COMPUTER STUDIES

STUDENTS NOTES

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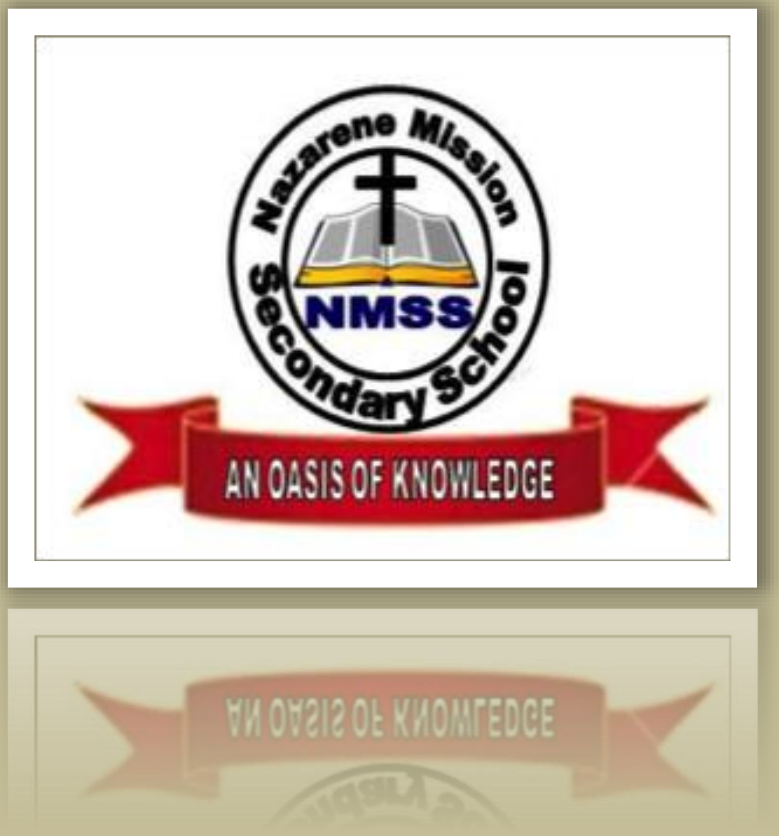

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COMPUTER STUDIES NOTES

What is a computer?

i. Computer is an electric device used for storing and processing data

The word device means anything that can store data or information.

In the computer there is a CPU (Central Processing Unit), which acts as the reasoning of computer.

ii. Computer can also be defined as an automatic, electronic data processing device that works under stored programs/instructions to produce information

DEFINITION OF TERMS

Automatic: because it can work on its own with little or no interventions from the user

Electronic: because they are made up of solid state known as integrated circuit necessary for electric current

Data: this consist of the raw, unprocessed facts, including text, numbers, images, and sound. Examples of raw facts are hours you worked and your pay rate.

Programs: are set of instructions that tell a computer what to do

Information: this is processed data e.g. the total wages owed you for a week's, month's work.

Peripherals: are all devices that can be connected to a CPU externally but under its control e.g. keyboard, mouse, printers, scanners etc.

Computer system: is the collection of computer software and hardware together with peripherals.

iii. Computer is also defined as an electronic device which accepts and process and store data and gives out results of the processing

This definition is giving us the four major functions or elements, which make the basic features of a computer, namely

i. Accepting data (input)
ii. Processing of data to derive information
iii. Giving out results of the processing (output)
iv. Storing information

The computer is the device that performs four functions:

- It inputs data (getting data into the machine)
- It stores data (keeping data Before and after processing)
- It processes data (performing carefully laid down mathematical and logical operations o the data)

- It outputs data (sending results of the processing to the user via some kind of display method).

Information Technology

The ability of a computer to process data and give out information has given rise to the concept of information technology.

Information technology (IT) refers to scientific advancement in computers and telecommunication devices, which has resulted in effective processing of data and transfer of information.

For example, few decades ago one of the ways of sending information was by sending a messenger. This was time consuming, especially when the distance is long. In present time, however, the same information can be relayed instantly using electronic mail (E-mail)

Difference between Data and Information

Data: Are raw, unorganized facts that need to be processed. Data can be something simple and seemingly random and useless until it is organized.

Information: when data is processed, organized, structured or presented in a given context so as to make it useful, it is called information.

Example

Each student's test score is one piece of data.

The average score of a class or of the entire school is information that can be derived from the given data.

CHARACTERISTICS OF A COMPUTER

A. **Speed**

The first characteristic of computer is speed and this means that computers work very fast. It takes few seconds to calculate works that we can take hour to complete. Computer can perform millions of instructions and even more per second. Therefore the speed of the computer is

determined in terms of microsecond (10^{-6} part of second) or nano-second (10^{-9} part of second).

B. **Accuracy**

Computers are accurate and that means it is rare for computers to make mistakes. The degree of accuracy of computers is very high and every calculation is performed with the same accuracy. The errors in computers are due to human and inaccurate data.

C. **Diligence**

A computer is free from tiredness, lack of concentration, fatigue etc. it can work for hours without creating any error.

D. **Versatility**

It means the capacity to perform completely different type of work. For example, you may use your computer to prepare payroll slips. Next moment you may use it for inventory management or to prepare electric bills.

E. Memory

Computer has the power of storing any amount of information or data. Any information can be stored and recalled as long as you require it, for any number of years.

F. **Storage**

The computer has an in-built memory where it can store a large amount of data. You can also store data in secondary devices such as flashes, which can be kept outside your computer and can be carried to their computers.

G. **No IQ**

Computer is a dumb machine and it cannot do any work without instruction from the user

H. **No feeling**

Computer does not have feelings or emotions, state, knowledge and experience.

HISTORY OF THE COMPUTER

Slide rule: it was a machine developed by English mathematician called Edmund Guinter which could perform operations like addition, subtraction,

multiplication, and division. It was widely used in Europe in 16th century.

History and Generations of Computers

The word Computer was a job title of people whose job was to perform repetitive calculations required to compute such things as navigational tables, tide charts, and planetary positions for astronomical almanacs. The present day electronics computers were given this name because they substitute these computers in the job they performed.

The history of the computer can be traced as far back as 300 BC when Babylonians were using a computer like machine to help in mathematical calculations

History of computer could be trace back to the effort of man to count large numbers. This process of counting large numbers generated various systems of numeration like Babylonian system of numeration, Greek system of numeration and Indian system of numeration. Out of these the Indian system of numeration has been accepted

universally. It is the basis of modern decimal system of calculation (0,1,2,3,4,5,6,7,8,9). But you will be surprised to know that computer does not use decimal system and uses binary system numeration for processing.

Binary numbers are formed by combination of only 2 digits or values 0(zero) and 1 (one) while digital numbers are formed by combination of ten numbers (0, 1, 2, 3, 4, 5, 6, 7, 8, 9)

Calculating Machines

The history of computer can be traced back as far as 300 bc when Babylonians were using a computer like machine which helped in mathematical calculations.

It took over generations for early man to build mechanical devices for counting large numbers. The Egyptian and Chinese people developed the first calculating device called ABACUS

The word ABACUS means, calculating board. It consisted of sticks in horizontal positions which were inserted sets of paddles.

Napier's bones

English mathematician John Napier built a mechanical device for the purpose of multiplication in 1617 AD. The device was known as Napier's bones

Slide Rule

English Mathematician Edmund Gunter developed the slide rule. This machine could perform operations like addition, subtraction, multiplication, and division. I was widely used in Europe in 16^{th} Century.

Pascal's adding and subtracting machine

This machine was developed by the man called Blaise Pascal at the age of 19 and it could add and subtract. The machine consists of wheels, gears and cylinder.

Leibniz's multiplication and dividing machine

This machine was developed by the German philosopher and mathematician Gottfried Leibniz around 1673. This machine could both multiply and divide.

Babbage's analytical Engine

The English man, Charles Babbage in 1823, built a machine called difference engine. Difference engine was designed to do complex mathematical calculations. Later he developed a general-purpose calculating machine called analytical engine. Charles Babbage is called the father of computers.

Mechanical and electrical Calculator

In the beginning of 19th Century, the mathematical calculator was developed to perform all sorts of mathematical calculations.

Modern Electronic Calculator

The electronic calculator used in 1960s was run with electronic tubes, which was quite bulky. Later it was replaced with transistors and as a result the size of calculators became small. The modern electronic calculator can compute all kinds of mathematical computations and mathematical functions. It can also be used to store some data permanently. Some calculators

have in-built programs to perform some complicated calculations.

Generations of Computers

The evolution of computer started from 16th century and resulted in the form of computer that we see today. The present day computer however, has also undergone rapid change during the last fifty years. This period, during which the evolution of computer took place, can be divided into five distinct phases known as Generations of computers. Each phase is distinguished form others on the basis of the type of switching circuits used.

First generation computers (1951-1958)

First generation computers were built with vacuum tubes. Vacuum tubes were tubes that were made of glass and were about the size of a light bulb. These computers were large in size and were difficult to write programs on them. Some of the computers of this generation include:

- **ENIAC**: it stands for Electronic Numerical Integrator and Calculator. It was the first electronic computer built in 1946 at university of Pennsylvania, USA by John Eckert and John Mauchy.
- **EDVAC:** it stands for Electronic Discrete Variable Automatic Computer and was developed in 1950. This is when the concept or idea of storing data and instructions inside the computer was introduced.
- **EDSAC:** it stands for Electronic Delay Storage Automatic Computer and was developed by M.V. Wilkes at Cambridge University in 1949.
- **UNIVAC:** stands for Universal Accounting Computer. It was produced by Eckerd and Mauchly in 1951

Limitations of first generation computer

1. The operating speed was very slow
2. Power consumption was very high
3. It required large space for installation

4. The programming capability was slow

Second Generation Computers (1958-1963)

This is when the device called Transistor replaced the Vacuum Tubes in the first generation in Bell Laboratories. Transistors are smaller than vacuum tubes and they have a higher operating speed and they don't require no heating. Thus the size of the computer got reduced considerably.

In the second generation, the concept of Central Processing Unit (CPU) was introduced.

In 1963, there was an introduction of the first computer industry standard character set called ASCII (American Standard Code for Information Interchange) that enables computer to exchange information.

Third Generation Computers (1964-1969)

The third generation computers were introduced in 1964. They used integrated circuits (IC). These ICs are popularly known as chips. A single IC has many

transistors, registers and capacitors so it is obvious that the size of the computer got further reduced.

An IC is a complete electronic circuit is a small chip made of silicon (the most abundant elements in the earth's crust). Those computers were made reliable and compact than computers with transistor and they cost less to manufactures. Computers of these generations are small in size, low cost, large memory and processing is very high.

Examples of computer developed during this time include: IBM-360, ICL-1900, IBM-370, and VAX-750. The higher level language such as BASIC (Beginners All Purpose Symbolic Instruction Code) was also developed during this period.

1964: introduction of computers built with ICs

1965: Digital Equipment Corporation (DEC) introduced the first Mini Computers and introduced programming language

1969: introduction of ARPANET and the beginning of the internet

Fourth Generation Computers (1970-1990)

The present day computers that you see are the fourth generation computers that started around 1975. It uses Large Scale Integrated Circuits (LSIC) built on a single silicon chip called microprocessors. Due to the development f microprocessor it is possible to place computers central processing unit (CPU) on single chip. These computers are called microprocessors. Later Very Large Scale Integrated Circuits (VLSIC) replaced LSICs. Thus the computer, which was occupying a very large room in earlier days, can now be placed on a table. The personal computers that we use now are the fourth generation computers.

Fifth Generation Computers (1991-200 & beyond)

The computers of 1990s are said to be fifth generation computers. The speed is extremely high in fifth

generation computers. Apart from this it can perform parallel processing. The concept of artificial intelligence has been introduced to allow the computer to take its own decision.

1991: release of World Wide Web standards that describe the frame work of linking documents of different computers

1993: Linus Torralds developed a version of UNIX called the LINUX system

1993: introduction of computer built with Intel's Pentium microprocessor

1995: Microsoft releases windows95 a major upgrade to its windows operating system

1997: windows 97 with major web enhancements was released by Microsoft

1998: Microsoft released 98 integrated with internet explorer 4.0

1999: Microsoft released Office 2000 featuring extensive web integrated and document collaboration-soon followed by windows 2000.

