

PREFACE

In today's technology-oriented society, computers and technology impact virtually everyone's life.

This book Information communication Technology is designed to ensure that students are current and informed in order to thrive in our technology-oriented, global society. Students not only learn about relevant cutting-edge technology trends, but they also gain a better understanding of technology in general and the important issues surrounding technology today. This information gives students the knowledge they need to succeed in today's world.

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CHAPTER ONE

COMPUTERS TODAY

REASONS FOR STUDYING COMPUTER STUDIES

- (1) To acquire general knowledge and skills in the use of computers and related technologies.
- (2) To use the acquired knowledge in computer studies to enhance learning other subjects.
- (3) To understand important issues of a technology based society and exhibit them using computers.
- (4) To exhibit basic computer skills that are required for employment.
- (5) To acquire knowledge as a foundation for further studies in computer technology.
- (6) To use a variety of computer technologies to assess, analyse and interpret information.

INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

ICT refers to the integration of computers and communication devices so as to process data.

INFORMATION TECHNOLOGY (IT). Is a term used to describe use of computers in business, education and everyday life.

WHAT IS A COMPUTER?

A computer is a programmable electronic device that receives data, allows processing on that data, stores it and gives output /results as needed.

The computer can store and manipulate large quantities of data at a high speed but it cannot think.

It can solve a number of problems but it is simply a machine and cannot solve them on its own.

PARTS THAT MAKE UP A COMPUTER BASED INFORMATION SYSTEM.

- The hardware
- The software
- The live ware / human ware /users
- Procedures/Guidelines
- Data/Information
- Communication tools (Phone, modem etc).

PLACES WHERE COMPUTERS ARE USED FOR DATA PROCESSING

- Hospitals.
- Industries.
- Schools
- Business
- Homes.
- Offices.
- Banks.
- Transport facilities.
- Weather stations.
- Mobile phone centers.
- Supermarkets.
- Security organs.
- Government institutions.
- Petrol stations.

USES/ FUNCTIONS OF COMPUTERS IN DIFFERENT AREAS WHERE THEY ARE APPLIED.

Business

- They are used to keep business documents in electronic form which reduces inventory costs.
- They are used in business communication through emails and telephone.
- They are used to carryout business data processing e.g. computing daily sales.
- They are used to design business documents e.g receipts, bills and invoices.
- They are used in E- commerce to sell and buy goods online
- They are used in advertisement of business products on TV, radios, internet, etc.

Banks

- They are used to count huge sums of money in banks and supermarkets which eases banking.
- ATM (Automated teller machines) are used in banks to work as tellers thus reducing bank congestion.
- They are used in banks to transfer money electronically eg EFT (Electronic Funds Transfer)
- For security through use of CCTV (Closed circuit Television) cameras

Weather stations.

- They are used in forecasting complicated weather patterns.
- Keeping weather station records

Hospitals.

- They are used to carryout medical research which has brought about new medicines.
- They are used in ambulances to monitor patients as they are rushed to hospitals.
- They are used in hospitals to design medical documents.
- To carry out disease diagnosis using x-ray and scan machines.
- They are used for medical collaboration through telecommunication.

Sports

- They are used to design games that can be played on computers eg need for speed.
- They are used to broadcast sports events like live matches on sky sports and DSTV.

Homes

- They are used for entertainment.
- Home banking. Today one can deposit or withdraw money from the comfort of his home.

- E- Learning through telecommunication one can register, attend lectures and graduate at home.
- Communication through whatsapp and facebook one can communicate with friends and relatives.
- Security.

Schools

- Computer Aided Learning (CAL) helps students to learn at their own pace.
- Computer Assisted Assessment is used to assess students' performance.
- Notes and tests are easily shared among students and teachers through use of the internet.
- They are used to carryout educational research on every topic from the internet.
- Electronic library (E-library) is used by students to search and borrow books.
- School management systems are used to manage records and generate students' report cards.
- Computers supplements textbooks through projects like cyber schools and internet.
- Edutainment: computers are used to entertain students as they are learning. They provide education through entertainment.

Government institutions

- Government uses computers to store records which reduces the storage costs.
- They are used to design documents.
- They are used by politicians to solicit for support through SMS and websites.
- Sensitise masses especially on health issues via SMS and internet
- For national registration and census.
- They are used in teleconferencing to coordinate people in different offices together.

Military and security

- They are used to design conventional and modern weapons like drones and warships.
- For security through use of CCTV (Closed circuit Television) cameras

CHARACTERISTICS OF COMPUTERS

- **Speed.** Computers are very fast in their operation.
- **Accuracy.** Computers rarely make mistakes hence the saying gabbage in gabbage out.(GIGO)
- **Storage capacity.** Computers keep data and information electronically for future use.
- **Deligence** i.e. do not get tired or bored
- **Versatility (Effective).** Computers do multiple tasks e.g. playing music, games and word processing.

- **Artificial intelligence.** Computers accept user requests and provide solutions to them.
- **Automatic (spontaneous).** They do not need any supervision in order to do tasks when instructed.

ADVANTAGES OF USING COMPUTERS

- Computers make the work easier and more enjoyable.
- Provide very neat and good quality work
- Computers provide good entertainment in form of games, music, films etc
- They are the best source of news if connected to the internet.
- Computers work effectively as they can tackle large volumes of data.
- Computers work diligently as they are ever available for work.
- They work very fast.
- They have helped to promote relationships over the internet.
- They have improved on education through research.
- They have improved on security for example use of CCTV (Close circuit television) cameras in supermarkets
- They have improved on communication through email and internet use.
- They have reduced on the operation costs where work of about 10 people is done by a single machine.
- Computers keep and maintain the best records.
- They also have an advantage of flexibility as they can perform a variety of tasks
- Computers are accurate in performing tasks and provide reliable information.

DISADVANTAGES OF USING COMPUTERS

- Computers have caused unemployment
- Internet use has promoted immorality.
- Computers are very expensive to purchase and maintain
- They are delicate and easily break and in case of breakage a lot of information may be lost which can lead to heavy losses.
- They are not reliable as they depend on electricity which is unpredictable.
- They cause health problems such as back ache, eye strain, repetitive strain injury, headache
- They can easily be affected by viruses leading to loss of important information

COMPUTER BASED TRAINING. (CBT)

This refers to use of computers to instruct or teach.

ADVANTAGES OF COMPUTER AIDED LEARNING (CAL).

- CAL contains enriched learning materials that can excite and engage the learners/users.
- A student learns at his own pace.
- A lesson can be stopped and later picked at a student's convenience.
- Exercises can be repeated for more understanding

- Skills and feed back can be given to encourage students and help them make corrections.

DISADVANTAGES OF C.A.L.

