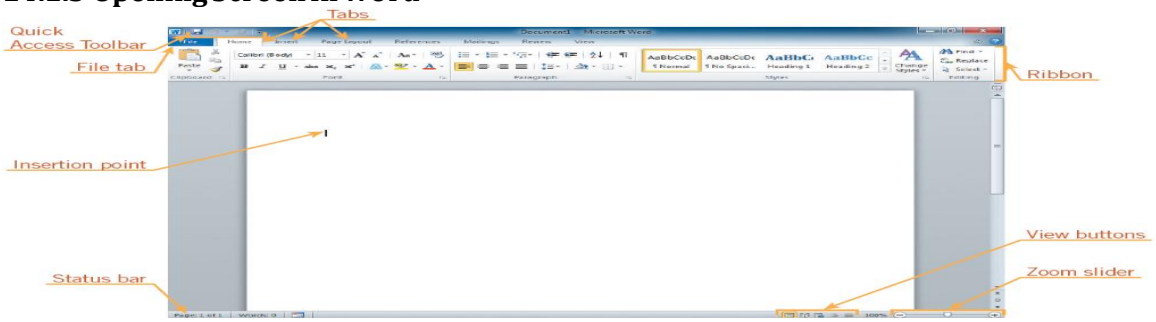
14.1.1 Word Processing Explained

- Word processing is the use of computer software to enter and edit text.
- You can easily create and edit documents, such as:
    - Letters
    - Reports
    - Newsletters with pictures and graphics

14.1.2 Starting Word

- Click the **Start** button on the taskbar.
- Click **All Programs** on the Start menu.
- Click the Microsoft Office folder.
- Click Microsoft Office Word 2010

14.1.3 Opening Screen in Word



14.1.4 Word Programme Window

ELEMENT	FUNCTION
Ribbon	Contains commands for working with the document, organized by tabs.
Quick Access Toolbar	Contains buttons (icons) for common commands.
Insertion point	Shows where text will appear when you begin typing.
Status bar	Displays information about the current document and process.
View buttons	Allows you to change views quickly.
Zoom slider	Allows you to increase or decrease the size of the document on-screen.

14.1.5 Document Views

VIEW	DESCRIPTION
Print Layout	Shows how a document will look when it is printed
Full Screen Reading	Shows text on the screen in a format that is easy to read and hides the Ribbon
Web Layout	Simulates the way a document will look when it is viewed as a Web page; text and graphics appear the way they would in a Web browser
Outline	Displays headings and text in outline form so you can see the structure of your document and reorganize easily
Draft	Displays only the text of a document without showing the arrangement of the text; if your document includes any pictures, they would not appear

14.1.6 Inserting Text and Understanding Word Wrap

- To enter text in a document, begin typing.
- When you reach the right margin, the text continues on the next line. This feature is called **word wrap**.

- When you press the Enter key, a blank line is inserted automatically, and you start a new paragraph.

14.1.7 Navigating a Word Document

- To enter or edit text, use the mouse or keyboard to reposition the insertion point.
    - **Mouse**: Move the mouse until the insertion point is where you want it to appear.
    - **Keyboard**: There are many options of keys to use, including arrows, Page Down, Page Up and shortcuts.

14.1.8 Keyboard shortcuts for moving the insertion point

PRESS	TO MOVE THE INSERTION POINT
Right arrow	Right one character
Left arrow	Left one character
Down arrow	To the next line
Up arrow	To the previous line
End	To the end of the line
Home	To the beginning of the line
Page Down	To the next page
Page Up	To the previous page
Ctrl+right arrow	To the beginning of the next word
Ctrl+left arrow	To the beginning of the previous word
Ctrl+End	To the end of the document
Ctrl+Home	To the beginning of the document

14.1.9 Using Backspace and Delete

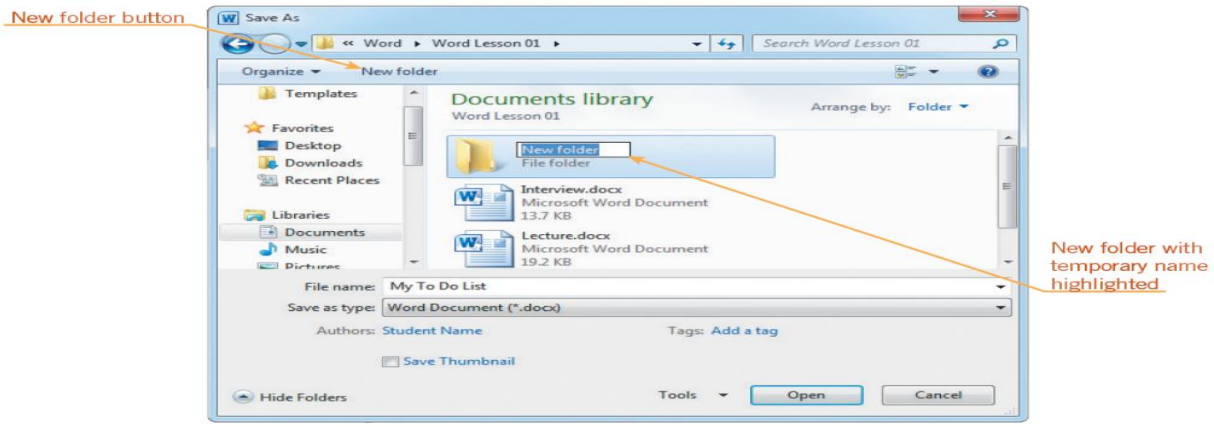
- There are two ways to delete characters:
    - **Backspace key**: Deletes the character to the left of the insertion point
    - **Delete key**: Deletes the character to the right of the insertion point.

14.1.10 Saving a Document

- To save a document for the first time:
    - Click the Save button on the Quick Access Toolbar.
    - Click the File tab, and then on the navigation bar, click the Save or Save As command.
- **Save command:** Copies over previous version
- **Save As command**: Used to save a document under a different name or location.

14.1.11 Creating a Folder

- Folders help you organize files.
- Create a new folder in the Save As dialog box.