2002: a private internet2 expected to be completed with higher speed, limited access & higher security expected to include advanced virtual reality interface. It is still a developmental stage.

Study questions

1. Write a short note on Fifth Generation of computer. What makes it different from Fourth Generation computer?
2. Why did the size of computer get reduced in third generation computer/
3. Give short notes on the following
    a) Slide rule
    b) Babbage's Analytical Engine
    c) Pascal's Adding and Subtracting Machine
    d) Leibniz's Multiplication and dividing Machine

4. Explain in brief various generations in computer technology
5. What does the following abbreviation stand for

a) VLSIC	d) EDSAC	g) BASIC
b) ENIAC	e) UNIVAC	h) DEC
c) EDVAC	f) ASCII	i) LSIC

6. The personal computers you see today are in which generation of computer?

TYPES OF COMPUTER

Computers are categorized into three categories based on how they operate. The three types of computer include analog, digital and hybrid computers.

Analog computers

These are kind of computers that use a currency of physical quantities such as electrical, mechanical or hydraulic phenomena to model the problem being solved.

Components of analog computers

Some of the **electrical components** include: potentiometers, operation amplifiers, integrators, fixed-function generators.

Some of the **mechanical components** include: gears, levers etc.

Some of the **hydraulic components** include: pipes, valves, and towers.

Advantages of analog computers

In analog computers performances are done by using properties of electrical resistance, voltage and so on. This enables analog computers to perform a lot faster than digital computers. As such, certain useful calculations that are difficult for digital computers are easily done by the analog computers.

Limitation of analog computers

- They make a lot of noise
- They take big footprint
- They produce a lot of heat
- They are not as precise as digital computers.

Digital computers

These are computers that use binary digits in order to model the problem.

Basic digital computer has four main sections: the arithmetic and logic unit (ALU), the control unit, the memory, and the input and output devices (generally termed I/O)

The control unit, ALU, registers (memories), and basic I/O are collectively known as a Central Processing Unit (CPU).

CPUs are constructed on a single integrated circuit called a microprocessor.

Hybrid computers

These are computers that combine the features of analog and digital computers.

- The digital component serves as controllers and provides logical operations
- The analog component serves as a solver of differential equations.

Since the analog computers are fast but not precise, the digital computers are precise but slow. The combination of both digital and analog features that form hybrid computer enables it to underscore both speed and precision.

CLASSIFICATION OF THE COMPUTERS

There are four classes of computers these are Microcomputers, Minicomputers, Mainframe computers and Super computers.

A. Micro computers

Microcomputer is the computer that uses a micro chip as its CPU. They are generally called Personal Computers (PC) because they are designed to be used by one person at a time.

Microcomputers are mainly used for general purposes in places like schools, at home, or at a business.

The major purposes for which micro computers are used include: word processing, database management, organizing and making presentations, internet surfing, playing games, and editing photographs, spreadsheet calculations etc.

Personal computers are in three major sizes:

i. Desktop computers: desktop are not portable due to their size. As the name suggests, they are meant to rest on top of a desk. The desktop computers usually have peripherals input and output devices such as keyboard, mouse and monitor

ii. Laptop computers: they are smaller and hence portable. Since they are designed to be used everywhere, they run both on battery and mains. They have built-in peripherals such as monitor which folds down, a keyboard and pointing devices such as a track pad or a touch pad. Laptops are generally expensive

than desktops of the same processing power because the smaller components that make up a laptop are more expensive.

iii. Palmtop computers: these are handheld computers. While they are portable, these handheld computers are not as powerful as laptops. Palmtops are at the lowest end of the computer ranges in terms of speed and storage.

Characteristics of microcomputers

- They are not multi programmable thus not allowing many programs to run at the same time
- Its process is done by a microprocessor
- They cannot handle many peripherals
- It has a small memory capacity
- They are not difficult to operate
- They are portable computers

B. **Mini Computers**

Minicomputers are computers that designed to support more than one user at a time. This kind of computer is

generally used for processing large volume of data in an organization. They are also used to link up other computer on a relatively small network called Local Area Networks (LAN). Minicomputers are smaller and less powerful than mainframe computers.

Characteristics of mini computers

- They are able to control limited peripherals
- They are fast when processing transactions
- They are able to give instant response i.e. airline reservation
- They are cheap to purchase compared to mainframe computer
- It require well trained personnel

C. **Mainframe Computers**

Mainframe computer is a large, powerful computer that has the capacity of handling processing for hundreds of users at the same time. Users connect to the mainframes and submit their tasks for the processing using **Dumb**

Terminals (terminals that have screens and keyboards for input and output, but do not do their own processing)

Mainframes are used as centralized information storage facilities where a company wants the processing power and information storage in one place. They are also used as controlling nodes in Wide Area Networks (WAN)

Characteristics of mainframe computers

- They are multi programmable thus allowing many programs to run at the same time
- It has fast processing unit hence fast in processing transactions. For example insurance companies uses mainframe computers to process information of millions of policyholders
- They are able to store large amount of data because it has a large memory capacity
- They are very difficult to operate.

D. **Super Computers**

Super computers are basically a mainframe computer that has its speed and power increased. Supercomputers have high processing speed compared to other computers. Super computers are used for weather forecasting, biomedical research, aircraft design and other areas of science and technology.

Characteristics of supercomputers

- They are used for application that requires a large amount of processing activities
- It has fast processing unit hence in processing transactions
- It is used to process very difficult transactions
- They are used to handle detailed calculations required to model wings of planes
- It is used for designing i.e. the designing of a car in order to improve the designs
- They are very expensive and difficult to operate.

AREAS IN WHICH COMPUTERS ARE USED

The computer has changed society today. People are now interacting with the computers in fields such as education, finance, government, health care, science, publishing, travel, and manufacturing.

Education Sector

In then education sector such colleges, secondary school, and universities, computers are used in various. Some of the ways in which computers are used in this field include

- For preparation of class time table for both students and teachers
- Student account handling
- To maintain a library database and for making of examination papers
- They are also used for designing and making presentations using PowerPoint.

Financial Sector

Computers have helped in financial sector and the most notable ones are: accounting, banking, payroll, and sales.

Accounting

Nowadays, most organizations have computerized their accounting systems. Using accounting software such as SAGE, they are able to produce financial statements quickly and with much accuracy.

Banking

Most banks now they are using the technology called Auto-Teller Machine (ATM). With ATM people are able to withdraw money, pay bills, check account balance, generate account statements. Computers are also enabling banks to work on network whereby customer's transaction can be done at any branch of their bank and get instant information about their accounts. Withdrawing can be done at any branch. With these capabilities, sending and receiving money has been simplified.

Payroll

With the increased population, companies are employing many people. Previously, it was tiresome and difficult to prepare salaries of employees in good time. With then development of payroll software, it takes only a few individuals to prepare salaries for hundreds of people within short period of time.

Sales

Large shops normally have a wide range of items for sale that sales personnel cannot manage to memorize prices of them all. On the other hand, it is not convenient for people to carry large amounts of cash when going for large shopping.

This is why Electronic Point of Sale (EPOS) and Electronic Funds Transfer on Point of Sale (EFTPOS) were developed whereby scanners are used to read cards and bar code to identify products and their prices.

Communication systems

Computer technology has now cut down on time it took to send a message from one point to another. .the internet has made it possible to send e-mail from one part of the globe to another and the recipients gets the message instantly.

In video conferencing, computer technology is facilitating communication whereby people from different parts of the globe can conduct meeting just as if they are physically face to face, this can be through Skype or any other means.

Transport systems

In transport systems, computer have assisted in the areas of mobility, security and traffic control relating to air, road, and rail and shipping.

The following are some of the technologies based on computers.

- Communication between plane and control towers
- Security checks which assist in detecting explosives
- Traffic control lights (robots) which automatically control road traffic
- Car tracking technologies which enables organizations and other people locate their cars ina particular region

Research system

people who are working in research use computer technologies in order to analyze the data. Programs such as spreadsheets are used to analyze large amounts of quantitative data much faster than if it was done manually.

Entertainment

Computers are used in the area of entertainment in several ways. They are used to design software and programs which enables people to play games.

With the coming of the digital and video cameras computers are used to edit video which enables people to watch home videos. They are also used for editing and listening to music.

Advantages of using computers

- Computers process data much faster than if the processing was done manually
- There is high level of accuracy in computer processed information so long as input data is correct
- Computers have the ability to store huge amount of data. This saves a lot of space and paper which could be required if the same data were to be stored manually
- Computers work automatically and are not subject to exhaustion. As such, they can process large amounts of data.

Disadvantages of using computers

- Computers requires a lot of time to be spent of training
- The computer can fail due to electrical failure, a hardware/software fault or viruses.
- As computers can do large amounts of work, they can also lead to loss of jobs. The work which required several people will be done by a single person operating the computer.
- With most organization computerizing their systems, job opportunity become limited.
- In case of computers on network, keeping information confidential may be difficult as some people may attempt to have illegal access to information.

COMPONENTS OF COMPUTER

Computer is made up with two components

- Computer hardware
- Computer software

Computer Hardware

This is the term used to describe all the physical parts of the computer system E.g. CPU, monitor, keyboard, mouse etc.

Functions of computer hardware

- To produce the output i.e. monitor and printer
- To enter data into computer system

Components of computer Hardware

There are five parts/components of computer hardware these are: processing devices CPU, input devices, output devices, storage devices, and communication devices

PROCESSING DEVICES

This is the devices which is responsible for converting/processing data e.g. CPU

The central processing unit (CPU)

This is the main part of the computer. It acts as the brain of the computer. The CPU is sometimes known as Central Processor

- It is central, because it is the center of computer data processing
- It is processor because it processes data
- It is unit because it is a chip, which contains millions of transistors (another name for chip is Integrated Circuit)

The CPU consist of three parts

- Control Unit
- Arithmetic and Logic Unit (ALU)
- main memory or Immediate Access Store (IAS)

PARTS OF THE CENTRAL PROCESSING UNIT

The control Unit

This is the part of the Central Processing Units that directs and co-ordinates the activities of the entire computer.

Arithmetic and Logic Unit (ALU)

This is the part/component of the Central Processing units that contains the electronic circuitry necessary to perform Arithmetic operations and logic operations.

Immediate Access Store (IAS) or main memory

This is part of the Central Processing Unit that stores data and instructions that control [processing.

TYPES of MEMORY

There are three types of memory

- Random Access Memory (RAM)
- Read Only Memory (ROM)
- Complementary Metal-Oxide Semiconductor (CMOS)

Random Access Memory

RAM is the temporary memory where computer keep data for the processing task, which is being undertaken.

This is called ***Volatile memory*** because when the computer is turned off, all data in this memory is lost

RAM is also called the primary memory and also main memory

Characteristics/Functions of RAM

- It is volatile
- It can be written and changed

Read Only Memory

This is part of the main memory, which is non-volatile and is mainly used to store programs essential for the running of the computer like operating system etc.

Functions/Characteristics of ROM

- It is non-volatile
- It cannot be written an changed
- It can be accessible to the user
- It helps to start up the computer

Complementary Metal-Oxide Semiconductor (CMOS)

This memory store flexible start up instructions such as time, date and calendar that must be kept current even when the computer is turned off

Characteristics of CMOS

- It is non-volatile
- It can be programmed
- It requires battery

Flash memory

This memory is used to store programs in personal computers, cell phones, mp3players, palm organizers, printers and digital cameras.

- It is non volatile
- It can be reprogrammed
- Does not require the use of battery

Processing speed

The processing speed of a microprocessor is determined by a number of factors

- ***The word size***

This refers to how many bits (binary digits) it can input/output and process at the same time. Early microprocessors used 8-bit word size; the newest microprocessor use `64-bit word size.

- ***Cache memory***

  Cache memory is used to store the most frequently accessed information stored in RAM. This is important in case it needs the instructions or data again, so that it does not need to go back to RAM memory to get them.

- ***Clock speed/* System Clock**

  The system clock or the clock speed controls the speed of operations within a computer. The clock speed is measured in units of cycles per second called Hertz (Hz). This is expressed in Megahertz and Gigahertz (GHz) where one megahertz equals 1 million cycles (beats) per second. The fast the clock speed the faster the computer can process information.