- There is lack of interaction and support of a human teacher is very important.
- Some students are scared of using computer and may not learn easily.
- Computers can not easily deliver a lesson to fit in unpredictable situation.
- Boredom may occur.
- The students are not given a chance to ask for explanations.
- Indiscipline may occur due to lack of supervision.

SITUATIONS WHERE HUMAN BEINGS ARE BETTER THAN COMPUTERS IN PERFORMING TASKS

- When performing tasks that are different each time.
- When reacting to unpredictable situations.
- In situations where human judgment is needed.
- In situations where human experience is needed.
- Situations which require creativity.

SITUATIONS WHERE COMPUTERS ARE BETTER. THAN HUMAN BEINGS IN PERFORMING TASKS

- When the tasks are repetitive.
- In dangerous tasks such as Bomb disposals.
- In automatic tasks which require no supervision.

CHAPTER TWO

THE COMPUTER HISTORY.

The history and evolution of computers starts with **simple calculating devices** that include;

- (i)The **ABACUS**; The first computing device was known as the **Abacus**. It was used for volume computing in China and Japan for thousands of years BC.
- (ii)**Logarithm tables**; This was developed by **John Napier in 1614**.
- (iii)The **slide rule**; This was first developed by **William Oughtred** in the **1620s** and was based on the concept of logarithms.

Early discovery – Mechanical Era

In the seventeenth century two further significant developments took place:

- (i)The **mechanical calculator** invented by a French man **Blaise Pascal** in **1647**
- (ii) **Leibniz's Stepped Reckoner** invented by a German mathematician, **GW Leibniz** in **1694**. This was a more effective calculator and more advanced than Pascal's machine as it could also multiply, divide and extract square roots.

Start of the computer age

(i) In the nineteenth century, **Charles Babbage of England (1792-1871)** made the most outstanding development in computing. He developed the **analytical engine** which was able to combine arithmetic and process data on its own. The analytical engine was recognized as the milestone signifying the start of the computer age.

Charles Babbage is recognized as the father of modern computing.

(ii) **Jacquard** developed the **weaving loom**. It first stored programs using metal cards punched with holes.

(iii) **Hollerith** then developed the **Hollerith's tabulator**. This used punched cards to store and tabulate data.

NB. The first operational computer was in 1946.

It had about 2000 bytes of memory and occupied 1600 square feet of space and cost about 4m US dollars. This was called ENIAC (Electronic Numeric Integrator and Calculator) and weighed 30 tones, had about 18000 vacuum tubes and failed to work every after about 7 minutes.

THE ELECTRONIC COMPUTER GENERATIONS

Computer generation refers to advancement in computer technology over a number of years.

There have been four major computer generations in the evolution of computer hardware each distinguished by different technology for the components that do computers processing work.

This improvement is mainly over:

- The technology used to build the computer.
- Internal organisation of the computer.
- Programming languages.

These changes in hardware have been accompanied by changes in the software that have made the computers more powerful, less expensive and easy to use.

THE FIRST GENERATION (1945-1959)

KEY CHARACTERISTICS/ FEATURES /TECHNICAL DEVELOPMENTS OR INNOVATIONS

- The first generation of computers relied on vacuum tubes to store and process information.
- They had extremely limited memory of about 2000 bytes.
- Programming was done in machine and assembler languages.
- They used punched cards for input and output.
- They were extremely slow and worked at a speed of 10 kilo instructions per second.
- Jobs such as running programs and printing were coordinated manually.
- They used magnetic drum memories.
- They were very large in size occupying a room's space

- They were extremely expensive costing about 4m US Dollars.

Examples of computers in First generation:

- (a) ENIAC (Electronic numeric integrator and calculator)
- (b) EDSAC (Electronic Delay Storage Automatic Computer)
- (c) EDVAC (Electronic Discrete Variable Automatic Computer)
- (d) UNIVAC (Universal Automatic Computer)
- (e) IBM 650 (International Business Machine)

THE SECOND GENERATION (1960-1964)

KEY CHARACTERISTICS/ FEATURES.

- The computers used transistors for internal operation.
- There was introduction of high level programming languages e.g. BASIC, COBOL and FORTRAN.
- The second generation computers worked at a speed of 200000 – 300000 instructions per second
- The computers used magnetic disk for external storage.
- There was increase in storage capacity to about 32 kilobytes of RAM.
- There was introduction of super computers such as LARC and IBM 7030.
An example is Honey Well 200, LARC (Livermore Atomic Research Computer), IBM 7030.

THE THIRD GENERATION (1965-1972)

KEY CHARACTERISTICS

- The third generation computers used integrated circuits (IC)
- The computers used simpler programming languages such BASIC , RPG(Report programming Generator) and Pascal.
- There was introduction of operating system such as Multics.
- They became cheaper and cost \$18000.
- There was increase in RAM to about 2 megabytes.
- There was increased speed to about 5M instructions per second.

Examples are PDP-1 and IBM360.

THE FOURTH GENERATION (1973-TODATE)

FEATURES

- Computers use large scale integrated circuits (LSI) and very large scale integrated circuits (VLSI)
- Development of microprocessors
- Development of microcomputers
- Introduction of many software programs
- They are in many varieties such as desktop computers and laptops
- Introduction of many hardware components such as digital cameras, scanners etc
- They are now cheap that even schools and homes can afford.

- They have increased storage capacity of more than 2 gigabytes
- There is increased speed of about 500 megahertz.
- There is wide use of internet.

Examples of 4th Generation computers:

8088, 80286, 80386, 80486, Pentium 1, Pentium II, Pentium III, e.t.c..

The Fifth Generation

The fifth generation is still a matter of contention among scholars. Some scholars; especially those from Japan, argue that the fifth generation is already underway while others say we are still in the fourth generation.

Characteristics

- The computers will become increasingly smaller
- The processing speed will exceedingly become fast as very powerful processors are made
- The computers will greatly depend on artificial intelligence and expert systems enabled by the use of parallel processing and superconductors e.g. the use of robotics and voice recognition
- The use of Quantum computation and molecular and nanotechnology will increasingly become common.
- The computers will be able to respond to natural language input and the machine will freely interact with humans.

Summary Generation	Major Innovation
Generation one	Vacuum tubes
Generation two	Transistors
Generation three	Integrated circuits
Generation four	Large scale integrated circuits
Generation five	Three dimensional circuit design

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CHAPTER THREE

CATEGORIES AND CLASSIFICATION OF COMPUTERS

Computers are classified according to use, purpose, size and process.

(a) CLASSIFICATION ACCORDING TO USE:

Personal Computers (pc): These are micro computers meant for independent use by individuals.

Desk-top computers; These are designed for use on desks in an office environment.

Laptops: These are very small and are meant to be used on laps.

Workstations: These are large and powerful computers that have inbuilt capabilities for interconnection and operations with each other.

Here a **client** is a computer requesting for a service such as printing.

A **server** is a computer providing the service requested by the client.