14.1.12 Locating and Opening an Existing Document

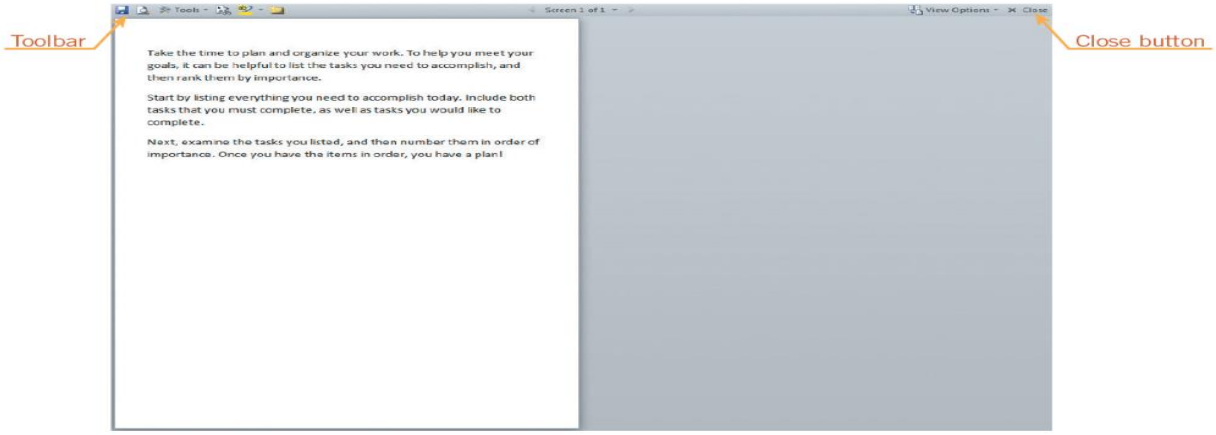
- To open documents click the File tab, then on the navigation bar, click
    - **Open** to open an existing document.
    - **Recent** to open a recent document.
    - **New** to open a new, blank document.

14.1.13 Zooming a Document

- You can use the Zoom feature to magnify and reduce your document on screen.
- A zoom percentage of 100% shows the document at its normal size.
- The easiest way to change the zoom percentage is to drag the Zoom slider at the bottom-right of the screen.

14.1.14 Switching to Full Screen Reading View

- Full Screen Reading View removes the Ribbon and the status bar from the screen.
- The Ribbon is replaced by a small toolbar
- To use this view, click the View tab on the Ribbon, then in the Document Views group, click the Full Screen Reading button.
- Document in Full Screen Reading view



14.1.15 Selecting a Page Orientation

- Documents printed in **portrait orientation** are longer than they are wide.
- Documents printed in **landscape orientation** are wider than they are long
- By default, Word is set to print pages in portrait orientation.

14.1.16 Previewing and Printing a Document

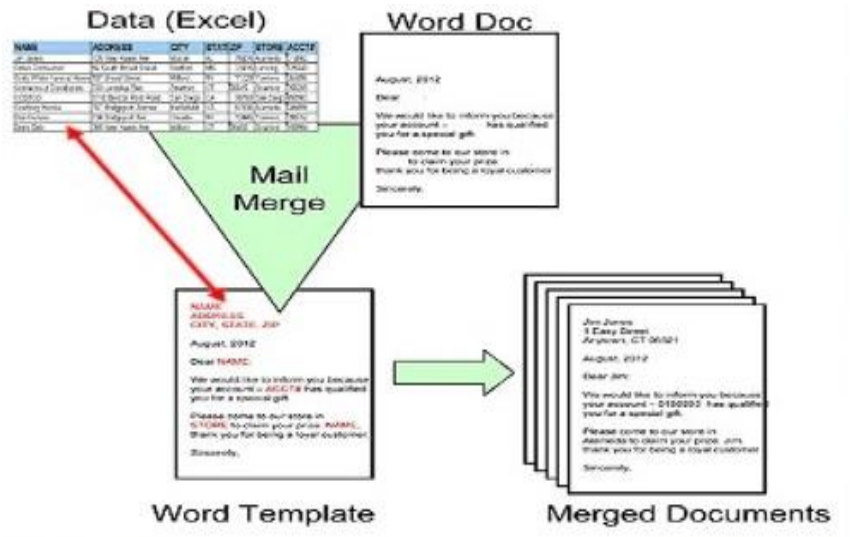
- Use the Print tab in Back stage view to preview a document before printing.
- Use the Print tab to change print settings.
- To print a document, click the Print button in the center pane on the Print tab in Back stage view.

14.1.17 Exiting Word

- To close the document without exiting Word, click the File tab, and then on the navigation bar, click the Close command.
- To exit Word, click the Close button in the upper-right corner of the document window.

14.1.18 Mail Merge

Mail merge is used to create a set of documents for many people. Each document has the same information, but the content is personalized.



STEP 1: Create Excel file

- One row for each student
- One column for each bit of data
- Label each column

For example, in the sample Excel workbook,

- Add data for another student.
- Add data about the homework completion rate for all ECE students.

STEP 2: Create Word document

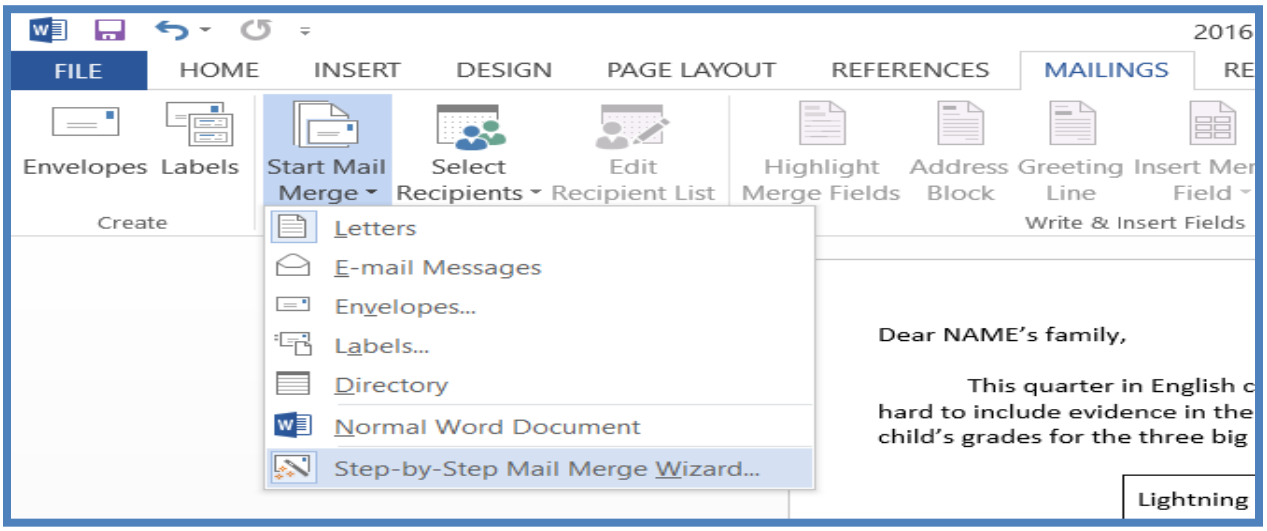
- Write and format letter as usual
- Put a placeholder word where you want the personalized information to go (ex: “NAME”, “SCORE”)

For example, in the sample Word document,

- Add a sentence below the table that will include personalized information about each student’s homework completion.