INPUT AND OUTPUT DEVICES

Input Devices

Input devices are the devices that are used to enter data into the computer

Examples of input devices are:

- Keyboard
- Mouse
- Digital camera
- Joysticks
- Light pen
- Scanner
- Microphone

MASTERING THE KEYBOARD

The keyboard

The keyboard is a board with set of keys used for rendering data into a computer and typing commands that directs a computer what to do.

A key: is a button on a keyboard, which performs a specific task or a range of specific tasks.

Uses of the keyboard

- Entering text data and numbers into the computer
- Playing computer games
- Entering instructions into the computer that instructs the computer what to do
- Moving around document

Advantages of entering data using a keyboard

- Good for manual text entry
- It is familiar device
- Special keys can be used for special functions
- Specialized keyboards can be used to speed up data entry.

Disadvantage

- Mistakes are easily made
- It has a large foot print (it takes a large space)
- Data input is slow compared to many other methods.

Keyboard layout/ classification of the keys on the keyboard

Alphabet keys

These are mainly keys that are used for entering text and data. Alphabetic keys on the keyboard are normally arranged based on the standard typewriter layout known as QWERTY. This refers to the top right five keys are position end.

The 46 alphabeti-numerical keys dominate the general typing area. Each alphanumerical key produces two symbols, and then second reached by holding down the "shift" key while pressing the alphanumeric key.

Digit/ numerical keys

These are keys that are used for entering numbers. There are two sets of numerical key. The first set is aligned on top of the alphabet keys. Another set located to the far right of the keyboard and it is known as numerical keypad.

Function keys

These are Keys that are used to enter specific commands into the computer. These keys are from F1 to F12

Apart from these major categories, there are other specific keys as outlined below

Cursor/navigations keys: these are used to move cursor. These include four arrow keys between the numeric keypad and then alphabet keys, Home, End, Page Up, and Page Down

Control keys

These are keys surrounding the QWERTY keyboard. These are keys such as CTRL, Enter, Caps, Lock, and ALT and so on. They work after combined with another key to perform an action

Toggle key

These are keys that are used to turn a feature on or off e.g. caps lock, NUM Lock and Scroll Lock

Special keys

These are keys that are used for special purposes e.g. Esc, typically cancels a selection or a procedure, Windows key used to display the start menu. All buttons with punctuation marks are also special keys

In addition to keys of the standard keyboard, then standard keyboard contains a ***numeric keypad.*** This is a set of digit

keys, which are used when being typed is predominantly numbers.

A keyboard sketch showing basic keys

Backspace: deletes backward

Enter: for starting a new line

Shift: for typing CAPITALS and used to reach other keys on top of other keys.

Spacebar: for spaces between words

Delete: deletes forward

Tab: for starting a paragraph

Typing

Typing is the insertion of text in the processor or any other program or text box. Typing is done by just pressing the respective keys on then keyboard. There are some keys that have got two symbols on them,

To type a symbol that is on the top of the button

Hold down Shift

Press the button

To type capitals

- Hold down Shift
- Type any alphabetical letter

Or

- Switch on Caps Lock by pressing on Caps Lock button. With the Caps Locks on everything you type will be in capital letters.

To type symbols,

- Hold down a shift key with one hand
- And press keys the other hand

Deleting

To delete text that is on the **left** of the cursor (the line blinking on the point of insertion) use **backspace**

The delete text that is on the **right** of the cursor, use DELETE

BLIND TYPING

This is having your hands dangled in the middle of the keyboard while your fingers rest on certain keys (home keys).

To ether the letter you need to reach the appropriate key with the closest finger. Thumbs are used to press space bar. Your other eight fingers, excluding thumbs, rest in the center of the keyboard.

Hand positioning

Fingers of the left had rest on the ASDF keys, while those of the right hand on JKL. The index fingers are on F and j. These keys have special pimples. The thumbs press the Space Bar.

Different types of keyboards

There are different types of the computer keyboard and the following are some of the keyboards that are commonly used.

Standard keyboard

Standard keyboard are the basic form of the keyboard. The standard keyboards, although they are the basic form of the keyboards they do have a slight different in the manner the keys are placed. Qwerty keyboards are the most common and they have the six alphabets Q, W, E, R, T, Y in the first row, while in A, Z, E, R, T, Y keyboards these letters are also placed in the first row and they are commonly used primarily in French countries.

Advantages of standard keyboards

- Standard keyboards were designed to prevent type bar jam, which occurred when the two typewriter keys near one another were struck simultaneously and would tangle together inside the machine
- The standard keyboards are familiar. It is the first method most people use when learning to type.

Disadvantages

- QWERTY keyboards were designed with the purpose of solving a typewriter issue. On that has no relevance with today's computer and laptops
- QWERTY design causes a lot of unnecessary movement in the hands, wasting time and leading to a greater risk of issues such as carpal tunnel syndrome. (A painful condition of

the hand and fingers caused by compression of a major nerve where it passes over the carpal bones through a passage at the front of the wrist. CTS are caused by repetitive movements over a long period, or fluid retention and are characterized by sensations of tingling, numbness, or burning.

Ergonomic keyboards

Ergonomic refers to the study of methods that can reduce stress on muscles to avoid repetitive strain injury. Ergonomic keyboards are designed in such a way that typing can be done without putting more stress on the fingers and wrist. If one is using ergonomic keyboard the work can be carried out in the easiest manner with the least possible strain on any muscle, joint, or organ.

Ergonomic keyboards come in two forms

- As a single piece, where a group of keys have been split in such a way that the angle at which the user places his or her wrist to type is the least stressful.

- In the form of separate pieces, each having a group of keys, so that the user can set the angle to his or her convenience.

Characteristics of ergonomic keyboards

- Split keyboards

  The most ergonomic keyboards have a split keyboard design. A standard keyboard is divided down the center with the resulting keys arranged in a V shape. This places less stress on the wrist and is more natural to the arms.

- Adjustable

  Ergonomic keyboards are made to allow someone adjust the split angle. If one is not sure what angle of split keyboard would be best for you, you can find a keyboard with an adjustable angle.

Disadvantages

- Cost

Ergonomic keyboards tend to be more expensive than standard keyboards.

- Ergonomic keyboards are not familiar to use as compared to standard keyboards.

Wireless keyboards

As the name suggests, these keys do not need to be connected to the computer via a wire. This makes it very convenient for the user to use the keyboard comfortably. Wireless keyboards use three basic types of connection, Bluetooth, infrared (IR), and the radio frequency to connect to the computer.

All the three types of wireless keyboards need external power to function. In most cases they use batteries.

Compact keyboards

Compact keyboards are slim and usually do not have the numerical keypad that is present on the right side of other keyboards. These are typically used in laptops, where sizing issues makes it difficult to accommodate a standard keyboard.

Internet keyboards

The Internet keyboards have special keys, called hot keys, which perform functions related to Internet usage. Hot keys have functions like back, forward, bookmarks list, e-mail inbox, Google search, YouTube, shopping online, etc.

This makes browsing on the Internet very convenient, as the user does not have to go through the process of clicking buttons via a mouse.

Gaming keyboards

As the name suggests, gaming keyboards are designed especially for gamers. They include features meant to enhance gaming experience, as well as provide convenient usage for gamers. They include features like volume control, key lighting, in-built joysticks etc.

Virtual keyboards

Virtual keyboards are software devices that let you input data just like a hardware keyboard. They open up as an application and can be controlled by a mouse or via a touch screen. They are mainly used in devices that do not

necessarily require a keyboard, like a tablet or a smart phone.

MASTERING THE MOUSE

A mouse is a small device that a computer user pushes across a desk surface in order to point to a place on a display screens and to select one or more actions to take from that position.

Buttons of the mouse

The mouse has got three types of button

- Right button (right click): it's the button on the right side of a mouse device. This button displays a context menu for the object under the pointer
- Left button (left click): the button on the left side of a mouse device. The left button is frequently used for selection
- Middle button (scroll wheel): it is used for scrolling

Uses of the mouse

The mouse is used to do the following things

- Selecting text or graphics
- Drawing auto shapes
- Pointing at menus
- Displaying menu

Advantages of using a mouse

- It is easy and convenient to use a mouse
- Selection of object on screen is made easier by using a mouse than using a keyboard.

Disadvantages of using a mouse

- A mouse can work only with software designed for e.g. windows
- It cannot be used to input text without the help of the keyboard
- It is not very accurate for drawing purposes.

Different types of mice

Cordless mice

These communicate to the computer without the use of cables. The advantage of this kind of mice is that they

reduce clutter (a collection of things lying about in an untidy mass) on the user's desk, and allow greater freedom as to where the mouse is placed.

Optical mice

These have no moving parts, they use laser light. The advantage with these mice is that they do not suffer from dirt clogging (they are not affected by dust and dirt).

Gyro mice

These can be used in mid air, they do not need a flat surface that's they are not affected by dirt and dust.

Scanners

Scanners are used for a wide range data input.

- They are used to enter pictures into the computer
- They are used to input text from a document. The reading of text (hand written or printed) by the scanner is called **Optical Character Recognition (OCR)**
- Scanners are used to read the specially spaced lines in magnetic cards e.g. multiple-choice examinations in

MSCE English. This is called **Optical Mark Recognition (OMR).**

- Some scanners read barcodes on goods and use the data so collected to produce customer's bill and update stock records for the shop. This method is known as **Electronic Point Of Sale (EPOS)**
- Other scanners read information from a magnetic strip of a card. When swiped through a scanner, the scanners transfer account information into the banking system, if used in the shop this is called **Electronic Funds Transfer at Point Of Sale (EFTPOS).** Other cards, however, do not have a strip but have a built-in circuit and a set of gold colored contacts. These are known as **Smart Cards.** A good example is: **Auto-Teller Machine card (ATM).**

  Advantages of using scanners

  - Good for inputting pictures and line art
  - Good for inputting large amounts of text using **OCR**

Limitations of scanner

- Text can be incorrect, some characters like zero and the letter o can be confused
- Flat bed scanners have large footprint.

Joystick

This is used in the same way as a mouse. It is mainly used for playing games. It is otherwise known as a game controller

Touch Pad

Touch pad is the kind of pointing device used by most laptop computers. The on-screen cursor is moved by sliding a finger along the surface of the touch pad. The buttons are located below the pad. Most pads allow left mouse clicking by taping on the pad itself.

Light pad

It looks like ordinary pen but this has a cable connecting it to the computer

Advantages

- It is used to input graphical data

- It has a small foot print
- It is similar to pen or pencil that the user will be familiar with

Limitations

- It is poor at inputting more general data such as text

Track Point

A track point is a small rubber projection embedded between the keys of the keyboard. The track point acts like a little joystick that can be used to control the position of the on-screen cursor. The track points are normally used in smaller notebook computers, which do not have space for a touch pad.

Track ball

A trackball is a kind of mouse with a movement sensitive ball located on top. The ball is rolled with fingers. The left and right buttons are usually located in the sides.

The trackball have got an advantage over a mouse in that they remain stationary and hence do not need a lot of room to use. However, like the mouse, dirty rollers can make

their cursor control jumpy and unsmooth. Modern trackballs are optical.

Touch screen

Touch sensitive display screens are kind of screens where the user can make choices and press button images on the screen using a **stylus.** Some computers, especially PDAs, use touch screens.

Graphic tablets

A graphic tablet consists of an electronic writing area and a special pen that works with it

Graphics tablet allow artists to create a graphical image motions and actions similar to using more traditional drawing tools.

Other input devices

There are so many other input devices. Some of them are outlined below.

Input device	Functions

Microphone	• Some computers can respond to spoken word and carry out instructions like printing or transcribing the spoken word into text
	• Voice can also be recorded in the same audio form on a computer using a microphone
Digital camera	• This can capture and store a picture in an electronic format without putting it on a film. This picture can also be transferred into computer via a cable
Digital video camera	• This captures moving pictures and can transfer them into a computer using a cable. This is otherwise known as **video digitizer**

Output Devices

These are all devices that are used to give out the results of the processing.