(b) CLASSIFICATION ACCORDING TO PURPOSE:

Special purpose; These are designed for a particular job or to solve particular problem e.g. digital watches, fuel pumps etc.

General purpose: These are designed to solve a wide variety of problems.

(c) CLASSIFICATION ACCORDING TO SIZE

Mainframe computers

Characteristics

- These are the largest and most expensive computers.
- They process work at a very high speed.
- They are normally used by large companies.
- They have very large memory and storage capacity.
- They are often used in the back ground by very large organizations ie many people access them via a PC
- They support data sharing and multiprogramming.

Mini computers.

Characteristics

- They are smaller compared to mainframe computers.
- They are mainly used for a special purpose/small scale general purpose.
- They are often used in mid –sized companies.
- They support several users at the same time
- They are more powerful than the micro computers
- More costly than micro computers but less expensive than mainframes

Micro computers/personal computers

Characteristics

- They are smallest computers
- They are the cheapest of all
- Their internal memory is small
- Some run on batteries because they are very small. (laptops and palmtops)
- They are comprised of mainly the Central Processing Unit (CPU), keyboard, mouse and VDU/Monitor

Note: A new term notebook has been introduced to mean very small laptops.

Super computers.

Characteristics

- These are extremely powerful computers.
- They have a greater processing capacity.

- They are often used in the military and in civilian service.
- They are used at the weather stations where a lot of data has to be processed to make predictions.

CLASSIFICATION BY PROCESS

Digital computers:

A computer designed to process data in numerical form. A digital computer uses 1/ or 0 to represent data e.g. a digital clock displays whole seconds, whole minutes & hours.

Most computers today are digital

Examples of digital computers include: Digital watches, Digital calculators and Digital speedometer

An analog computer: A computer that represents data by measurable quantities in order to solve a problem, rather than by expressing the data as numbers.

This does not use multiples of 1 or 0 but rather uses full range of numbers, including fractions e.g. $\frac{1}{4}$ a second. **Examples of analog computers include:** Thermometer, Voltmeter and Speedometer

Hybrid computers: A hybrid computer combines both features of digital and analog computers.

Examples of hybrid computers include: Laptops, Tablets and Desktop computers

CHARACTERISTICS OF DIGITAL COMPUTERS

- Use binary code system to interpret information
- Transmit data in a discrete wave form
- Fast and cheap
- Require less memory
- Not affected by weather changes during data interpretation
- More accurate in interpreting information

CHARACTERISTICS OF ANALOG COMPUTERS

- Do not use binary code to interpret information
- Transmit data in a continuous wave form
- Slow and expensive
- Require more memory to operate
- There are affected by weather changes during data interpretation
- Less accurate in interpreting information

SOME COMPUTER TERMS.

Network computers:

This refers to where two or more computers are connected together. This allows sharing of data by computers connected to the network.

It also allows sharing of resources such as a printer.

Down sizing: This is the concept of reducing both the cost and size of the computers.

Stand alone computers: These are computers not connected on anything else e.g. Internet.

Dumb terminals: These are computers that do not have their own CPU and hence do not process data

Intelligent terminals: These are computers that have their own CPU and hence process data

Micro controller/Embedded/Dedicated computers are computers that are too small that can even be won e.g. a calculator.

COMPUTER'S PRIMARY TASKS

- **Input:** Accepts data from the user.
- **Output:** Returns the processed information to the user.
- **Storage:** Stores data till it is needed.
- **Processing:** Data Processing is the procedure of transforming data into desired output
Information Processing is the process of transforming data into which can be used to make better decisions (pay cheques, pay slips)

FACTORS AFFECTING THE COMPUTER SPEED AND CAPACITY

- **The processor type:** It is the speed of the processor chip that determines the overall speed of the computer. Examples include IBM compatible pc, 486, Pentium, Pentium II, Pentium III, Pentium IV etc
- **Graphic card:** A powerful graphic card improves the computer's performance by displaying the screen contents faster & more clearly.
- **R.A.M size (Random Access Memory).** The more RAM, the computer has, the more speed it will work at. The speed of the computer can be increased by increasing R.A.M.
- **Hard disk speed & storage capacity:** Hard disks are also measured by their speed measured by the disk access time. The smaller the access time, the faster the hard disk will store & retrieve data.
- **The clock speed.** The computer clock governs how fast the CPU will run. The higher the clock speed, the faster the computer will work for you.

The clock speed is given in units called **megahertz** (MHz). The original IBM PC ran at 4.77 MHz, while modern ones ran at over 500MHz.

Megahertz = 1 million machine cycle per second.

FACTORS TO CONSIDER WHEN BUYING A COMPUTER.

- The processor speed.
- The hard disk space.

- The installed programs.
- Amount of RAM.
- Nature and size of monitor provided.
- Warranty and guarantee.
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- The storage devices
- Needs of the users.
- The price
- The source i.e. the manufacturing company.

THE COMPUTER HARDWARE.

THE COMPUTER SYSTEM: The computer system refers to the components that make the computer work. These include the hardware, the software and the human ware / user.

THE HARDWARE.

The computer hardware refers to the physical components of the computer. The hardware components of an information system include: the C.P.U, MEMORY (primary & secondary storage), INPUT and OUTPUT devices.

THE CENTRAL PROCESSING UNIT (C.P.U)

A microprocessor is a device that controls the overall operations of a computer ie it is the brain or heart of your computer.

The CPU microprocessor that executes instructions to perform processing tasks is the most complex and powerful part of a computer.

It is the speed of the processor chip in your computer which is the main factor determining the speed of your computer.

The speed of the CPU is referred to as the **clock speed** and it is expressed in **megahertz**.

Megahertz =1 million machine cycles per second

BASIC OPERATIONS OF A COMPUTER MACHINE CYCLE.

- **Fetching** is the process of obtaining a program instruction or data item from memory. The time taken to fetch is called instruction time, or I-time.
- **Decoding** is the process of translating the instruction into commands that the computer understands.
- **Executing** is the process of carrying out the commands.
- **Storage** is the keeping of data in the CPU location temporary.

PARTS OF THE CPU

- Control unit
- Arithmetic Logic Unit
- Main memory

FUNCTIONS OF THE C.P.U IN TERMS OF ITS COMPONENTS:

THE CONTROL UNIT:

This is designed to perform the following:

- To supervise the entire operation of your computer.
- To monitor the peripheral devices such as printers, card reader etc.
- It provides a system for storing and remembering the instructions
- It opens and closes circuits that feed data to and from the computer.
- Controls the flow of data throughout the system. Data flows through paths & buses

Buses are electronic highways that transmit data or instructions from one part of the processing hardware to another.

FUNCTIONS OF BUSES IN A COMPUTER.