STEP 3: Mail merge

- Mailings > Start Mail Merge > Step-by-Step Mail Merge Wizard



Summary of mail merge steps (in Word)

1) Select document type: Letters
2) Select starting document: Use the current document
3) Select recipients: Use an existing list
    a) Browse: select Excel file
    b) May want to sort or filter
4) Write your letter: insert merge fields
5) Preview your letter
6) Complete the merge: Edit individual letters

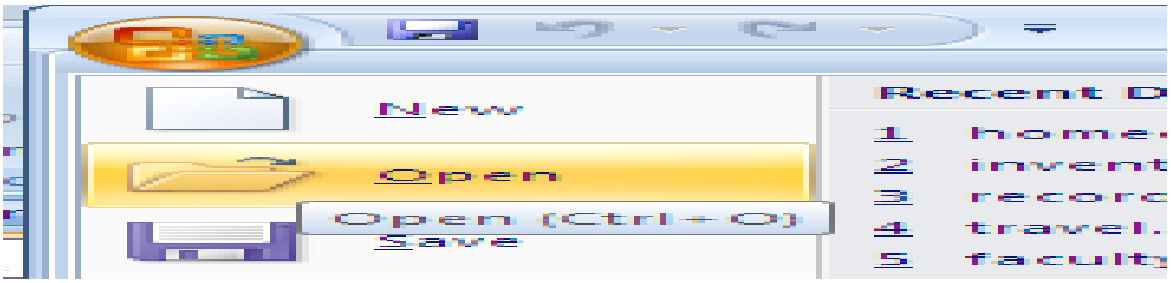
14.2 Microsoft Excel or Spread Sheets

14.2.1 Key Terms Used in Spread Sheets

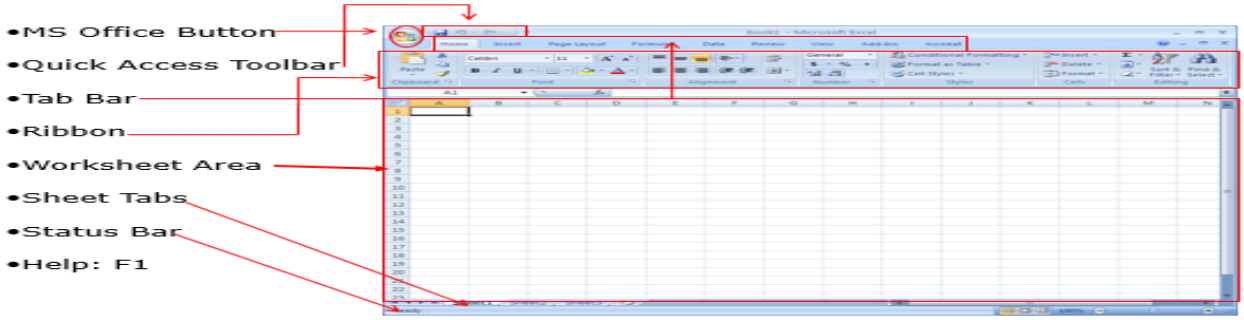
- **A spreadsheet (worksheet):** A spreadsheet (worksheet): a piece of paper in which data can be manipulated by the computer stored in rows and columns. A workbook (Excel file) has multiple sheets
- Each sheet may have multiple pages.
- Record and organize information in a row (record)-and-column (field) format.
- Make calculations and simple statistical analyses across a row or a column.

- Create charts based on the data displayed in a spreadsheet.
- **A workbook refers to an Excel document**. You will sometimes hear it called a "spreadsheet."
- In Default, each workbook has 3 "sheets" associated with it. You can rename these sheets to something more fitting to your purpose (e.g. Term 1, Term 2, Term3…)
- You can add sheets if you'd like to.
- Your workbook is the ENTIRE file and the file name should reflect the function the file serves.
- Termly_Results.xlsx
- Inventory.xlsx

14.2.2 Excel Workbook Window

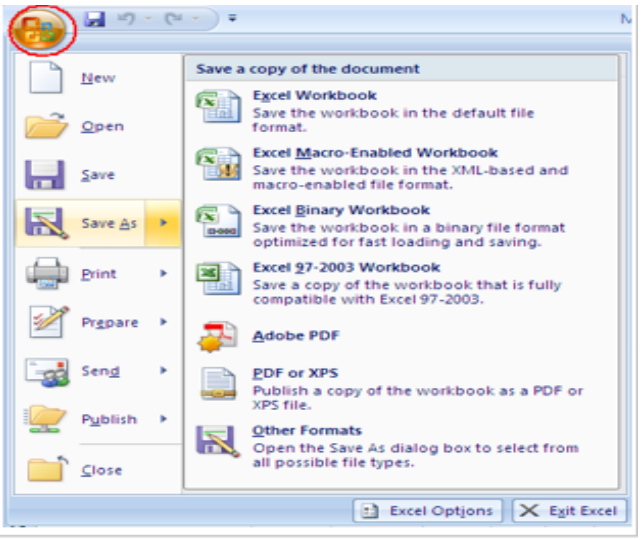
- Open the MS-Excel
- Start-All Programs-Microsoft Office – Microsoft Office Excel 2007 for example
- This creates a new workbook.
- Open an Excel workbook – double-click on the practice file named "homeexpense.xlsx"
- Open an Excel workbook in Excel
- Click on Office Button and select Open.
- Locate the file via file folders.
- Double-click on the file.
- 