Examples of Output devices are

- Monitor
- Printer
- Speakers
- Fax

Forms of output

- Soft copy: a soft copy is a kind of output, which is not tangible but can only, be seen or heard. Soft copy can be audio or visual, on a Visual Display Unit (VDU). The most common, however, is the visual output.
- Hard copy: a hard copy is tangible output of data. Printers mostly produce it.

The difference between hardcopy and softcopy is that hardcopy is the tangible output while softcopy is the intangible output.

SOFT COPY
MONITOR

Monitor is the most frequently used output. Two important characteristics of monitor are the size and clarity. The diagonal length of its viewing area indicates a monitor size. Common sizes are 15, 17, 19, and 21.

The monitor's clarity is indicated by its resolution, which is measured in pixels.

Pixels are individual dots (or picture elements) that form images on a monitor. Pixel is a short form for picture (pix) and element (el).

Resolution refers to the image sharpness of a display screen. The greater resolution (the more pixels) the better the clarity of the image. For a given level of clarity, large monitors require a higher resolution (more pixels).

Uses of the monitor

- It is used to show instructions and data as they are input
- It also displays images

Types of Visual Display Units

There are different types of Visual display Unit namely:

1. Cathode Ray Tube (CRT) monitors
2. Thin Film Transistors (TFT) screen
    i. Liquid Crystal Display (LCD) monitors
    ii. Gas Plasma Display (GPD) monitor: it is a type of Thin display screen which uses neon gas

Other types of display include

- Electro-Luminescent display (EL)
- Vacuum Fluorescent Display (VFD)

Cathode Ray Tube (CRT) monitors

This works by firing a beam of electrons at a specially coated glass screen. This is the monitor which consists of along glass tube with an electron gun on one end and the green on the other. The electron gun shoots electrons to illuminate the screen,and the screen is coated with tiny dots.

Characteristics of CRTs

- They need a high voltage supply
- They have a curved shape

- They are large, heavy and need a lot of power hence are not suitable to be used by the laptop computers

Thin Film transistors (TFT) screen

This is often called a flat screen monitor because the display surface is flat rather than having the slight curved in CRTs.

Characteristics

- They are thin and light, hence are used on laptop computers and other portable devices like mobile phones
- They do not need high voltage or use a much electrical power as a CRT screen.
- They are more expensive than the CRTs.

LIQUID CRYSTAL DISPLAY(LCD)

There are flat-panel monitor that are made of special liquid crystal.

CHARACTERISTICS

- **They are less bulky**
- **Consume less power**
- **Have little strain effect on eyes.**

There are two technologies used to make LCDs

(1)Passive Matrix: create images by scanning the screen

(2)Active Matrix: Display is made using thin film transistors(TFT) technology. This technology consume more power but the quality of image is good.

GAS PLASMA DISPLAY(GPD)

-Resembles LCDs only that they make use of gas instead of Liquid crystal. The gas is called Neon gas.

HARDCOPY

Hard copy is a tangible output of data. Printers mostly produce Hardcopies.

Printers

A printer is an output device that prints characters, symbols, and graphics on a paper or any other hardcopy medium. It produces a hard copy form of output.

The quality of sharpness (resolution) is given by DPI (dots per inch). This refers to the measure of the number of dots printed in a linear inch.

Types of printers

There are two types of printers, namely:

- Impact printers
- Non impact printers

IMPACT PRINTERS

Impact printer form characters by hammering the shape of a character onto a carbon or ink ribbon placed against a paper and this leaves an impression of the character on the paper. Examples of impact printers are the Dot Matrix Printer and Daisy Wheel printers

Dot matrix Printer contains print head of small pins, which strike an inked ribbon against paper, or carbon, to form an image.

Advantages of dot matrix printer

- They can handle both text and graphics

Disadvantages

- They are generally slow
- Printing quality is not good
- They cannot print color text or graphics
- They are noisy when printing

NON-IMPACT PRINTERS

Non-impact printers form characters and images without direct physical contact between the printing mechanism and the paper. These printers form characters in various ways such as spraying ink onto the paper.

Types of non-impact printers

There are three types of non-impact printers, these are

- Laser printers.
- Inkjet
- Thermal

Laser printers

These printers create images with dots. With laser printers, images are produced on a drum, treated with magnetically charged ink-like toner, and then are transferred from drum to paper.

Why they are most common non-impact printer

- They produce sharp, crisp images of both text and graphics
- They are quiet and fast
- They can print in different font styles and types.

Inkjet printer

Inkjet printers form the image on the page by spraying tiny droplets of ink on the paper. These are the most common type for home use systems.

Advantages

- They can print in color
- They produce good quality printouts
- They are quiet
- They are less expensive

Disadvantages

- They are slow than the laser printers
- They have a lower resolution
- They are more expensive to operate than the laser printer

What is common in terms of printing among laser, dot matrix, and inkjet printers is that all of them form images with little dots.

Thermal printers

This printer forms image by burning dots onto special paper, using colored waxes and heat

Advantages

- They produce highest quality color printing

Disadvantages

- They are very expensive and they use expensive paper.

Difference between impact and non-impact printers

- Impact printers use an inked ribbon or carbon, unlike non-impact printers that use ink or toner
- Impact printer use a print hammer or a wheel unlike non-impact printer
- Impact printers are noisy when printing, while most of the non-impact printers are silent
- All impact printers do not print colored document, unlike most of the impact printers which print in color (e.g. inkjet or thermal printers and some expensive laser printers)

Multifunction printers

These are printers that do more than printing. These printers do printing, scanning, copying and faxing.

This means a single multi function printer combines a photocopier, scanner, and fax machine.

Advantages

- They take less space than using four separate machines
- They accost less than four separate machine

Disadvantages

- If one component breaks, nothing works—if for example, the photocopier component breaks then the other components; fax, printer, and scanner will not work.

Characteristics of impact printers

- They produce noise when printing due to the physical contact between printing head and the paper
- Most of them are slow when printing
- Most of them produce poor quality output
- They are cheap because they are use ordinary stationery

Characteristics of non-impact printers

- They are quiet when printing because there is no physical contact between printing head and the paper
- Most of them are fast when printing
- They are very expensive to purchase

- Most of them produce good quality output

STORAGE DEVICES

Storage is an essential feature of the computer. It enables the computer to save, store information for future use. Computers store data either in chips inside the computer (primary storage) or on the media such as magnetic disk, compact disk etc., these are called secondary storage. Secondary storage is the storage of data outside the processor. Secondary storage includes floppy disk drive and hard disk drive. Primary storage includes ROM and RAM. Data stored in these chips is immediately accessible to the central processing unit, unlike data stored on secondary storage where there is a delay while the data is loaded into memory from the storage medium.

Types of secondary storage devices

There are several types of secondary storage devices but the following are the common

1. Magnetic media
2. Optical disks
3. Solid state media

Magnetic media

Magnetic media are those devices whose data is stored in a form of magnetic fields. These include floppy diskettes and zip disks.

Floppy Disk

These devices are named floppy because they contain a flexible plastic disc inside. The word floppy means flexible or not rigid

It is also called a diskette because it is a removable flat piece of Mylar plastic packaged in a 3.5-inch plastic case.

Parts of floppy disk and their functions

- Write protect notch: it allows one to prevent a diskette from being written to. This means that the write-protect notch allows one to protect the data already in the disk
- Read/write head: is used to transfer data between the computer and the disk
- Plastic jacket: protects them from dust, sunlight and moisture.
- Metal shutter: slides out of the way when the disk is inserted into the drive to give way for the read/write head to reach the disk inside.
- Hub/spindle hole: rotates the disk for data retrieval

Types of floppy disks

There are four types of floppy disk and these are

- 3.5-inch floppy disk: these are the present day standard disks. They carry the label 2HD the 2 means double sided and HD means high density, which means it stores more data than the previous standard DD- double density
- Zip disks: these are disks with capacity of 100 or 250 megabytes. They are 70 times the storage of the standard floppy disks.

  Zip disks are used to

  - Store large spread sheet files
  - Store data base files
  - Store image files
  - Store multimedia presentation files and websites
- Super disks: they are disks with the capacity of 120 megabytes
- HiFD disk: HiFD disks have the capacity of 200 megabytes. They have 140 times the capacity of today's standard floppy disks

Note: zip disks; super disks and HiFD are known as the floppy disk cartridges.

Advantages of floppy disks

- They are cheap
- Floppy disk is available in most computers.

Disadvantages

- They hold very little data
- They can easily get damaged when exposed to sunlight, moisture and dust.

HARD DISK DRIVE (HDD)

Hard Disks are thin but rigid metal platters covered with a substance that allows data to be held in the form of magnetized spots. Unlike floppy disks that use flexible plastic, hard disk uses metal. Hard disks are sealed form impurities within a container since they can take (attract) things like dust particles, smoke particles, human hair, finger print smudge etc. which can cause what is called a head crash.

Head Crash

- A head crash happens when the surface of the read/write head or particles on the surface comes in contact with the surface of the hard disk platters.
- A head crash also happens when you bump a computer too hard

  Head crash causes the loss of data on the disk since they may fail to read.

  Types of Hard Disk

There are three types of hard disks namely

1. Removable hard disk (external): these consist of one or two platters enclosed along with read/write heads in a hard plastic case, which is inserted into a microcomputers cartridge drive.

   They are used to transport huge files, such like desktop publishing files with color and graphics and large spreadsheets. They are also used to back up data.
2. Non removable hard disk (internal): they are also known as fixed disk because they are located inside the system unit and are used to store almost all programs and data files. Nearly every microcomputer uses its internal hard disk to store its Operating system and major application like MS Word and Ms. Excel.
3. Hard disk packs: these are removable devices used to store massive amounts of information.

Performance enhancement (how to improve the performance of hard disks)

There are three ways of improving the performance of hard disks and these are: *Disk Caching, redundant arrays of inexpensive disks and file compression/decompression.*

Disk caching

This improves hard disk performance by anticipating data needs. Hard disks improve their access time by caching. Disk cache, sometimes called a buffer, consists of memory chips on a hard disk that stores most frequently accessed items such as data, instructions, and information. Disk caching and memory caching works on the similar fashion. When a processor requests data, instructions, or information from the hard disk, the hard disk first checks its disk cache-before moving any mechanical parts to access the platters. If the requested item is in disk caches, the hard disk sends it to processor. If the hard disk does not find the requested item in the disk cache, then the processor must wait for the hard disk to locate and transfer the item from the disk to the processor.

During the idle processing time, frequently used data is read from the hard disk into memory. When needed, the data is accessed directly from the memory. The transfer rate from memory is

much faster than from hard disk, as a result, the overall system performance is increased by as much as 30 percent.

Redundant Arrays of Inexpensive Disks (RAIDS)

This improves the performance by expanding external storage. Groups of inexpensive hard disks drive are related or grouped together using networks and special software. These grouped disks are treated as a single large capacity hard disk. They can outperform single disks of comparable capacities.

File compression and Depression

This increases storage capacity by reducing the amount of space required to store data and programs.

File compression helps to speed up transmission of files from one computer system to another. Two well know file compression programs are WinZip and KPzip

Advantages of Hard Disk

- They can read and write data faster than floppy drives
- They have a large storage capacity

Disadvantages of Hard Disk Drive

- They are prone to head crashes (a situation when the read/write head touches the surface of the disk)

Advantages of hard disks over floppy disks

- Hard disks have a large volume of storage capacity
- Access in hard disks is faster than in floppy disks

OPTICAL DISKS/media

An optical disk is a removable disk on which data is written and read through the use of laser beam. Examples are CD-ROM, CD-R, CD-RW, DVD and VCD.

CD-ROM (Compact Disk Read Only Memory)

Advantages of CD-ROM

- They have large amount of storage capacity
- Data stored is permanent- there cannot be accidentally changed or deleted
- Production is very cost effective when a large number of copies are produced.

Disadvantages

- Access is as fast as for magnetic disk

- You cannot write your own data on the CD.

CD-R (compact Disk Recordable)

Advantages

- They can be read by ordinary CD drives
- Data is permanent
- They have a large data storage volume

Disadvantages

- Access is not as fast as for magnetic disks
- They cannot be reused if the data on them is no longer needed
- Not all computers have a CD-R writer.