- **Data sharing** - the expansion bus must be able to transfer data between the computer and the peripherals connected to it.
- **Addressing** - A bus has address lines, which match with those of the processor. This allows data to be sent to or from specific memory locations.
- **Power** - A bus supplies power to various peripherals that are connected to it.
- **Timing** - The bus provides a system clock signal to co-ordinate the peripherals attached to it with the rest of the system.

TYPES OF BUSES

(i). Data bus

Data Bus: Sometimes referred to as memory bus, the data bus is used to transfer instructions from memory to the CPU for execution. It carries data (operands) to and from the CPU and memory as required by instruction translation.

(ii). Address bus. An address bus consists of all the signals necessary to define any of the possible memory address locations within the central processing unit.

(iii). Control bus: Is used by the CPU to direct and monitor the actions within the central processing unit.

ARITHMETIC-LOGIC UNIT (ALU):

An arithmetic logic unit (ALU) is a digital circuit used to perform arithmetic and logic operations. The purpose of the ALU is to perform mathematical operations such as addition, subtraction, multiplication and division

PRIMARY STORAGE / MAIN MEMORY.

This is a [storage device](#) used by a [computer](#) to hold the currently executing [program](#) and its working data. Or Memory is a circuitry which is used to store data temporary with in the CPU while the computer is operating.

It is composed of magnetic storage devices or semi-conductor devices for example RAM and ROM.

The main memory is a temporary storage area that holds things like:

- 1 The information you are working with.
- 2 The application software that you are using.
- 3 The operating system software.

Memory is also known as main store or internal store or immediate access.

The transfer of data such as program instructions within memory is faster than transfer of data between the CPU and peripherals.

The two types of memory are Random Access Memory (RAM) and Read-Only Memory (ROM)

FUNCTIONS OF PRIMARY MEMORY IN COMPUTING.

1. *It stores programs and files under current use.*
2. *Stores files needed for a complete boot process of the computer.*
3. *It determines efficiency and performance of a computer.*
4. *It provides extra space for the CPU while processing data by swapping files in and out of the hard drive.*
5. *It establishes the basic communication between basic input and output devices on a computer e.g. mouse, keyboard, and monitor, e.t.c.*
6. *It stores a log of frequently visited files which increases the speed of accessing that particular file.*
7. *Primary memory enables the user to recover work in memory for the last 5 minutes in case of a power cut.*

ADVANTAGES OF PRIMARY STORAGE.

- Data can be retrieved from the primary memory storage for re use in a short time.
- Data can easily be accessed by the control unit since access is random and item found by its location memory.
- It keeps data in case of power failure over a long period of time.
- Stores all changes and information cannot get lost.

DIS ADVANTAGES.

- It's limited by physical composition of the CPU.
- A large primary capacity is very expensive.

THE RANDOM ACCESS MEMORY (RAM)

RAM is the memory that is directly available to the CPU.

RAM is read and write computer memory used to store data temporarily.

It holds all data and programs in current use.

RAM can also be defined as memory with the ability to access any allocation in memory in any order with the same speed.

RAM contains all the work in progress since the user last saved to disk. So it changes constantly as the computer is used for different tasks

Data held in RAM is easier to access than data held in secondary storage devices.

By improving RAM you can improve the performance of your computer, process more data and run more complicated programs.

RAM in microcomputers is '**volatile**' which means that the contents of the memory are erased when the computer's power is switched off.

Modern operating systems (O/S) can use spare storage space on the hard disk as if it is working memory and this is referred to as "virtual memory" or "virtual RAM"

CHARACTERISTICS OF RAM

- RAM is volatile computer memory
- RAM is read and write computer memory.
- RAM stores data temporarily because its contents disappear when the computer is switched off.
- Its contents are user defined that the user dictates what is to be contained in the RAM.

TYPES OF RAM

There are two types;

Static RAM (SRAM).

This is very fast compared to dynamic and holds its contents as long as there is power

More expensive.

Dynamic RAM (DRAM).

This can only hold its contents for a short while even when power is on.

READ ONLY MEMORY (ROM).

ROM is a memory chip on which fixed data is written permanently at the time of its manufacture.

New data cannot be written into the memory and so the data on the memory chip is unchangeable and irremovable.

ROM is used to store permanent data such as the instructions needed to get the computer started and working properly as soon as it is switched on.

The data on ROM chip will consist of: items of software, such as the startup programs and the computer's operating system and the various pieces of programming software.

ROM is non-volatile memory which means its contents, do not disappear when the computer's power is switched off.

CHARACTERISTICS OF ROM

- It keeps data permanently i.e. information cannot be deleted
- Memory cannot be upgraded or changed
- It is non-volatile and therefore retains information when power is off.

TYPES OF ROM

PROM (PROGRAMMABLE READ ONLY MEMORY): This type of memory can only be programmed once after it has been manufactured, such that when its programmed with the instructions stored , it can never be altered e.g. the CD writables.

EPROM (Erasable programmable Read Only Memory)

Here the instructions can only be erased once and then reprogrammed and can never be altered e.g. the CD-re-writables

EEPROM(Electronically erasable programmable Read Only Memory)

This type of memory enables the user to put instruction in this memory as many times as one may wish.

The instructions will remain in the memory until when one may wish to have them changed E.g. it is applicable in most color televisions.

EEPROM stores BIOS.

DIFFERENCES BETWEEN ROM AND RAM

RAM	ROM
It is Volatile	It is non-volatile
It can be read and written to	Its contents are read only
It offers temporary storage	Offers permanent storage
Its size can be increased	Its size may not be increased
Occupies bigger portion of main memory	Occupies smaller portion of memory
Contents are user defined	Contents are defined by the manufacturer

SPECIAL PURPOSE MEMORIES

Apart from RAM and ROM there are several types of special purpose memories found inside the CPU or in the input and output devices.

These memories are very vital because they increase the overall performance of data and instructions moving in and out of the CPU.

These memories include buffers, registers and cache memory.

BUFFERS

This is a temporary holding place that may be part of the CPU or built in an input or output device. Because the CPU is very fast compared to the input or output devices; buffers provide temporary storage so that the CPU is set free to carry out other activities instead of waiting for all data to be entered or output. For example, since a printer can not work at a speed of the CPU, buffers in the printer temporary hold the output to be printed as the CPU is performing other functions.

Buffers can hold more than one piece of data at a time.

REGISTERS

A register is a temporary storage area used to hold instructions and data currently being processed by the control unit or ALU. It has high speed storage areas. It holds data and instructions until it is processed.

Unlike buffers, registers hold one piece of data at a time and are inside the CPU.

Examples of registers are:-

An accumulator: - This temporarily holds the results of the last step of ALU.

Instruction Register: - This temporarily holds an instruction just before its interpreted into a form that CPU can understand.

An address register: - This temporarily holds the next piece of data waiting to be processed.

Storage Register: - This temporarily holds a piece of data that is on its way to and from the CPU and the main memory.