14.2.3 Excel Window

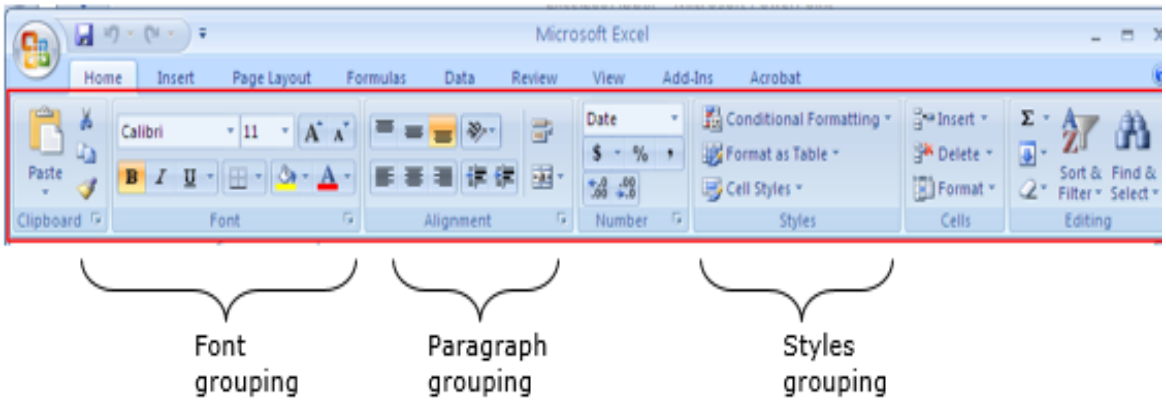


14.2.4 Microsoft Office Button

- Performs many of the functions that were located in the **File** menu of older (or Excel 2010) versions.
  - New, Open, Save, Save As, Print, Send, Close, etc.
- File Format
  - Save As
    - Excel Workbook, .xlsx
      - Smaller size with new Office 2007 features.
    - Excel 97 – 2003 Workbook
    - Other Formats: web page, .csv



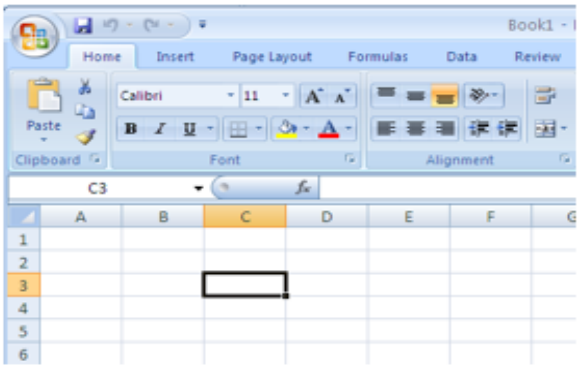
14.2.5 Ribbon



- Each "tab" (such as "**Home**", "Insert"…) will open a ribbon with several command items each in similar groupings.
- Home: has the common formatting tools, clipboard, fonts, paragraphs, number, Styles, Cells, and Editing.

14.2.6 Workbook

- The workbook is comprised of:
  - Rows (labeled numerically)
  - Columns (labeled alphabetically)
  - Cells



- A cell is labeled with both a numerical and alphabetical value.
  - Naming convention:
    C3 is active as
    Indicated by the
- Tab Key: navigate cells.

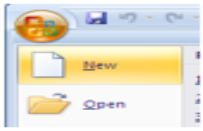
14.2.7 Creating of a Workbook

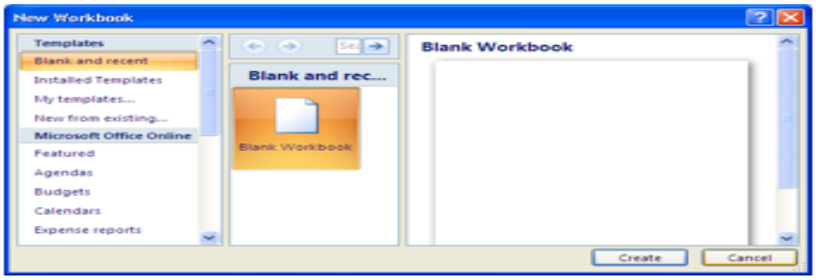
- Create a new workbook.
- Save it with a file name.
- Enter data: column headings, row headings, and data.
- Format data: column headings, row headings, and data.
- Save the file.

14.2.8 New Workbook

You have a blank workbook when you open Excel.

- Or click on **Office Button** and select **New**.
- Click on **Create** button.

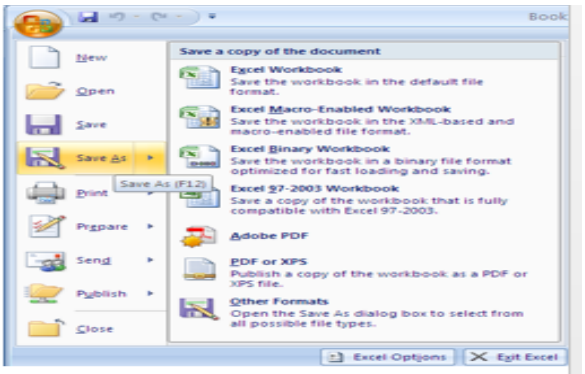




14.2.9 Save a Workbook

Click on **Office Button** and select **Save** or **Save As**.

- **Save**: save the workbook as .xlsx. This format is Excel 2007 compatible. It cannot be opened in previous version of Excel unless you have an Office 2007 converter installed.
- **Save As**:
  - Excel Workbook – .xlsx
  - Excel 97 – 2003 Workbook – .xls
  - Other Formats – .CSV and others.



Example of Creating a Workbook

- You should always enter headings to columns and rows to identify what the numbers represent.
- Practice: make a workbook of Traditional Leadership and Governance course results.

Name	ICT	Traditional Mgt	Com Skills	Traditional Legal Framework	Total Marks
Kasase Mary					
Banda Edward					
Smith Rejoice					
Mulenga Ivy					
Lomba Jane					

Data Entry

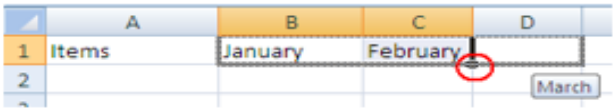
- To move HORIZONTALLY across cells, hit TAB.
- To move VERTICALLY, hit ENTER.
- Practice:
- Enter column heading and row heading.
- Enter data.

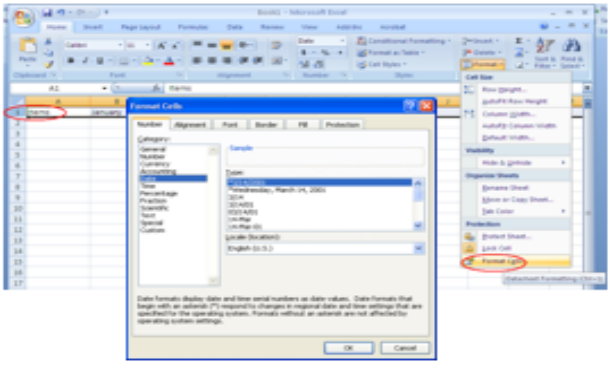
14.2.10 Autofill

AutoFill Enter the months of the year, the days of the week, multiples of 2 or 3, or other data in a series. You type one or more entries, and then extend the series.