CD-RW (Compact Disk Re-writable)

Advantages

- Disk can be reused
- Can be read by a normal CD drive
- Direct and sequential access possible
- They have a large storage capacity

Disadvantages

- They are more expensive than the CD-R
- They are slower to write to than the CD-R
- Access is not as fast as the magnetic disk.

DVD (Digital Versatile Disk or digital Video Disk) and VCD (Video Compact Disk)

Advantages

- They have a large amount of storage space
- Data is permanent

Disadvantages

- They are more expensive
- They may not be read in other CD drives

Registers: these are the special high-speed storage areas

Function: they are used by the control unit and the Arithmetic and Logic Unit (ALU), to speed up processing.

Buses: buses or bus lines are electrical data roadways through which bytes are transmitted within the CPU and between the CPU and other components of the CPU.

The three principal bus lines are

- Industry standard architecture (ISA). It is too slow and was developed by International Business Machines (IBM)
- Peripheral Component Interconnect (PCI). It is faster than ISA
- Accelerated Graphics Port (AGP). It is the newest and it is very fast.

Ports: a port is a connecting socket on the outside of the system unit.

Types of ports

Serial ports: these are used for variety of purposes. They are used to connect a mouse, keyboard, modem and many other. They are good for sending information over a long distance.

Parallel ports: these are used to connect devices that need to send or receive a lot of data over a short distance. Parallel ports are used to connect printers to the system.

Accelerated Graphics Port (AGPs): these are used to connect monitors and they are able to support high-speed graphics and other video input.

Universal Serial Bus (USB) port: these are faster ports and are used to connect several devices to the system unit. They are expected to gradually replace serial and parallel ports.

FireWire ports: these ports are newest. These ports are faster than the USB ports. They connect high-speed printers and even video cameras to the system unit.

Multiplexing: this is the process that allows multiple programs to be communicating at the same time.

COMMUNICATION DEVICES

Communication is defined as a process in which two or more computers or devices transfer data, instructions, and information. Today, even the smallest computers and devices, with hundreds of

computers and devices can communicate directly with one another, with hundreds of computers on company network or with millions of other computers around the globe, often via the internet.

For successful communication you need the following

- A sending device that initiates an instruction to transmit data, instruction, or information.
- A communication device that connects the sending device to a communication channel.
- A communications channel, or transmission media on which the data, instructions or information travel.
- A communication device that connects the communication channel to a receiving device
- A receiving device that accepts the transmission of data, instructions, or information.

MODEM

Modem means (MODulator-DEModulator)

Modem is a device that changes signals from analogue to digital or digital to analogue.

Modulation: is the process of converting from digital to analogue

Demodulation: is the process of converting from analogue to digital.

How it works

Modem connected to a computer converts the computer's digital signals into analog signals into eh process known as

The Modem enables digital microcomputers to communicate across analogue telephone lines. Modern is regarded as an input and an output because for incoming signals it converts the analogue signal into a digital signal and for the outgoing signals it converts the digital signal into analogue signals

TYPES OF MODEMS

There are three types of modem and these include internal, external and wireless modem

Internal modem: consist of a plug-in circuit board inside the system unit. A telephone cable connects the modem to the telephone cable wall jack

External modem: this modem stands apart from the computer and is connected by a cable to the computer serial port. Another cable connects the modem to the telephone wall jack.

Wireless modem: it connects to the computer serial port not to telephone lines. Wireless modems receive through the air.

Advantages of modems

- They are cheap
- They are easy to use
- They can be used anywhere provided a telephone line is available.

Disadvantages

- Data transfer through a modem is relatively slow.

As a result, much faster digital modems for Internet connection were developed; these are ISDN, ADSL and Network Hub/Switch

ISDN (Integrated Service Digital Network)

Advantages of ISDN lines

- It sends and receives data much faster than a modem
- It has the capability of handling large amounts of data.
- It enables videoconferencing (users can talk to and see each other)

Asymmetric Digital Subscriber Line (ADSL)

Advantages

- It sends and receives data much faster than both a modem and ISDN
- It does not require a dial up connection---a connection in which a computer gets connected to the internet when a modem dials up to a telephone number provided by internet services provider (ISP)
- Users are permanently connected to the internet
- You can still make receive calls on the telephone line connected

Network Hub/Switch

A hub or a switch is a central point that connects several devices in a network together. These are devices used to connect computers on Local Area Network (LAN). Computers on network can access each other through the hub or switch. In a star network, these help each individual computer to access information on the source computer without going through other computers.

Network Cards

They are sometimes called a network interface card (NIC pronounced nick), is a communications device that enables a computer or device that does not have built-in networking capability to access a network. Network cards are in a variety of styles. A network card for a desktop computer is an adapter card that has a port to which a cable connects. A network card for mobile computers and devices is in the form of a USB network adapter, Express Card, PC Card, or a memory card.

SOFTWARE SYSTEM

Definitions

Software is set of computer programs that were designed to improve the work of the computer system.

Programs are a group of instruction that tells hardware what to do. On its own, hardware cannot do anything. A program can be a single program or a set of programs. It also includes data that has been. Example of software: windows etc.

Functions of software

- To optimize the work of a computer
- To facilitate the running of users programs
- To provide assistance with program development

TYPES OF COMPUTER SOFTWARE

There are two types of computer software: namely

1. Systems software
2. Application software

SYSTEM SOFTWARE

System software is the software that controls the hardware and how all other software works. System software enables the application software to interact with the computer. System software consists of the programs that control or maintain the operations of the computer and its devices. System software serves as the interface between the user, the application software, and the computer's hardware. It also helps the computer manage its internal and external resources.

Types/components of system software

The following are the components of the system software

1. Operating system
2. Utility programs
3. Language translators
4. Device drivers

Operating system (OS)

Operating system is a set of programs containing instructions that work together to coordinate all the activities among computer hardware resources.

Functions of Operating System

Many different operating systems exist, designed for all types of computers. However, most operating systems provide similar functions. Here are some of the functions of the operating systems.

1. **Booting**: this is the process of starting or restarting a computer. When turning on a computer that has powered off completely, you are performing **cold boot. A warm booting** is the process of using the operating system to restart a computer. Warm boot closes any running processes and programs; however, it does not save any unsaved work. Thus, always remember to save your work before rebooting (restarting) a computer.

   Boot disk: is a drive from which your personal computer boots (starts). Sometimes a hard drive becomes damaged and the computer cannot boot from the hard disk, or you may want to preview an operating system without installing it. In these cases, you can boot from a special disk, called a boot disk or recovery disk that contains a few system files that will start the computer.
2. CPU management
3. File management
4. Error handling
5. Disk Formatting

Other functions include

- Allocating and assigning system resources: a primary function of all operating system is to determine which if the computer system resources (CPU, primary memory, secondary storage, input and output devices) are needed for the job at hand and to allocate and assign those resources.
- Scheduling operations: apart from assigning system resources an operating system also needs to determine how to schedule the use of those resources. Today's operating systems allow the computer to work more than one job at the same time.
- Operating systems also play a role in providing system security: most multi user systems require users to use user ID and password before allocating access to the system. The

operating system checks the validity of the entered information and reports any attempted breaches of security.

- Monitoring system activities: the other function of the operating system is to monitor system activities. The operating system will notify the user if input/output devices need attention, if an error has occurred, or if anything abnormal occurs in the system.
- Operating systems also provides help to End-Users: all operating system pride help on some areas through the use of F1 button
- Memory management: controlling the amount of memory used for each application as well as itself
- Error handling: the OS detects any interruption in the executing of the program instructions and gives possible cause and/or solution. These errors may include when a printer run out of paper in the course of printing and hardware and software malfunction.
- Disk formatting:

Types of operating system

There are three categories of operating system namely

1. **Single user operating systems**

This is a kind of operating system which allows only one user to run one program at a time. For example, if you are working in a graphics program and want to check e-mail messages, you must quit the graphics program before you can run the email program. Early systems were single user/single tasking. Smart phones and other mobile devices, however, often use a single user/single tasking operating system. Most other operating systems today are multitasking.

2. **Multi-user operating system**

This type of operating system allows two or more users to run programs simultaneously. Networks, servers, mainframes, and supercomputers allow hundreds to thousands of users to connect at the same time.

3. **Multitasking operating system**

These are operating systems that allow a user to have several applications running simultaneously and to switch between them. In this case, there is no need to close one program before running another one.

Information organization

One major function of an operating system is to organize information. It is very important to organize information in a computer environment because of the following reason

1. It enables easy access to information
2. It is easy to transfer information from one location to another
3. It is easy to sort information

USER INTERFACE

In more general terms, an operating system provides a means of communication between the computer and the user. This communication is known as user interface. There are a number of user interfaces that have been in use with computers. These include: command line interface, menu driven interface, and Graphic User Interface (GUI)

Command line interface uses instructions (commands) with specialized syntax (grammatically arranged words), which the user and the computer can understand. The user types the commands instructing the computer what to do and in response the computer gives the response after executing the command. The response may sometimes be in form of further instructions to the user. The disadvantage with this interface is that it requires the user to give exact spelling, grammar and punctuation. Examples of command line interface are in the disk Operating System.

Menu driven interface was invented to address the problems of memorizing commands that command line interface had. In menu driven interface, the tasks that the computer can do are listed in menus that are displayed for the user to choose. This is more user-friendly because it does not require a lot of memorizing. However, the tasks that the computer can do are so many that menus are required to display them effectively. This leads to the problem of having so many menus and submenus making it difficult for one to easily tell where one item or the other is.

Graphic User Interface is the most user-friendly interface. It uses a combination of menus, graphics, windows and pointers. With these, it is very easy to communicate with computer. For details on how GUI works, see the section on Windows below.

DISK OPERATING SYSTEM (DOS)

Disk Operating system is essentially command-driven interface. It allows a chain of complex commands to be entered into a computer to customize the operating system for a particular use. The user is supposed to type in commands in exactly the correct syntax to perform any operation.

Contents of DOS

The DOS contains a number of items of which some are as follows

- Command interpreter/processor: this is a file which holds instructions for interpreting most of the various commands. The command interpreter comprises of mainly instructions which command services frequently needed, which are called internal commands e.g. COPY. These are called internal commands because they are held in the memory of a computer all the time.
- External commands: these are instructions for services which are less frequently used. As such, these are kept on s removable disk and are run when required.
- Command line or DOS prompt: the A> or B> or C> symbol which is displayed on the screen after booting up. The drive displayed is called the default drive or current drive

Information organization

It is helpful to keep information in an organized manner for easy retrieval. To be able to do this, you need to understand Dos file structure

Computers store information using devices known as drives. On PCs drives are labeled using drive letters as follows.

A-first floppy drive

B-second floppy drive (if available)

C-first hard disk drive. If there are other additional hard disk drives, they take subsequent drive letters such as D, E and F.

If there are other drives, for example, CD or DVD-ROM drives, they carry the drive letters following hard drive letters. That is, if you have two hard disk drives they will be labeled C and D the CD-ROM drive will be drive E.

All information in a computer is kept in form of files. A computer file is similar to a paper document holding related information. All files are stored in directories. A directory is like a container for keeping files.

Advantages of information organization

- It is easy to find and retrieve information one needs.
- It is easy to transfer information from one location to another.
- It is easy to sort the information.

DOS file management systems

DOS uses specified commands to work with files. At this time. You need to start your computer in DOS, if you have already started the computer; this can be done by opening command prompt which falls either under programs or accessories in the start menu.

DOS prompt like this

C :\> you will also see the blinking cursor after it. Whatever you type will appear on the screen and this is called command line, because it is where you type commands to DOS.

Changing drives

To change current drive:

- Type drive letter for the drive you want followed by a colon
- Press enter

For example, if you want to make the flash drive E a current drive, type E: at the system prompt. When you press Enter, you will see the following

E :\>

Viewing the content of directories

To display or lists the contents of the active directory you use the DIR commands as follows:

- Type DIR
- Press space bar once
- Type location of the directory (see file location)

To display the contents of directory page by page

- You type space and /P after the DIR command

For example

C:\>dir /P

Changing directories

To view a file or execute a program in a directory or subdirectory, made the directory containing the program or file the active directory. This is done using CHANGE DIRECTORY (CD) commands as follows:

- At command prompt, type CD
- Press space bar (type a space)
- Type the directory name of the one you want to make active
- Press enter.