CACHE MEMORY

Most modern processors incorporate small high-speed type of SRAM called Cache Memory. The purpose of cache memory is to allow the processor to access data and instructions even faster than it would have taken to fetch it from the relatively slow DRAM.

SECONDARY STORAGE AND ITS ABILITIES.

- It represents the physical sequence of 'O's and 'I's
- It is very compact.
- It is capable of re-use
- It is fast in transferring data.

ADVANTAGES OF SECONDARY STORAGE

- It is cheaper than primary storage.ie it is cheaper to store data in a magnetic media than storing it in the main memory.
- It has huge storage capacity.
- It facilitates easy movement of data stored electronically.
- Data in secondary storage is safe from natural hazards or un authorized persons.
- It is no-volatile storage of data and instructions.ie its contents do not disappear when power is switched off

STORAGE MEASUREMENT

Digital means communication signals or information represented in a discrete form usually in a binary or two state way.

Digital = on\off = 1\0.

In binary each 0 and 1 is called a bit (binary digit).

Bits are grouped in various combinations to represent characters of data. That is, numbers, letters, figures, punctuation marks etc. E.g. H can respond to the electronic signal 01001000 (off-on-off-off-on-off-off-off)

In computing 8 bits are called a byte and each character is represented by a byte.

A BYTE refers to the amount of space in memory or on a disk needed to store one character = 8 bits.

Bytes are the basic measure of storage in computers.

A computer is made of millions of tiny electronic circuits. For every circuit in a computer chip, there are two possibilities;

An electronic current flows through the circuit or an electronic current does not flow through the circuit, when an electronic current flows through a circuit the circuit is on which is represented by “1” When no electricity flows, the circuit is off represented by “0”

Each time a computer reads an instruction it translates that instruction into a series of bits i.e. 1's and 0's. On most computers every character from the keyboard is translated into eight bits, a combination of eight 1's and 0's. Each group of eight bits is called a byte.

The smallest element a character is composed of 8 bits.

Bits form Bytes, Bytes form a word

Data Measurement Chart	
Data Measurement	Size
Bit	Single Binary Digit (1 or 0)
Byte	8 bits
Kilobyte (KB)	1,024 Bytes
Megabyte (MB)	1,024 Kilobytes
Gigabyte (GB)	1,024 Megabytes
Terabyte (TB)	1,024 Gigabytes
Petabyte (PB)	1,024 Terabytes
Exabyte (EB)	1,024 Petabytes

Data and programs are stored on your disk as files.

A **file** is a collection of related data stored under a given name.

FOLDERS/DIRECTORIES; this refers to a collection of related files grouped together e.g. “a class lists folder” can hold all files related to classes. Folders can also contain sub folders and the uppermost is called a “Root Folder”.

DATA AND INFORMATION

DATA refers to a collection of raw facts .

INFORMATION; refers to organized and arranged data.

Usually useful and

Can also be converted to data

THE CODE SYSTEM

Various groups of binary codes have been developed to represent the 26 alphabetical letters and the special keys in accordance to specific standards and codes.

They include ASCII Code, EBCDIC Code and BCD Code.

EBCDIC Code (Extended Binary Coded Decimal Interchange Code): This is an 8 bit character

THE ASCII Code (American Standard Code for Information Interchange): It is a 7 bit character or code system.

BCD Code (Binary Coded Decimal): This employed the 6 bit character. e.g. 110101 would represent E.

THE SYSTEM UNIT

This is the name given to the box, which houses the C.P.U and other computer components that go together to make the computer work.

This is of two kinds. i.e. the Desktop version and the Tower versions.

Components of a system unit/CPU

They include the processor (CPU), hard disk, motherboard, RAM chip, ROM chip, power supply, system fan, **CMOS battery (Complementary Metal Oxide Semiconductor)**. This is used to store configurations about the computer which includes;

The amount of memory

Type of disk drives

Current date and time.

Keyboard and monitor type

THE SYSTEM MOTHER BOARD.

This is contained within the system unit and all the vital computer components plug directly into the system board along with other electronic components.

STORAGE DEVICES. (SECONDARY STORAGE)

Storage devices hold data or information until it is needed for processing.

These storage devices are also called: Secondary storage devices or Auxiliary storage devices.

Examples include hard disk, compact disk, flash disk, floppy disk, memory cards etc

(a) THE HARD DISK

This is a type of magnetic disk for data storage located inside the computer case.

This is the largest data storage area within your computer.

It is used to store your operating system and application software as well as your data files.

ADVANTAGES OF USING HARD DISKS.

- It provides permanent storage within the P.C.
- It stores the largest amount of data.
- It is much faster than floppy disks & CDs.
- It aids other storage devices as it stores the operating system.
- The data on the hard disk is always secure since it is not portable.

DISADVANTAGES OF HARD DISKS.

- Most disks are metallic hence bound to expansion and contraction which may lead to loss of data.
- Hard disks can fail if poorly handled e.g. violent shaking.
- They are easily affected by viruses.
- They are not portable.
- They are not interchangeable.

Most computers have one hard disk located inside the computer case called drive C. Additional drives are named .D, E etc respectively

Hard disks keep 1 Gb – 1Tb of data

(b) FLOPPY DISKS

This is an exchangeable circular, flexible disk usually 3.5 inches in diameter and permanently in a plastic case.

A floppy disk stores 1.44 Mb of data

ADVANTAGES OF USING FLOPPY DISKS

- They are portable
- They hold more data than magnetic tapes
- They have a fast speed than magnetic tapes
- They are interchangeable

DISADVANTAGES OF USING FLOPPY DISKS

- They hold little information compared to hard disks
- They are not reliable and may easily lose data
- They require careful handling to avoid physical damage
- They are very slow compared to hard disks

(c) ZIP DISKS

A zip disk is similar in appearance to a standard floppy disk but is thicker

ADVANTAGES OF ZIP DISKS

- They hold more data than floppy disks
- They are more reliable than floppy disks
- They are faster than floppy disks
- They are portable
- They are interchangeable

DISADVANTAGES

- Not readily available on the market
- Most computers do not have zip drives
- They are slower than hard disks

Zip disks can store 100Mb of data

They are suitable for back up, archiving and moving files between computers

(d) MAGNETIC TAPE

This is storage of data on magnetic tapes. They look like audio or video cassette tapes. They are often used for backing up data. They have sequential access

Can store up to 1 TB

ADVANTAGES OF MAGNETIC TAPES

- They are portable
- They are interchangeable
- They are used for backing up data

DISADVANTAGES

- Not readily available on the market
- They are the slowest

(e) DIGITAL VERSALITE DISK (DVD)

This is sometimes referred to as **digital video disk**.

Pre-recorded DVDS have a storage capacity of 4.7Gigabytes (14 times a C.D)

DVDS are good for video and sounds.