- **Fill in the months of the year**
  - Type in the first 2 months.
  - Change the cell type to Date type.
    - Select the row of the months by clicking on the row tab such as "1". Go to **Format** and select **Format Cells**... (bottom).
    - Select **Date** and click on **OK**.

•Highlight the cells of the two months and drag the bottom right corner to expand the cells with the rest of the months.





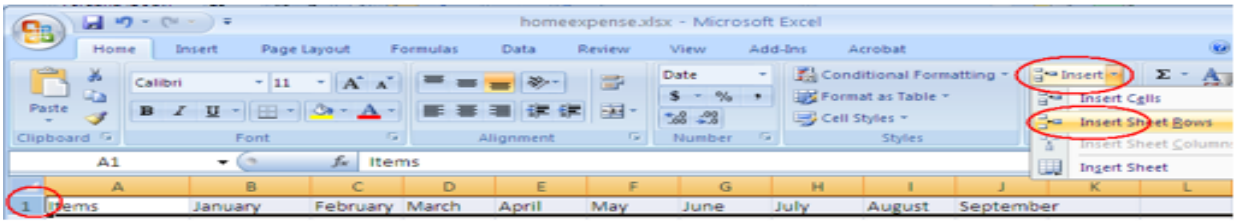
14.2.11 Types of Data

- You can enter numerical or text data in a cell.
- Enter numbers in cells. You may need to change the cell format to numbers.
  - Highlight number cells in the practice file, go to **Forma**t and select **Cell Format**. Select Number and click on OK.
- If you see ######, you need to expand your column so the data fits.
  - Double click on the line between the two column headings to auto-fit.
  - Drag the border between two columns.
- Change numbers to Currency with $ sign.
  - Highlight all number cells and click on $ icon.
- To enter fractions, leave a space between the whole number and the fraction. For example, 1 1/8.
- To enter a fraction only, enter a zero first. For example, 0 1/4. If you enter 1/4 without the zero, Excel will interpret the number as a date, January 4.

14.2.12 Insert a Row/Column

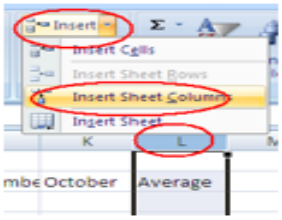
Insert a row:

- Select the row you would like to insert above
  - Clicking on the row number tab.
- In **Home** tab, go to **Insert** and select **Insert Sheet Rows**.



Insert a column:

- Select the column you would like to insert next to it
  - Clicking on the column letter tab such as L.
- In **Home** tab, go to **Insert** and select **Insert Sheet Column**.



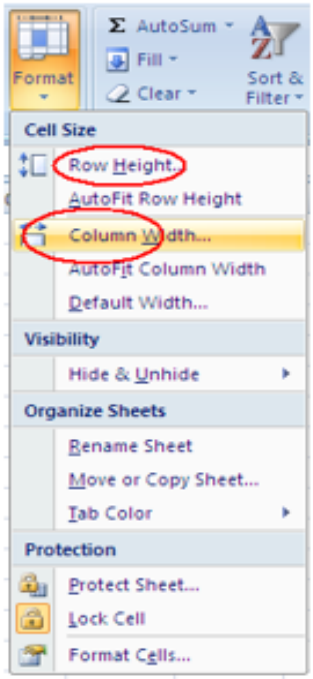
14.2.13 Change Column Width or Row Height

Column Width

- Drag the border between two columns to adjust a column width.
- Adjust column width for a group of columns
  - Highlight the columns you want to adjust their width.
  - In **Home** tab, go to **Format** and select **Column Width**...
  - Enter a number of characters for column width. Click on OK.

Row Height

- Drag the border between two rows to adjust a row width.
- Adjust row width for a group of rows
  - Highlight the rows you would like to change their height.
  - In **Home** tab, go to **Format** and select **Row Height**.
  - Enter a number of the row height and click on **OK**.
    - One point=.035 cm

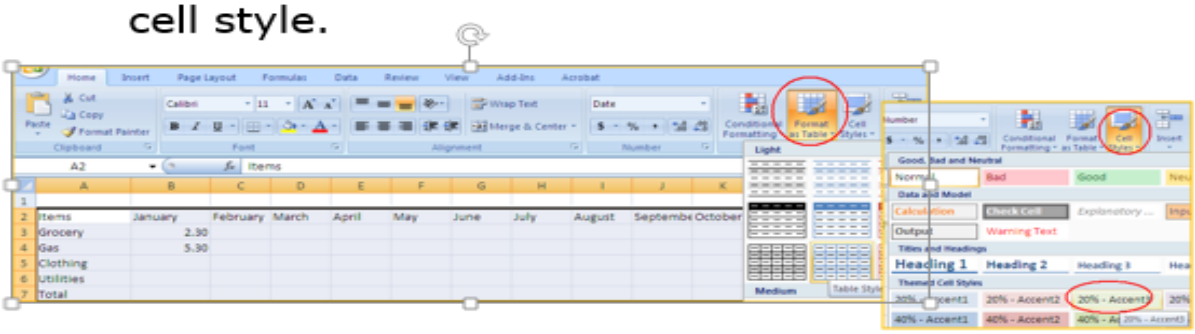


14.2. 14 Format a Worksheet

- Change the font size, color, and the background of a cell or group of cells.
- Select the cells you'd like to change. Then select a formatting tool.
- To show cell borders, highlight the cells and select a border.

14.2.15 Table Styles and Cell Styles

- Table Styles
  - Highlight the Excel table (all cells), go to **Format as Table** icon. Select a table style.
- Cell Styles
  - Highlight cells, go to **Cell Styles**, select a cell style.



14.2.16 Excel - Header and Footer

- In **Insert** tab, click on **Header & Footer** icon.

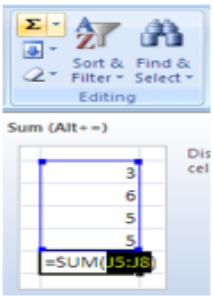
- Type in a header in the Header box.

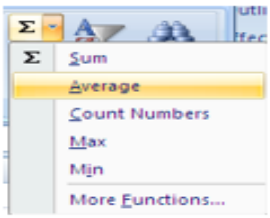
- Click on **Go to Footer** icon. Click on **File Name** icon to insert the file name in the Footer box.
- To go back to the Normal view of the spreadsheet, click on **View** tab and select **Normal**.