For example, if you are at C :\> and you want to change to program files directory, type the following at command and press enter.

CD program files

To return to the root directory

- Type CD\ at command prompt
- Press enter

Creating a directory

To create a directory, the MKDIR (or DIR) command is used as follows:

- Type MKDIR.
- Press space bar
- Type location where you want to create the directory.

If you want to create a directory named TEST in the directory C, for example, press enter after typing:

MKDIR C:\TEST

Deleting directories

The command RMDIR is used to remove a directory. The abbreviation RD can also be used.

- Type RMDIR
- Press space bar
- Type location and press enter

To remove the directory TEST for example

- Type RMDIR C:\TEST
- Press Enter

Deleting files in a directory

To erase a file the DEL command is used as follows:

- Type DEL
- Press space bar
- Type location
- Press Enter.

For example, to remove a file named **PETER** from drive C:

- Type DEL C: WAKHONZA.
- Press Enter.

To erase all contents o f a directory use DEL command, for example, to remove files from TEST directory:

- Types DEL C:\TEST*.*
- Press Enter

Copying files

Files can be copies from one directory to another. To do this, the COPY command is used as follows

- Type copy
- Press space bar
- Type the present file name (including its extension and location).
- Press space bar
- Type the destination location and its file name (this may be the same name as in source directory)
- Press Enter

For example, to copy the files PETER directory

- Type COPY C:\TEST\PETER.DOC C:\NOTES\PETER
- Press Enter

To copy all files from one directory to another, wild card characters are used.

For example, the following command will copy all files from PETER directory to NOTES directory.

- Type COPY C:\TEST*.*C:\NOTES

I f you make TEST your current directory, this command will be shortened to the following

COPY C:*.*C\NOTES

Renaming files

Files can be renamed using the RENAME command as follows:

- Type RENAME
- Press space bar
- Type old FILE NAME (including location)
- Press space bar
- Type new name

For example, if you want to rename PETER which is in Notes directory to become CEDAR

- Type: RENAME Peter Cedar
- Press Enter

The rename command can also be abbreviated as REN

DISK MANAGEMENT

Formatting a disk

A disk cannot be used with a computer unless it is formatted. Formatting is a process during which the computer arranges the surface of the disk into a form it can recognize and use to store data. Note that formatting will erase all data or programs on the disk:

To format a disk, the FORMAT command is used as follows:

- Type FORMAT
- Press space bar
- Type drive to be formatted
- Press Enter

For example, if you want a floppy disk (in drive A):

- Type FORMAT A:
- Press Enter

If you want to format the drive which is the current root directory, just type FORMAT and press Enter

Labeling a Disk

Once a format command has been run, you will be prompted to supply the label of your disk so that you should be able to know what it contains next time you want to use it

Copying a disk

There are two ways of copying a disk. One uses an eternal DOS command known as DISKCOPY. Another one uses an internal DOS command known as COPY

To copy contents of a floppy disk in drive A using the DISKCOPY command

- Type DISKCOPY A: A:
- Press Enter

This command will load the disk copy program from DOS. You will prompt to insert a source diskette in drive A. do this and press Enter

Using the COPY command

- Type COPY
- Type space
- Type Source Disk drive and wild cards
- Type Destination Disk drive
- Press Enter

For example, to copy contents of a diskette in drive A into a diskette in drive B

- Type COPY A:*.*B:
- Press Enter

Wildcard characters

Sometimes you need to delete or copy more than one file. This can be time consuming to delete one file at a time. In order to handle multiple files with DOS commands, you use what are known as **wildcards character.**

Wildcards are character that can be used to represent more than one letter. DOS has two wild card characters which can be used in file specifications: the asterisk (*) and a question (?)

The question mark

A question mark in a filename extension stands for any single character in that position

Example

If you want to delete all files in a directory you can

- Type DEL ????????.???
- Press Enter

This command is instructing the computer to delete all files with any character in every position of the file name. Each character of the file name is represented by each question mark

Example

If you want to copy all files with a name beginning with Test (that is, files with names like Testament, Test-tube, Testimony):

- Type COPY A: TEST????,????
- Press Enter

The Asterisk

An asterisk in a file name means that any character or combination of characters can be in that position in the rest of the filename. This is a short hand for a series of question marks.

Example 1

To delete all files from a directory:

- Type DELL*.*
- Press Enter

WINDOWS OPERATING SYSTEM

Windows is a kind of operating system that uses the Graphic User interface to facilitate communication between the computer and the user. GUI uses a number of facilities – a combination of which makes the GUI t be the most user-friendly type of interface.

Contents of Windows

Windows basically consists of the GUI which has four major components namely: **Windows, Icons, Menus** and **Pointers.** They are in short abbreviated as WIMP

Windows

Windows is a rectangular area on a display screen in which text or graphical images may be displayed. Several windows may be displayed on a screen at the same time. Most computers use software that handles all screen displays by means of windows.

Each window provides menus and icons which can be used to execute commands relevant to the task in the window. Almost every window in the Windows environment contains some basic buttons for closing, minimizing and restoring the window (except for dialog boxes which contain only button for closing the window)

Icons

Icons are buttons with small meaningful pictures or symbols of the things they represent for easy memorization of their functions. They are used as a shortcut for opening he items or sending the command they represent. There are several types of icons and these include

- Program icons
- File icons
- Folder icons
- Toolbar icons

These program, file or folder icons are displayed in dialog boxes or on the desktop.

- **Program icons** consist of a symbol of the program they represent and a small caption under the icon
- **Folder icons** usually consist of yellow boxes with the name of the folder under it
- **File icons** consist of a symbol for the program that was used to create the file and the name of the file under it.

MENUS

Menus are indicates=d in two major ways; by name and by a small black triangle on the right of a list or an icon.

Pointers

Pointers are tools used for pointing and clicking on icons, menus, and other items.

Advantages of Windows over DOS

- It is more user friendly because of the GUI
- It is faster than DOS
- With many utility software attached to it, it is easy to maintain.
- It is task oriented
- It can handle several tasks at the same time making it possible to work with several programs at once.

File management in Windows Environment

Files in windows are organized in drives which contain folders and subfolders (folders containing other folders). Folders are like containers or filing cabinets. They can contain other folders referred to as sub-folders and files.

To locate a file or a folder, you trace it through a file path. This is a chain of folders and sub-folders which lead to where the folder or file is. It is otherwise known as an address. For example, a fillet

ha is on Drive C and is in the folder **my music,** contained in another folder **personal** which is in the folder **my documents** will have the following as its address:

C:\user\Peter\my music

The above address simply means my music is contained in Peter which is in User which in turn in contained in Drive C. it is important to know addresses because they assist in locating lost files or folders.

Searching for lost files or folders

To locate a file or folders

- Click on start
- Click find
- Type file of folder name
- Click find now

Creating a folder

To create a folder inside another folder

- Right-click anywhere inside the folder in which you want to create the other folder or on desktop
- Select New
- Click folder
- Type Folder Name

To create a folder in a dialog box

- Click the new folder icon on the toolbar of the dialog box
- Type folder name in the textbox provided.

Utility programs

Utility programs are also known as service programs.

Utility programs are generally used to support enhance, or expand existing programs in a computer system.

They perform tasks related to the control and allocation of computer resource. They enhance existing functions or provide services that are not provided by system software programs.

Functions provided by utility programs include the following: managing files, searching for files, viewing images, uninstalling programs, cleaning up disks, defragmenting disks, backing up files

and disks, setting up screen savers, protecting against viruses, removing spyware and adware, filtering Internet content, burning optical media discs, playing media files etc.

Examples of tasks done by the utility programs are

- Software protection against damage by viruses
- Creating back ups
- When there is a software crash, utilities help to recover the lost files.

Language translators

These are instructions produced by programs to create system and application software. They are used to translate or convert the statements in programming language into a form that the computer can understand.

Programming language

It is a set of rules and symbols that tells the computer what operations to do

Machine language

It is the basic language of a computer that is represented in 0s and 1s

Programming language is also called high-level language

Machine language is also called low-level language

Types of language translators:

There are two types of language translators namely: **compiler and interpreter**

Compiler

A compiler is a language translator that converts the entire program of a high level language into a machine code before the computer executes the program.

The interpreter

An interpreter is a language translator that converts each high level statement into machine language and executes it immediately, statement by statement.

The difference between a compiler and an interpreter is that compiler translates the entire program into machine code while a compiler translates statement by statement.

Device drivers

These are specialized software programs that allow input and output devices to communicate with the rest of the computer.

APPLICATION SOFTWARE

Application software is software that has been developed to solve a particular problem, to perform useful work on specific tasks, or provide entertainment.

Types of application software

There are two types of application software

- General purpose software (or genetic or content free software)
- Custom designed software (or bespoke or tailor software)

General-purpose software

General-purpose software is a kind of software that is made for different applications or use. The user decides what to use the software for. Thus y they are called content-free because it is the user who decides what to use the software for. Examples of general-purpose software application programs are word processors, spreadsheets, and database.

Custom-designed/tailor made software

Tailor-made software is software designed for a specific field. Examples of tailor made software include

- Sage for accounting
- Payroll software for preparing salaries of employees
- SPSS (Software Package for Social Science) for statistics

Type of software	**Examples of application software**	**Purpose**
Word processing	Microsoft word, Corel WordPerfect, Lotus Word Pro	Writing letters, reports and other documents
Spreadsheets	Microsoft Excel, Lotus 1-2-3, Corel Quattro Pro	Working with calculations, creating models, simulation
Databases	Microsoft Access, Lotus Approach, FileMaker Pro, Corel Paradox	Organizing, sorting and searching data
Desktop publishing	Microsoft Publisher, Serif PagePlus, Adobe PageMaker, Quark Express	Production of brochures, newsletters, invitation cards
Presentation software	Microsoft PowerPoint, Microsoft Photo Editor, Corel	Designing and presenting slide shows to an audience

	Painter, Adobe Photoshop, Adobe Illustrator	
Graphics	Microsoft Paint, Microsoft Photo Editor, Corel Painter, Adobe Photoshop, Adobe Illustrator	Painting and drawing
Computer-aided design	Autodesk autoCAD, Viagrafix DesignCAD	For designing architectural plans and models.

SAFE USE AND MANAGEMENT OF COMPUTER AND LABORATORIES

Most computer parts and software are vulnerable to both intentional and accidental destruction. The destruction can lead to loss of software and data. It is therefore, important to observe some safety precautions in keeping and using computers.

Management of computer laboratory

Computer laboratory is a place where computers are kept and used. Computer laboratories and the computers themselves must be kept clean at all then times so that they do not breakdown easily.

Qualities of a good laboratory

The good computer laboratory must have the following

- Smoke detectors and fire extinguishers- this prevent fire that can damage the computers and other files
- Carpet- to prevent dust that can damage the storage devices and even the computers
- Celling and air conditioners – to regulate temperature
- Lockable doors – to prevent thieves and any unauthorized personnel
- Security guards – to prevent physical security around the premises
- Well ventilated – to allow good circulation of air
- All electricity cables should be wired properly to avoid accidents
- Should have adequate light
- Should always be clean
- Uninterrupted Power Supply- to allow saving of data and proper shutting down of computer in cases of electrical power failures.

Lab assistants/Personnel

It is very important that a computer laboratory should have well trained staff. the lab personnel is there to assist the student with resolving problems relating to coursework. The lab assistants assist with general problems that students may encounter while visiting in then labs eg printing jam, saving files etc.

The computer labs are for education purposes only. Lab users failing to comply with the lab guidelines may lose privileges to campus lab facilities.