ADVANTAGES OF DVDS

- They store large amount of data
- They are interchangeable
- They are portable
- They cannot easily be affected by viruses
- Have a higher speed than floppy disks.
- Accept graphics and sounds compared to floppy disks.

DISADVANTAGES

- They are expensive
- Most computers do not have DVD Readers or drives

(f) COMPACT DISK

Have a capacity of 700Mb_

ADVANTAGES OF CDS

- They store large amount of data compared to floppy disk

- They are interchangeable
- They are portable
- Have a higher speed than floppy disks.
- Accept graphics and sounds compared to floppy disks.
- They cannot easily be affected by viruses
- Cheaper than flash disks

(g) FLASH DISK

Has the capacity of 1-32 GB

ADVANTAGES OF FLASH DISKS

- They store large amount of data compared to floppy disk and CDs
- They are interchangeable
- They are portable
- Have a higher speed than floppy disks and CDs.
- Accept graphics and sounds compared to floppy disks.

MEMORY CARDS

Has the capacity of 1-32 GB

ADVANTAGES OF MEMORY CARDS

- They store large amount of data compared to floppy disk
- They are interchangeable
- They are portable
- Have a higher speed than floppy disks.
- Accept graphics and sounds compared to floppy disks.
- They cannot easily be affected by viruses
- Cheaper than flash disks

Examples of secondary storage medium

This is a physical material on which a computer keeps data, instructions and information for future use. Common types of storage medium are:

- Floppy disk
- CD ROM
- Magnetic tape
- Hard disk

Examples of secondary storage devices/ Storage Media.

- Floppy disk drive
- CD ROM drive
- Magnetic tape drive
- Hard disk drive

Examples of optical disks.

- C.DS
- DVD'S
- Optical card
- Optical tape

Examples of Magnetic disks

- C.D. Rom
- D.V.D
- C.D.RW

CD ROMS & C.D Recordable are referred too as WORM-write once read many. **Storage capacity.** This is the number of bytes (i.e characters) a storage medium can hold.

A storage device records and retrieves items to and from a storage medium. Storage devices act as input devices when they read and act as output devices when they write.

Reading. This is the process of transferring data, instructions and information from a storage medium into memory.

Writing. This is the process of transferring items from memory to storage medium.

The speed of a storage device is defined by its access time, which the amount of time it takes to locate an item on a medium.

HOW TO PROTECT YOUR FLOPPY DISK/CD/DVD

- Keep it in a clean container
- Protect it from dust
- Keep it away from sunlight
- Keep it away from heat or coldness
- Do not store it near magnetic sources
- Do not bend it
- Do not pour liquids on it

REASONS FOR FORMATTING A DISK.

When you buy a new disk, you should first format it. This is because of the following factors;

- It prepares the new disk for storing data
- It erases un wanted information

STORAGE TERMS

A driver is a program that helps a computer system to access the different types of the hardware

Formatting disks is the process of preparing a new disk for use so that the operating system can recognize it and be able to access it

Disk defragmentation is a tool that helps to re arrange scattered files and folders on a storage media so as to speed up access to files and folders

Disk compression is a tool that helps to compress storage media contents to fit in smaller space so as to create more free space on the media

Back up data refers to creating copies of data and programs on separate storage device to avoid losing important data in case the computer fails

Partitioning disk refers to the process of dividing a large physical disk into two or more partitions called logical drives

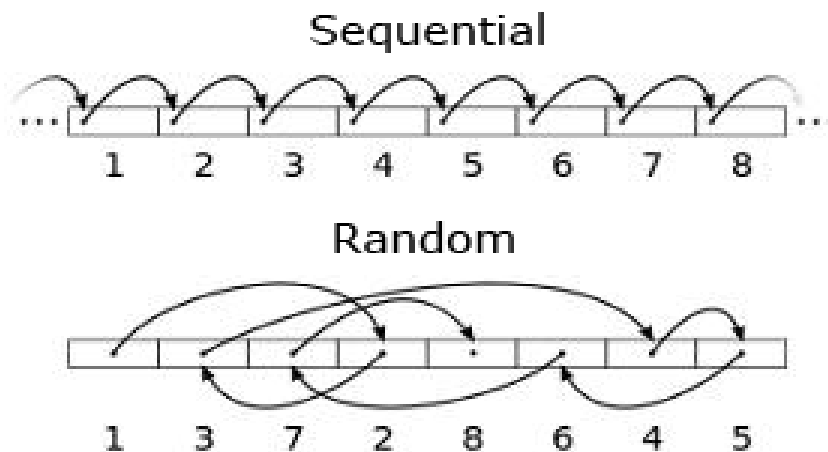
A logical drive is a drive, which can be accessed as if it is a separate disk but in actual sense it is a partition of one physical disk

Formatting is the process of preparing a floppy disk or hard disk for reading and writing by organizing the disk into storage locations called **tracks** and **sectors**. For reading and writing purposes, sectors are grouped into **Clusters**.

Random access/direct access (machine access) is a term used to describe the ability of a computer to immediately locate and retrieve data from a storage device

Sequential access (serial access) is a method of retrieving data from a [storage device](#) where the device must move through all information up to the location where it is attempting to read or write.

Access Method Diagram



<http://www.computerhope.com>

INPUT DEVICES

A computer would be useless without some way for you to interact with it. This is because the machine must be able to receive your instructions and deliver the results of these instructions to you.

Input devices accept instructions and data from the user.

Some popular input devices include the following: mouse, keyboard, scanner, digital camera, joy stick, voice recognition equipment, web cam and touch screen.

THE MOUSE: This is the device used in on – screen graphics and supplements the keyboard to input instructions.

FUNCTIONS OF THE MOUSE INCLUDE

- Selecting drop down menus.
- To point and click on items
- Selecting items. /Highlighting.

- Dragging and dropping items to a different location

Examples of mice include; desktop mouse-used with desktop computers, trackball mouse used with laptop computers and touchpad mouse also with laptop computers.

- **Advantages of using a mouse**
- A mouse is user friendly for computer beginners.
- A mouse is easy and convenient to use with graphical user interface.
- Using a mouse to select items or move to a particular position on the screen is faster than using a keyboard.
- A trackball is good for limited desk space because the user does not have to move the entire device.
-
- **Disadvantages of using a mouse**
- It is not easy and convenient to input text with a mouse.
- Issuing commands by using a mouse is slower than by using a keyboard.
- It needs some practice in order to control mouse properly.
- A mouse is not accurate enough for drawings that require high precision.

THE KEYBOARD.

A typical keyboard has 102 or more keys.

It looks like a typewriter in structure.

Examples include;

Enhanced keyboard -where keys repeat themselves

Standard keyboard – which has no duplication of keys.

Functions of the keyboard include;

- Typing data into the computers.
- Selecting items.
- Highlighting a text.
- Selecting drop down menus.