14.2.17 Basic Calculating Functions – Total, Average

Excel has mathematical functions for you to use.

- **Total**
  - Click on the Cell that displays a total.
  - In **Home** tab, click on the sum function icon.
  - Highlight the cells included in the total and hit Enter key.
- **Average**
  - Click on the cell that displays an average.
  - In **Home** tab, click on the little down arrow in the sum function icon and select **Average**.
  - Highlight the cells included in the average and hit Enter key.





14.2.18 Creating Basic Formula

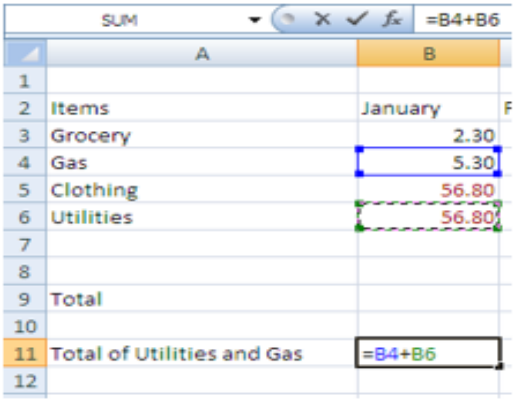
You conduct a mathematical calculation in Excel by typing a simple formula into a cell. An Excel formula always begins with an equal sign (=).

Math **operators**

- Addition: +
- Subtraction:-
- Multiplication:*
- Division:/

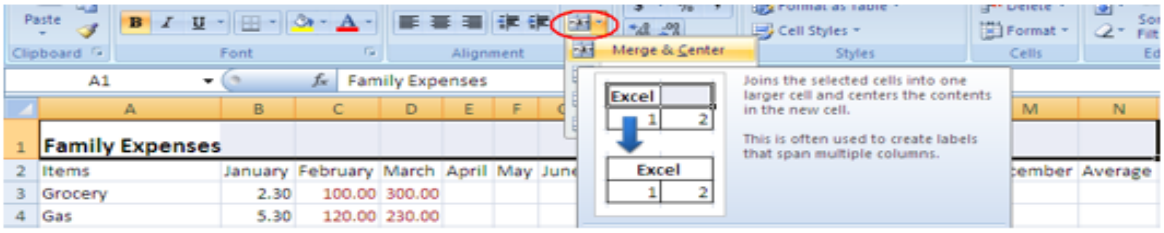
Example: Gas + Utilities

- Click on the cell that displays the expense of Gas and Utilities.
- Enter =.
- Click on the Gas cell for January.
- Enter +.
- Click on the Utilities cell for January
- Hit Enter key.



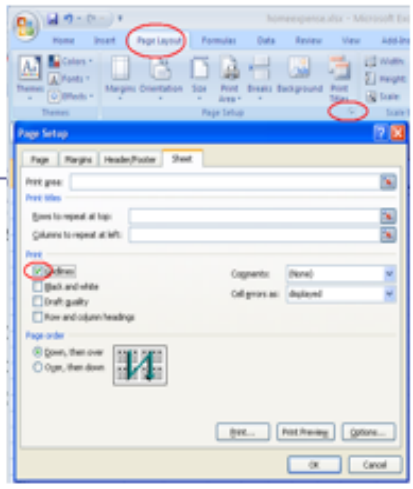
14.2.19 Merge and Center

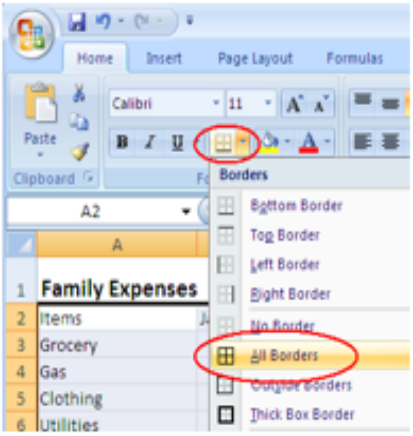
- You may want to add a title for an Excel table.
- Insert a row above the column heading row.
- Type the title in the first cell of the title row.
- Highlight the cells you would like to display the table title.
- Click on **Merge and Center** icon.



14.2.20 Print an Excel Sheet

- As default, there are no borders around cells.
- For printing, there are two ways to print boarders around cells.
  - Gridlines: This way adds gridlines around the cells in the table.
    - Click on **Page Layout** tab.
    - Click on **Page Setup** group.
    - Click on **Sheet** tab.
    - Check **Gridlines**. Click on **OK**.
  - Add borders: This way adds borders around the cells you selected.
    - Highlight the cells you want to have borders.
    - In **Home** tab, click on the down arrow next to the border icon and select a choice of borders.
    - You have flexibility of selecting a variety of borders.