Duties of lab assistants

- Keep the lab clean and organized; pick up thrsh, paper, disks, pens etc
- Straighten chairs, keyboards, mice, monitors etc
- Clean monitors
- Notify technical staff if the supply are low
- Be alert to students
- Assist the students with computer problems
- Delete students files and extra files from the desktop
- Make sure no one enters the labs while the classes are in session
- Make sure the computer desks are clean
- Connect and power on all peripherals before powering on the computer

Rules and regulations to be observed in the computer lab

DON'T

- Switch off your computer without shutting down using the start button
- Bring food or drinks into the lab
- Disconnect the keyboard, mouse, monitor, printer or ny peripheral if the PC is powered on at the mains
- Use tobacco products in the lab
- Play games in the lab
- Enter lab if the class is in session
- Change software preferences
- Save any personal files to hard drives
- Save username or passwords used by you to log in to accounts

DO

- Save all your files to removable media (USB drive, etc)

- Return all lab materials
- Talk softly in the lab

Leadership role

- Talk to the staff or teachers whenever you feel something needs to change
- Come up with ideas on how to improve our services in order to serve the students better
- Remember to know about the Do's and Don'ts

Possible causes of loss of data and software in the lab

In the computer lab, data and other important information can be lost. This can be so due to a number of factors like:

- Power failure – interrupted power supply can lead to both destruction of delicate parts of computer such as hard disks and loss of unsaved data
- Crashing of disk
- Natural disaster such as fire, earthquakes can destroy computer system
- Accidental erasure of data: data can be lost through faulty procedures which may lead to users erasing data accidentally.
- Viruses can also cause havoc in your computer system causing massive loss of data
- Dust
- Thieves and hackers etc.

Safety measures against loss of software and data

To prevent loss of software and data, there is a need to follow proper rules of keeping our computers and the computer laboratory.

These include:

- Physical restrictions on the computer laboratory: no one should be allowed to enter into the computer lab without the presence of properly trained and responsible personnel
- **Thieves and hackers:** Burglar proofing the laboratory to prevent thieves from stealing computers or accessories
- **Fire:** Having fire fighting equipment inside the laboratory
- **Dust:** Dust proofing your computers by covering them with a cloth after use
- Keeping our laboratory clean and ventilated

- **For power failure:** Connect our computer to Uninterrupted Power Supply – when the mains electricity has gone off, the UPS retains power for several minutes allowing the user to save his/her work and shut down the computer properly.
- **Viruses:** Having anti-viral software to protect computers from viral attacks
- **Crashing of disk:** Back up all files that in case of loss of data, the back up can be used instead
- **Accidental erasure:** make sure you know what you want to do. Be skillful and competent.

COMPUTER VIRUSES

Personal firewall

A personal firewall is a utility that detects and protects a personal computer from unauthorized intrusions. When connected to the Internet, your computer is vulnerable to attacks from a hacker. A hacker is someone who tries to access a computer or a network illegally.

Operating systems often include personal firewall. Windows automatically enables its built-in personal firewall, called windows firewall, upon installation of the operating system. If your operating system does not include a personal firewall or you want additional protection, you can purchase a stand-alone personal firewall utility or a hardware firewall, which is a device such as a router that has a built in firewall.

Virus

A computer virus is a program designed to harm or cause harm on an infected computer. It spreads through e-mail attachments, portable devices, websites containing malicious scripts and file downloads. A computer virus attaches itself to the host files and always activate whenever you open the infected fi9les. The virus can replicate itself and then infect the other files on your computer causing more damage.

Computer viruses do not generate by chance. The programmer of a virus, known as a virus author, intentionally writes a virus program. Some authors find writing viruses a challenge. Others write virus programs to cause destruction. Writing a virus program usually requires significant programming skills.

Signs of Virus infection

- An unusual message or image is displayed on the computer screen
- An unusual sound or music plays randomly
- The available memory is less than what should be available
- A program or file suddenly is missing
- An unknown program or file mysteriously appears
- A file becomes corrupted
- A program or a file does not work properly
- The computer operates much slower than usual.

Different types of computer viruses

There are different types of computer viruses and the following are some of the types and what they do.

Macro viruses

These viruses infect the files created using some applications or programs that contain macros. They hide in documents shared through e-mail and network.

Memory resident viruses

They usually fix themselves inside the computer memory. They get activated every time the OS runs and end up infecting other opened files. They hide in RAM.

Overwrite viruses

These types of viruses delete any information in a file they infect, leaving them partially or completely useless once they are infected.

Direct action viruses

These viruses mainly replicate or take action once they are executed. When a certain condition is met, the virus will act by infecting the files in the directory or the folders. The viruses are generally found in the hard drive, but they keep on changing location

Directory virus

Also known as cluster virus or file system virus. They infect the computers directory by changing the path indicating file location. They are usually located in the disk but affect the entire directory.

FAT Viruses

These viruses attack the File Allocation Table (FAT) which is the disc part used to store every information about the available space, location of files, unusable space etc.

Companion viruses

These types of viruses infect files just like the direct action and the resident types. Once inside the computer, they accompany other existing files.

E-mail virus

This is the virus spread via an email. Such virus will hide in an email and when the recipient opens the mail it infect the computer.

Worm

This program is very similar to virus and has the ability to self-replicate leading to negative effects on your computer.

Trojan horse

Unlike viruses, Trojan horse does not replicate itself but it can be just destructive. Trojan horse is those programs that claim to rid your computer of viruses but instead introduces viruses into your computer.

Antivirus

To protect a computer from virus attacks, users should install an antivirus program and update it frequently. An antivirus program protects a computer against viruses by identifying and removing any computer viruses found in memory, on storage media, or on incoming files. Most antivirus programs also protect against worms and Trojan horse. When you purchase a new computer, it often includes antivirus software.

COMMUNICATION AND NETWORKING

Communication

Communication is defined as the process in which two or more computers or devices transfer data, instructions, and information

Data communication is the process of transmitting data signal from one point to another through the network.

Terms used in data communication

Some of the terms used in data communication include:

Data signal: this is a voltage level in the circuit which represents the flow of data.

Signal modulation and demodulation: this is the process of converting data signals to and from a form that is suitable for transmission over a transmission medium. For example, modem.

Multiplexing: this is the process of sending multiple data signal over the same medium.

Demultiplexing is the process of separating the multiplexed signals at the receiving end.

Bandwidth: is the maximum amount of data that a transmission medium can carry at any time and measured in HERTZ.

Broadband signal: is a digital signal that is generated and applied to then transmission medium directly without modulation

Broadband transmission: is the transmission of analog signal over the medium using a particular frequency.

Attenuation:

This is the decrease in magnitude and energy of a signal as it progressively moves along a transmission medium.

Modes of data communication

Simplex transmission: it is then transmission of data in one direction

For example: computer which can transfer information to the printer but the printer cannot transfer back to then computer

- Radio because there is no feedback

Half duplex transmission: is a mode of transmission, data is transferred in both direction but not simultaneously for example fax machine

Full duplex transmission: this is mode of transmission, data is transferred in both direction but simultaneously for example: telephone, discussion

Networks

network is a collection of computers and devices connected together via communication media and transmission media.

Importance of Network

i. Facilitate communication: using communication people communicate efficiently and easily via E-mail, instant message, online social media, etc.
ii. Sharing hardware: in a networked environment, each computer can have access to hardware on the network. For example, if computers are connected to the network and the

printer is connected to the network, computer users can have access to the printer instead of providing each user with the same piece of printer.

iii. Sharing data and information: in a networked environment, any authorized computer user can have access to data and information stored on other computers on network.

iv. Sharing software: users connected to the network can have access to software on the network

v. Transferring of funds: this is called Electronic Fund Transfer, it allows the users connected to the network to transfer money from one bank to another via transmission media.

Limitations of Network

Although network has many advantages, it also has many challenges that are associated with implementation and human factors. Some of then limitations and disadvantages include

i. Security issues: data and information held in a computer on a network is more prone to illegal access threats than the one held in a stand-alone computers.

ii. High initial cost: the initial cost of buying network hardware and software is very high.

iii. Moral and cultural effects: large networks like the internet have chatrooms and messaging services that enables under age children to meet peers and adults on the net some of whom may have bad intentions. Access to pornographic sites on the internet has also made the fight against social problems such as HIV/AIDS, bad sexual behavior, drugs and substance abuse more complicated.

iv. Spread of terrorism and drug trafficking: the network provides a rich recruitment ground for all types of illegal activities such as terrorism and drug trafficking. The easy flow of information from one place to another keeps even those who are on the wrong side of the communication easily.

v. Over-reliance on network: modern organization today have phased out most manual operations. This means that all business process depend on computer networks. The disadvantage of this overreliance is that if by any chance the network fails or goes down, then all systems in the organization will be brought to an end.

Classification of Network

Networks are usually classified as a local area network, metropolitan area network, or wide area network. The main difference among these classification is their area of coverage.

Local Area Network

Is a network that connects computers and devices in a limited geographical area as a home, school computer laboratory, office building. A wireless LAN is a LAN that uses no physical wires. Computers and devices that access a Wireless LAN must have a built in wireless capability or the appropriate wireless network card.

Metropolitan Area Network (MAN)

This is a high-speed network that connects local area networks in a metropolitan (a very large and densely populated industrial and commercial city) area such as a city or town and handles a bulk of communications activity across that region.

Wide Area Network

This is a network that covers a large geographic area (such as a city, country, or the world) using a communication channel that combines many types of media such as telephone lines, cables, and radio waves.

Network architectures

Network architecture refers to the design of the computers, devices and media in a network.

Categories

Network architecture is categorized into two as

Client/server network: this is a network design whereby one or more computers act as a server, and the other computers on the network request services from the server.

A server is sometimes called host computer. This computer controls access to the hardware, software, and other resources on the network and provides a centralized storage for the programs, data, and information.

The clients are other computers and mobile devices on the network that rely on the server for resources. For example, a server might store a database of customers. Clients on the network access the customer database on the server.

Peer-to-peer network: this is the design whereby each computer, called peer, has equal responsibilities and capabilities, sharing data, or information with other computers on the peer to peer network. Each computer stores files on its own storage devices. Each computer the network contains both the server operating system and application software.

All computers on the network share any peripheral devices attached to any computer. For example, one computer may have a laser printer and a scanner, while another has a printer.

Elements of Network

A computer network is made up of several standard elements (components), which can be classified in four categories namely: data communication media, communication devices, networking software, and data signals.

Data communication media

Data communication media: this is a pathway used for carrying data and information from one point to another. Communication media can be divided into two: communication using cables and wireless communication

Communication using cables (bound media)

This is when the data signal is transmitted through a restricted pathway such as a cable.

Types of bounded transmission media (cables)

There are several types of bounded transmission media but the most common ones are

i. Two wire open lines cables: are made up of two parallel copper wires separated by a plastic insulator. They are used in telecommunication network to transmit voice signal.

ii. Twisted pair cables: is made up of two solid copper wire strands (a single length of something) wound around each other in a double helix (three dimension shape) manner. These cables are used to transmit both voice and data signals.

Types of Twisted Pair cables

There are two types of twisted pair cables

Unshielded Twisted pair (UTP): these are cables that do not have a shield that prevents ElectroMagnetic Interference (EMI) also called 'electric noise' from the environment.

Noise is unwanted electrical energy that degrades the quality of signals and data. Noise may come from lightening sparks, radio signal and even the radiation from the spark plugs in motor vehicles.

Shield Twisted Pair (STP): these are similar to unshielded twisted pair only that a braided shield is wrapped around the wires to shield or protect them from noise.

iii. Coaxial (koakiso) cables: this cable resembles the cable used to connect television antenna to a television set. This cable has a central copper core which may be of solid or stranded wires surrounded by insulator.

The advantages of coaxial cables include

- They are stable even under high loads
- They can carry voice, data and video signal simultaneously
- They are more resistant to radio and electromagnetic interference than twisted pair cables

Disadvantage of coaxial cables include

- They are expensive to buy and to install as compared to twisted pair
- They are hard to work with

Fibre optic cables

Fibre optical cables utilize light to transmit data from one point to another on the network. The light signal travels through the core, through a process referred to as total internal reflection.

Advantages of Fibre optic cables

- They are fast and support high bandwidth
- It covers a large distance because it has a low attenuation
- It is smaller and lighter than copper cables

Disadvantages

- They are very expensive to install
- Connectivity devices and the media are expensive

Wireless communication (unbounded media)

Wireless or bounded media, is a type of media that is used to transfer data from one point to another without using physical connection. In this case, transmitting antenna and receiver aerial facilitate the communication. Examples of wireless transmission media include microwaves, satellite, radio waves, and infrared transmission.

Advantages of wireless communication

- It is flexible in operating as compared to bounded media
- It can span large geographical areas easily
- It can take place via satellite even in very remote areas that do not have highn cost physical infrastructure such as telephone lines

Disadvantages of wireless communication

- It is difficult to establish or configure
- The initial cost is very high.