Parts of a keyboard

A standard keyboard has 3 main divisions,

- Alfa numeric keypad. The Typewriter Area
- The Numeric Keypad and the
- Cursor control keys (Navigation keys).
- The Function Keys area.
- Special keys

Advantages of using keyboards for data input.

- Entering data and instructions with keyboards is generally faster than pointing devices.

- Keyboards are more reliable and usually produce fewer errors than other input devices such as voice input and optical character recognition.
- **Disadvantages of using keyboards**
- It takes a lot of time to practice in order to type quickly and accurately.
- Typing speeds are still very low when compared with computer speeds.
-

THE SCANNER.

A scanner helps you to scan printed material into your computer which can then be stored. Editing can then be done on the scanned data and pictures.

THE DIGITAL CAMERA.

Like a traditional camera this takes photos/ images and stores them digitally and can be transferred to your computer to be used in graphics.

A JOYSTICK; This assists in playing games.

VOICE RECOGNITION EQUIPMENT

This is attached to your computer to convert the spoken words into data.

This requires training your software to respond to your particular voice.

The system is still not perfect.

- **Advantages**
- No typing of data is necessary.
- The system can be used remotely by telephone or by people whose hands are disabled or occupied.
- They are also ideal for the blind or visually impaired users.
-
- **Disadvantages**
- Error rate is still high at the moment.
- Recognition of words is slow.
- Words sound the same e.g see and sea cannot be distinguished.
- The system is not suitable for use in noisy places.
- Many people find it difficult to speak in “writing” style.

WEB CAMS.

These are installed to allow a two way communication i.e. both voice or sound and text.

TOUCH SCREENS.

These are screens that can sense when a particular part of the screen is pressed hence respond accordingly. They are commonly used by security systems and can read fingerprints of individuals.

E.g.s mobile phones, ATMs, etc.

It is both an input and output device

- **Advantages**
- No extra peripherals are needed except a monitor.
- A touch screen allows easy access to commands which are usually identified by words or symbols on the screen.
- **Disadvantages**
- Touch screens are not suitable for inputting a large amount of data because they require a lot of arm movements.
- Only items on the screen can be selected.

STYLUS AND GRAPHIC TABLET

- A **stylus** is a pen-like pointing device which uses pressure to write text and draw lines.
- A **graphic tablet** is a flat, rectangular electronic plastic board on which stylus writes or draw. It can be used to digitise drawing with great accuracy. Stylus and graphic tablet are mainly used for computer-aided design and drafting by architects, map makers, artists and designers.

POINTING DEVICES INCLUDE.

- Mouse
- Joystick
- Track ball
- Light pen

OUTPUT DEVICES

Output devices accept data from a processing device and convert it into a form which is usable by the computer human operators.

The main hardcopy output devices are printers and plotters while, Softcopy output devices include monitor, projector, speakers and touch screens.

THE PRINTERS.

Printers print characters, symbols and graphics on print media which includes paper, plastics, cloth etc.

There are two categories of printers.

IMPACT PRINTERS

These are a type of printers that produce a hard copy output by the print mechanism. Examples include; Dot matrix, character printers and Line printers.

DOT MATRIX. These work by firing a row of pins through an ink ribbon onto the paper.

The more pins the better the quality.

They generate a lot of noise.

They give poor quality work.

CHARACTER PRINTERS. These print one at a time .e.g. Daisy wheel printers, Thimble printers and Line printers.

They are slow and noisy.

LINE PRINTERS. These print a line of characters at a time.

ADVANTAGES OF USING IMPACT PRINTERS

- They print a various font styles and heavy graphics.
- Today, they are very fast; they go over a speed of 160 cps.
- They are easier to maintain-their print heads require fewer periodic cleaning.
- They are reliable that's why they are used in commercial printing.
- They can't print on continuous paper especially dot matrix printers.

DISADVANTAGES OF USING IMPACT PRINTERS

- They are noisy during operation.
- They have a lower print resolution compared to other types.
- Their print heads usually overheat which slows the process of production.
- They are slower in printing compared to non impact printers/.
- They are more expensive than non impact printers.

NON-IMPACT PRINTERS.

- These produce a hard copy out put without the print heads physically touching the printing surface. Examples include; Ink jet printers, Laser jet printers, Thermal printers and Bubble jet printers.

INKJET PRINTERS. These work by spraying ink onto the paper using tiny jets.

- They are quiet.
- Produce better quality work than laser and dot matrix printers
- They are very slow in speed hence suited for office or homes.
- They are small and relatively cheap.

LASER JET PRINTERS. These use a laser to print and print a page at a time.

- They have a very high speed.
- They produce good quality work in large quantities.
- This also includes colour laser printers which produce coloured prints.

ADVANTAGES OF USING NON- IMPACT PRINTERS

- It has a clear resolution i.e prints better pictures.
- It prints better graphics and a variety of fonts than impact printers.
- They make less noise compared to impact printers.
- They are faster than impact printers.
- They use little power compared to impact printers.

PRINTING METHODS:

The printer is an output device by which we can get hard copy of the output i.e on a paper.

- (i) **Line printing:** In this type of printing, the printer prints line by line.
- (ii) **Character printing:** In this type of printing, the printer prints one character

at a time. e.g dot matrix printer.

(iii) **Page printing:** In this type of printing, the printer outputs page by page e.g laser jet printer.

COMMON FACTORS TO CONSIDER WHEN BUYING A PRINTER

Speed given by pages per minute (ppm)

Memory of at least 2mb

Price of the cartridge or toner

Availability of cartridges.

Purpose for which the printer is going to be put to use.

Printer drivers. Most printer drivers are installed before a printer can print some work for you.

PLOTTERS.

These are related to printers but will allow you to print larger images for example maps and drawings.

MONITORS /THE VISUAL DISPLAY UNIT (V.D.U) (DISPLAY DEVICES).

A display device is an output device that conveys text, graphics and video information to the user. Information on a display device is called a **Soft Copy** because it exists electronically and displays only for a short period. Display devices can be;

(a) Polychromes (Coloured)

(b) Monochrome (means that information displays in one colour e.g white and black.

Advantages of using colours

- Colours make the screen displays attractive.
- Colours can be used to highlight error messages and menu options.

Disadvantages

- Screens with a lot of colours take long to process.
- More memory is required to display a lot colours.

Advantages of display devices

- Time to display the image is fast.
- Screen displays can include text, graphics and colours.
- Display devices are usually quite.
- No paper is wasted for obtaining the output.

Disadvantages of display devices

- Information produced on the screen is only temporary and will be lost when the power of the display device is turned off.
- Unsuitable for users with visual problems.
- Needs a separate device to produce a hard copy.

Two main types of display devices are CRT monitors and LCD monitors.

CRT monitors work like a standard television because it also contains a Cathode Ray Tube (CRT).