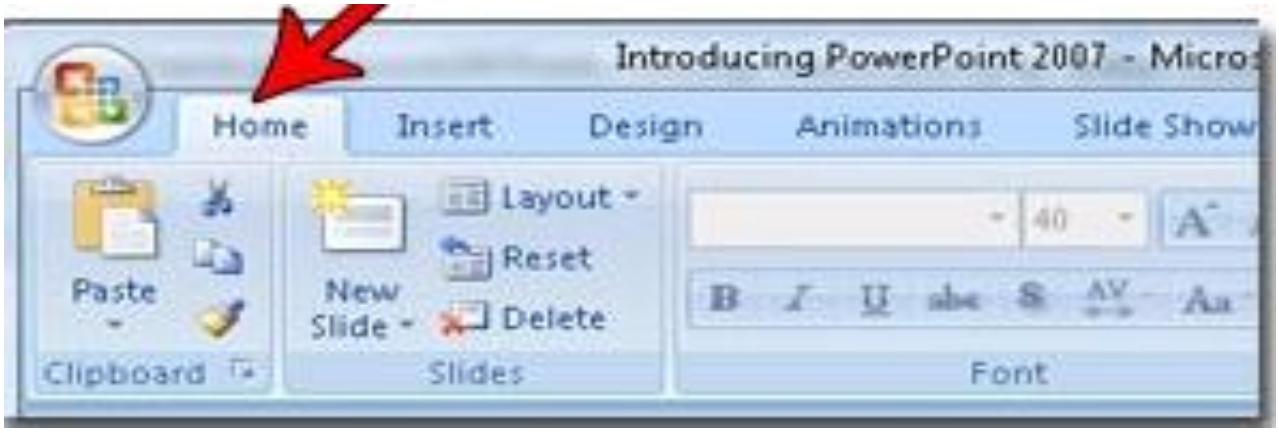




14.3 Microsoft PowerPoint Presentation

14.3.1 Using power point in classroom

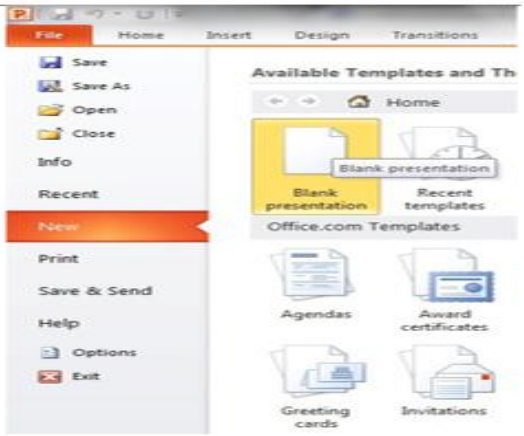
This application program can enable teachers, students and royal highnesses alike to prepare presentations aimed at communicating effectively to subjects of the chiefdoms. In this part of the unit, we will refer to the PowerPoint “Ribbon” in terms of navigating the program. The Ribbon is the strip of buttons across the top of the main window. Users can access anything the program has to offer through the Ribbon.



Create a New Presentation

Select “File” then “New”

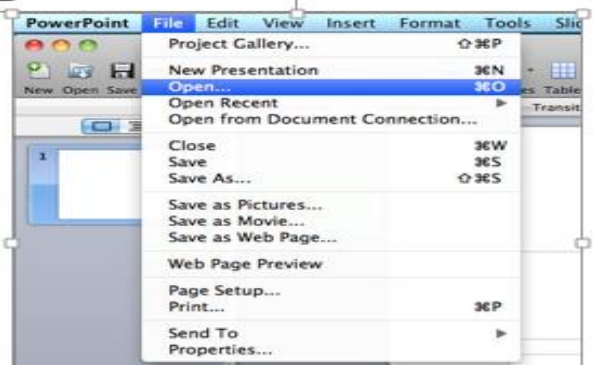
Shortcut: Hold the Control button, then press ‘N’ for “New”



Open an Existing Presentation

Select “File” then “Open”

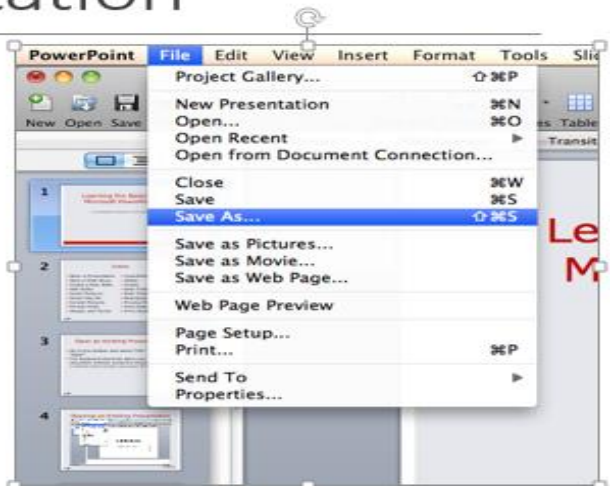
Shortcut: Hold the Control button, then press ‘O’ for “Open”



Saving a Presentation

Select “File” then “Save As”

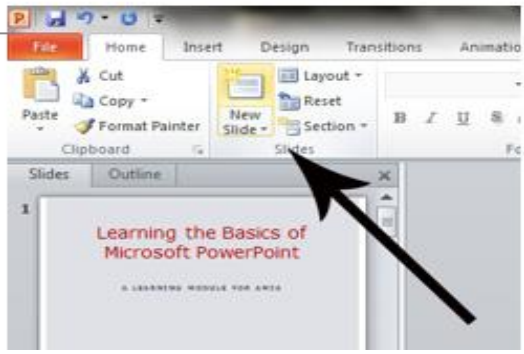
Shortcut: Press f12 to Save the file with a new name



Add a Slide

Go to the “Home” ribbon and select the “New Slide” button

Select the Slide Pane and press “Enter”



Insert Pictures from Files

Go to the “Insert” ribbon then select “Picture”

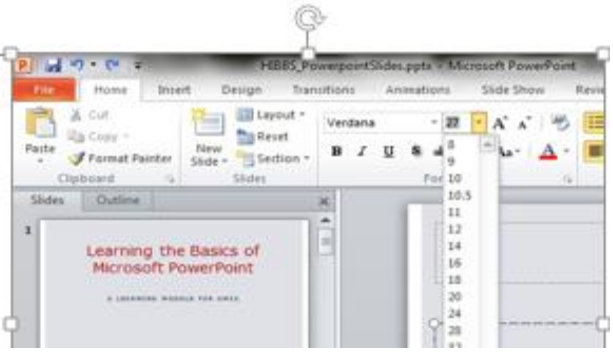
Locate the image file from the folder to where it is saved.

Select “Insert” from the dialog box.

Format Fonts

Go to the “Home” ribbon then make changes to the font size and style of the text.

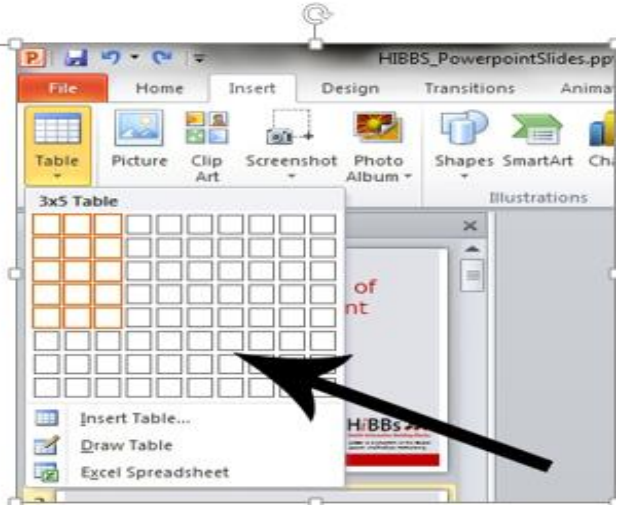
This Home tab also allows you to change all aspects of the font size and style.