Communication devices

Communication devices are devices that are used as interface or junctions between the terminals

Network Equipment and Terminologies

i. **Network server**: this is a host/giant computer that provide resources to the other computers workstation) on the network
ii. **Workstation**: this is any computer connected to the network
iii. **Client**: is any computer that is able to access information from the server
iv. **Node**: it is any device that can be connected on the network e.g. a printer
v. **Modem**: it is a device that can change digital signals and analogue signals
vi. **Hub**: it acts like an extension where it spreads network cables to each computer from server
vii. **Transmitters**: this is electronic telecommunication device that transmit electronic signals to receiver in a given radius. It sends signals to all the equipment
viii. **Switches**: it is an electronic device that split the incoming calls using binary logic e.g. (2, 4, 16, 32, 64, 128, 256 etc.) and route them to another computer or controller and dispenses them to their destination. For example a company may have one incoming phone line into many.
ix. **Bridges**: it is a computer circuitry that links phones and computers together. Some bridges are very simple all they do is to enable the computer to perform dialing tasks such as speed dialing
x. **Network cables**: these are cables that are used to connect computers in a network.
xi. **Network interface cards (NIC)**: it is a communications device that enables a computer or device that does not have built-in networking capability to access a network.
xii. **Gateways:** this is any device that can be configured to provide access to wide area networks or Internet.
xiii. **Personal computer memory card international association (PCMCIA) cards:** this is a card inserted into a device such as personal assistants or a laptop in order to enable wireless communication between the devices and a wired network server

Network software

These are programs that help the user to establish connection to another computer or network, manage the transmission of data, instructions, and information.

Network software can be classified into two main groups namely

- Network operating systems
- Network protocols.

Network software

These are operating systems specifically designed to improve the computer's retrieval, transferring and processing of data on the network. The servers run the software on the network. In addition, this software performs the following network related functions

- Provides access to network resources such as printers and folders
- Enables nodes on then network to communicate with each other more efficiently
- Responds to requests from application programs running on the network
- Supports network services like network card drivers and protocols

Protocols

Protocols refer to the rules and technical procedures that govern communication between different computers on a network.

Data signals

All messages that are sent and received through the network must be represented using a data signal. A signal can either be analog or digital.

Network Topology

Network topology is how computers and devices have been arranged in a communication network. Three common used network topologies are star, bus, and ring.

Star topology: on a star network, all the computers and devices (nodes) on the network connect to a central device, thus forming a star. Two types of devices that provide a common central connection point for nodes on the network are hub and switch. All data that transfers from one node to another passes through the hub or switch.

Advantages of star topology

i. Star network are easy to configure

ii. It allows centralization of key networking resources like concentrators and servers

iii. It gives the network administrator a focal point for network management. When something goes wrong with the network, the administrator can troubleshoot it from one place.

Disadvantages of star topology

i. The star-based network is costly because it requires one complete cable per computer.

ii. If the central hub fails, the entire network will be down
iii. Time consuming during installation because each node forms a segment of its own.

Bus topology: this is the type of topology whereby all the devices that are on the network share a single cable. A bus is a physical cable that connects the computer and other devices.

Advantages

i. Computers and other devices can be attached and detached at any point on the bus without disturbing the rest of the network.
ii. Failure of one device does not affect the rest of the bus network.

Disadvantage

i. The drawback is that several workstation may want to transmit simultaneously and there has to be some strategy of deciding who to get a line.
ii. Troubleshooting a cable fault is difficult because the fault could be anywhere on the cable.
iii. The bus topology limits the number of computers that can be connected to then cable because each computer is listening to the cable in order to transmit.

Ring topology: in a ring topology, all devices are connected to one another in the shape of a ring. If the main channel has been damaged, or any computer or device on a ring network fails, the entire network potentially could stop functioning.

Advantages of ring topology

i. It uses a short length cable
ii. Ring topology is easy to install

Disadvantages

i. Modification may be difficult because adding or removing a device can disrupt the entire network
ii. Troubleshooting is difficult

Mesh topology

This is a type of topology where there are many paths between different locations. In a mesh topology, every node is connected to every other node in the network.

Advantages

i. The network can still operate even when a node breaks down or a connection breaks

ii. The network is reliable

Disadvantages

i. It is expensive on cable due to redundant links

Tree/hierarchical topology

This is a hybrid topology whereby the groups of star-configured networks are connected to linear bus backbone.

Network security

Network security *is the security measure that is implemented to protect your data and information from intruders on the network.*

Ways of enforcing security

- Share level security: this is a network security whereby the user decide which resources to give for sharing
- User-level security: this is the type of security, which uses the password. A network administrator assigns accounts to users and each user is provided with a unique name and password which he or she can use to access network resources

Internet

What is the difference between Network Operating System (NOS) and General Operating System?

The general operating system is the software designed to control the hardware, provide common programs like calculator, notepad, paint etc. and provide the platform in which the user can install application software.

Network Operating System is the type of operating system that is designed for network use.

Nazarene Mission Secondary School NMSS AN OASIS OF KNOWLEDGE

CAREER OPPORTUNITIES

The era of computer and information and communication technology has brought both blessings and disappointments in the workplace. Some people have acquired very paying jobs while others have lost theirs. Many jobs have been created in the areas like banking, manufacturing, educational institutions, communication sector and other service industries.

Educational opportunities in ICT

Most computer-related educational opportunities offered at post-secondary level are new and dynamic compared to other disciplines. It is therefore difficult for most institutions that offer ICT courses to update their ICT curricula in order to accommodate these rapid changes. These changes also make it difficult for aspiring ICT professionals to identify the best career opportunities and training institutions to join. ICT courses are offered in the following tertiary institutions:

- Universities
- Polytechnics
- Middle level colleges

Universities

A university is considered as the highest institution in formal education. In most countries, universities are categorized into two major groups namely public and private universities.

Public universities

Public universities are established by the state and are run by the state appointed management team. Admission to such a university is controlled by either then state or a recognized body. However, most universities in developed countries do their own independent admissions on running of programs. Fo r example, university of Malawi {Chancellor College, The Polytechnic, College of Medicine, University of Agriculture {Bunda College, Chitedze, Natural Resources College} administer University entrance examination to students for selection and admission.

Private universities

Private universities are self-sponsored institutions set by individuals, churches or any other organization. Such universities are privately run and students' enrollment depends on whether the student is capable of sponsoring him/herself. However, for these universities to operate they must be registered or accredited by the commission of higher education or any other quality assurance body that is recognized worldwide. Accreditation leads to public acceptance and confirmation evidenced by the grant of charters by the state or accrediting bodies for example, Catholic Universities. Universities are authorized to offer approved diploma, undergraduate and postgraduate programs. Some of the ICT related degree programs offered at university level courses include Bachelor of Science, Bachelor of Information Technology/Systems, Bachelor of Science (computer engineering) and Bachelor of Science Mathematical Science.

Research institutions

These are institutions that concentrate on narrow fields of study such as computer or ICT technology, agriculture and space science.

Polytechnic

These are institutions of higher learning that mostly offer diploma and certificate courses in technical fields such as ICT, mechanics and food production. A polytechnic may also be accredited by a university or the state to offer degree programmes. Some of then ICT courses offered at polytechnic level are diploma and certificate in computer studies, computer repair and assembly, computer operator and management information system.

Colleges

Just like the polytechnics, middle level colleges offer diploma, certificate and craft courses in many disciplines such as technical, ICT, teacher training and business management. In Malawi, such colleges include Domasi College of Education, Soche Technical and Lilongwe Technical Colleges. Most public and private colleges are now offering ICT related courses both at certificate and diploma level. The most important consideration to make before you join a college to pursue in ICT course is:

- Whether it offers ICT courses recognized both locally and internationally
- The cost of training with such an institution

Career opportunities in ICT

Information and Communication Technology has created new job titles. The following are some of then responsibilities of the professionals who are generally called Information Technology Workers.

1. Computer operator

Some of the responsibilities of a computer operator include

i. Entering data into the computer for processing
ii. Keeping up-to-date records of all information processing activities

2. Computer Technician

Computers require regular maintenance; upgrading as well as emergency repairs and computer technicians do this. Some of the responsibilities of computer technicians are:

i. Troubleshooting computer hardware and software related problems
ii. Assembling and upgrading computers and their components

iii. Ensuring that all computer related accessories such as printers, modems, storage media and devices are in good working conditions

iv. In developing countries, technicians help hardware engineers in designing and creating some computer components such as storage devices and motherboard.

3. System analyst

This is a person who is responsible for analyzing a company's needs of problem then design and develop a computer based information system.

Some of then responsibilities of a system analyst include:

i. Reviewing the current manual or redundant information system and making recommendations on how to replace it with a more efficient one

ii. Working with programmers to construct and test the system

iii. Co-cordinating training for users of then new st=ystem

A good system analyst is one who has at least the following attributes

i. Good problem solving and creativity: must have wide experience in solving problems

ii. Good communication skills: then analyst must be able to communicate clearly and precisely both in writing and in speech. He or she must be able to talk to different groups of people like managers, operators, attendant and the general public

iii. Must be business knowledge: the analyst must clearly understand the environment for which the system is being developed.

iv. Technical knowledge: a system analyst must be well trained in relevant areas of computer science such as hardware, software-programming knowledge.

4. computer programmer

then following are some of the responsibilities of a computer programmer

i. develop in-house application programs or system programs

ii. customize commercial application packages to suit then organization's needs

iii. install, test, debug, and maintain programs developed or customized for the organization

5. software engineer

This is one who is skilled in software development and technical operation of computer hardware.

Some responsibilities of the software engineer are

i. Developing system and application software

ii. Developing user and technical documentations for the new software

iii. Maintaining and updating the software to meet day-to-day requirements while overcoming challenges.

6. Computer engineer

Some of the responsibilities of computer engineer are:

i. Design and develop computer components such as storage devices, motherboard, and other electronic components
ii. Determine the electrical power requirement of each computer component
iii. Re-engineer computer components to enhance its functionality and efficiency
iv. Design and develop engineering and manufacturing computer controlled devices such as robots.

7. Information system manager

The information system manager plans, staffs, schedules, controls, and monitor all the activities of the ICT department in the organization.

Other responsibilities of an information system manager include:

i. Making sure that all tasks in the IT department are done correctly and on time in order to support business planning, control and decision making process
ii. Preparing budgets for the department
iii. Managing the human resource within the department

8. **Database administrator (DBA)**

The major purpose of computerizing an organization or institution is to store data in an organized way for easy access, retrieval and update. The organization requires a person who should be responsible for updating records in an information system database. For this reason, a database administrator is responsible for:

i. Designing and developing database application for the organization
ii. Setting up security measures needed to control access to data and information
iii. Keeping the database up-to-date by adding new records, modifying or deleting unnecessary records

9. **Computer trainer**

Due to the dynamic nature of computers and information technology, there is a high demand for qualified ICT trainers. Some of the responsibilities of an ICT trainer are:

i. Training people on how to use a computer and various application programs

ii. Developing training references materials
iii. Guide learners on how to acquire knowledge through carrying out research
iv. Preparing learners for ICT examination

10. **Web administrator/webmaster**

A Webmaster is responsible for

i. Developing and testing websites
ii. Maintaining, updating and modifying information on the website to meet new demands by the user.
iii. Monitoring the access and use of internet connection by enforcing the security measures,
iv. Downloading information needed by an organization or institution from Internet websites.

11. **Computer graphics designer and typesetters**

These are people who are responsible for designing graphical objects and professional publication. Such people may get employed in publishing houses to typeset books, newspapers and magazines.

12. **Network administrator**

A network administrator is a specialist whose responsibilities are to:

i. Set-up a computer network
ii. Maintain and enforce security measures on the network
iii. Monitor the use of network resources
iv. Maintain and troubleshoot network related problems

13. **Computer sales representatives**

Computer sales representative should have good knowledge in information and communication technology. This would help them to analyze customer needs and advise them accordingly. A good computer salesman needs to be self confident, persuasive and proficient in business communication.

14. **Self-employment**

Self-employment can be achieved by using a computer or other ICT devices such as mobile phones to start bureau services, Internet services, consultancy services and computer hardware and software vendor business.