Insert Tables

Go to the “Insert” ribbon then select “Table”

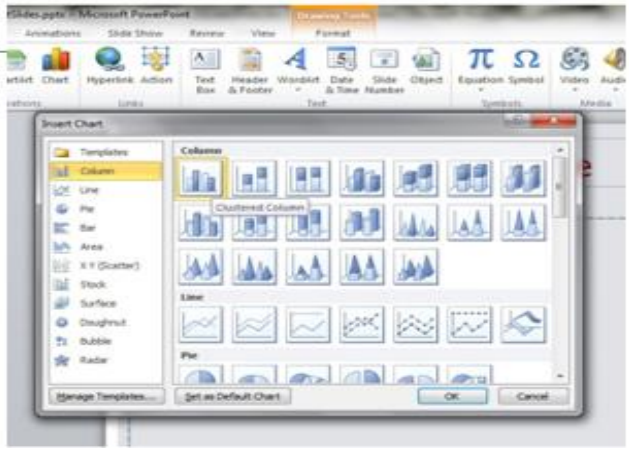
Move the mouse over the table illustration to select the size of the table you would like to use.

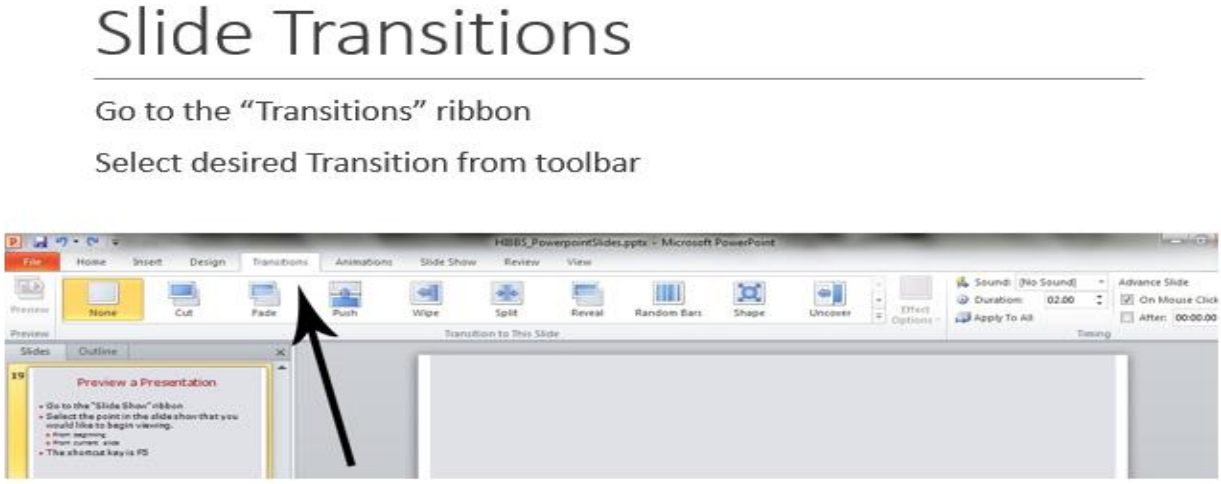


Insert Charts

Go to the “Insert” ribbon then select the “Chart” button.

Option to choose from Area, Bar, Line, Pie and several other Chart Options.





14.3.2 Rearranging Slides

To move a slide, click on the slide thumbnail in the left column

- Drag and drop the slide at the desired location.

To move consecutive slides at one time, click and hold the Shift key as you select the slides you want to move.

- Drag and drop the slides at the desired location.

14.3.3 Preview a Presentation

Go to the “Slide Show” ribbon

Select the point in the slide show that you would like to begin viewing.

- From beginning
- From current slide

The shortcut key is F5

View Slides vs. Outlines

The default view is Slides

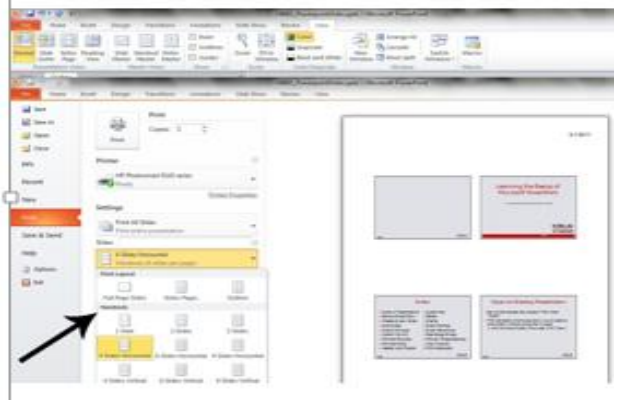
The second option is Outline view to show the slide show as outline notes

Print Handouts

Select "File" then select "Print"

- A dialog box appears that allows you to change the printer and select the number of copies to be printed.

You can also select to print handouts of the slideshow.



14.4 Microsoft Access Database

Your royal highnesses, kindly follow this link and attend a practical lecture on Microsoft Access (https://www.slideshare.net/vethics/ms-excess-basics-ppt)

14.5 Microsoft Publisher

I would like your royal highnesses to further enjoy yourselves by visiting this link so that you explore more on Microsoft Publisher (https://slideplayer.com/slide/4625900/)

Activity

1. Enter the academic record (Subject results) for each Traditional Leadership and Governance learner in excel for three consecutive terms of your choice
2. Use excel to create a bar chart and pie chart for the Traditional Leadership and Governance course results in (1) above.
3. Use mail merge to send a memo to all Royal Highnesses about the diploma programme in Traditional Leadership and Governance.

Summary

In this unit, we practically went through a demonstration on Microsoft Word, Excel and PowerPoint Presentation. Further, we discussed various situations of applying computer applications. I therefore, urge you to continue practicing in order for you to perfect your skills covered in this unit.

REFERENCES

Abbott, C. (2001). ICT: Changing Education; Routledge Falmer.

Crawford, R. (2010). ICT. Bradford: Pearson Education

Driscoll, T. (1997). Computer Studies and Information Technology. London: MacMillan Education Ltd

Florian, L. & Hegarty, J. (2004). ICT and Special Educational Needs: A Tool for Inclusion. Open University Press.

Hatherly, A. (2009). ICT and the Greatest Technology: A Teacher's Mind. Early Childhood Folio, Vol. 13, Annual 2009

Hayes, M. & David, W. (2006). ICT in the Early Years. Open University Press.

Jacobs, J. (2010). Computers part of your life. Dorandia: Study Opportunies

Murray, K. (2007).Microsoft Office System. NewDelhi: Microsoft Press

Phiri, W. (2019). Applied Statistics and Introduction to ICTs. Ndola: Mission Press