Advantages of CRT Monitors

- Can produce fast and rich colour output.
- Can be viewed from a very wide angle.
- Cheaper than LCD monitors in general.

Disadvantages

- Emit higher electromagnetic radiation (EMR) than LCD monitors.
- Consume more energy than LCD monitors.

LCD (Liquid Crystal Display) rather than a cathode ray tube uses liquid crystal to create images on the screen.

Advantages of LCD monitors

- They require less than one third of the power and take up less space than traditional CRT monitors.
- Radiation emitted by LCD monitors is negligible.

Disadvantages.

- They are usually more expensive than CRT monitors.
- They can only be viewed from a very narrow angle.

The images on the screen are formed by small dots called picture elements (Pixels)

The more the pixels, the higher the resolution and the better the clarity

For a monitor to display data or information, It must be connected to a video card or graphic adapter.

EXAMPLES OF GRAPHIC ADAPTERS

- Monochrome Display Adapter (M D A). This was the first video card that was used in early computers. It displayed the text in one colour.
- Hercules Graphics Card (HGA). This can display text and images using up to 16 colours.
- Enhanced Graphic Adapter (EGA)
- An improvement of (EGA) and also shows in 16 colours.
- Video Graphic Array (VGA); This offers at most 256 colours.
- Super Video Graphic Array (SVGA). This offers more than 256 colours.

- XGA Extended Graphic Array

SCREEN RESOLUTION: This refers to the clarity/sharpness of the screen display. Resolution is often expressed in dot per inch (**dpi**)

The more pixels they are per square inch , the better the resolution. Higher resolution gives greater clarity and sharpness

A PIXEL. (picture element) is the smallest dot that can be displayed on the monitor.

REFRESH RATE: This refers to the number of times per second that the screen pixels are recharged so that their glow remains bright.

SCAN RATE. The scan rate of the screen measures the number of times the screen is refreshed per second.

DOT PITCH This refers to the amount of space between the pixels (dots). The closer the pixels the crisper the image.

THE COMPUTER PROJECTOR.

This is used to project the information for an audience to view. It is often used in schools and sales promotions.

Other output devices include;

- Speakers
- Touch screens

VOICE/ SPEECH SYNTHESIZERS: These convert text files into audio output eg Reading an email to a blind person.

MODEM: A modem is attached to your computer to convert digital data to analogue data that is sent over the telephone line. The receiving modem on the other end turns the analogue data back to digital data. This is known as **m**odulation and **d**emodulation hence the name modem.

LIGHT EMMITING DIODE AND LIQUID CRYSTAL DISPLAY(LED&LCD).

These are used on ATMs, videos recorders, microwaves, calculators and digital watches. This means that many people use computers throughout the day without necessary knowing it.

FACTORS TO CONSIDER WHEN CHOOSING AN OUTPUT DEVICE.

- The cost.
- Quality of output
- Volume of output
- Processing speed
- Hardware components
- Compatibility with the existing devices.

THE COMPUTER PERIPHERALS/ATTACHMENTS.

Peripherals refer to the devices that you can attach to your computer system unit so as to have more services. This refers to all computer parts apart from the system unit / CPU.

Peripheral devices are connected to the system unit using special cables called **data interface cables**.

They carry data and information to and from the devices.

The cables are connected to the system unit using connectors called **ports**.

Interface cables are used to connect peripheral devices to the motherboards via ports.

A port is a point of attachment to the system unit.

This is an outlet for data to the computer peripheral e.g printer, monitor, modem, flash disks e.t.c

Types of ports

(i) Serial port. A serial port transmits data one bit(s) at a time and usually connects devices that do not require fast data transmission.

(ii) Parallel ports : Used by many printers and send out 8 bits or 1 byte at time.

(iii) USB port (Universal Serial Bus) can theoretically connect up to 127 different peripheral devices

USB also supports hot plugging as well as plug and play.

Devices connect to the system unit using USB port include keyboard, mouse, scanner, disk drive and digital camera.

EXPANSION SLOTS AND BOARDS

Expansion slots are places where new boards or cards can be added to customize the computer. e.g Tv card, sound card e.t.c ...

COMPUTER AND LAB CARE.

COMPUTER LABORATORY.

A computer laboratory is a place where students learn practical uses of computers

RULES AND REGULATIONS.

- Students are prohibited to enter the lab unless authorized.
- Always wear your proper student UNIFORM before you visit the lab.
- Eating or drinking in the lab is prohibited.
- Files should be saved to a designated location
- Avoid music, video, software and data download
- Games of any kind, unless authorized by your instructor, are PROHIBITED!
- Foreign disk are not allowed into the lab unless authorized by the instructor
- Do not attempt to repair or tamper with lab equipment or move any equipment from its original position.
- Do not remove or load (install) any software or hardware into the computer
- Do not change the settings of the computer.

- Displaying obscene, lewd, or sexual harassing images or text in the lab or using lab facility is forbidden.
- Avoid playing or running in the computer lab
- The lab should be kept clean and tidy all the time.
- Do not give passwords to un authorized users
- Avoid answering the commands you do not understand.

CARING FOR MICRO COMPUTERS

Like all electronic equipment, microcomputers need to be serviced regularly to maintain their operability. Some of the measures that should be taken are:

- (a) Avoid abrupt switching off and on the computer system. Use the normal way of shutting down the computer from the start button.
- (b) Avoid making connections when the computer is on power e.g keyboard connections, mouse, printer, monitor
- (c) Place the microcomputer in a dust free environment. Dust covers should be used to cover the microcomputers when not in use if you use polythene covers, do not cover immediately after switching off as it will trap heat.
- (d) The microcomputer should not be exposed to direct sunlight.
- (e) Ensure good ventilation to avoid heat.
- (f) The computers should be regularly serviced. The service should normally include.
 - Blowing dust from the system unit.
 - Cleaning the floppy drives, keyboard including all the keyboard contacts.
 - Also clean the monitor externally and the computer equipment regularly.
- (g) Use stabilizers or UPS to ensure a steady power supply to the computer system.
- (h) *Burglar proofing the room*
- (i) *Installing fire prevention and control equipment*
- (j) *Installing lightening arrestors on the computer room*
- (k) *The room should be well laid out with enough space for movement.*
- (l) *Dust and dump proofing the computer room.*
- (m) *Cables and power sockets should be well insulated and of the correct power rating to avoid short circuits that can damage computer components.*

MEASURES NEEDED TO PROTECT THE USER WHILE IN A COMPUTER LABORATORY.

1. *All cables should be insulated to avoid the danger of electric shock to the users.*
2. *Cables should be laid away from user paths to avoid tripping on them.*
3. *Providing standard furniture to avoid poor posture during machine use which may lead to strain injury and limb fatigue.*

4. *Providing antiglare screens (light filters) and adjustable screens to avoid eye strain and fatigue caused by over bright cathode ray tube (CRT) monitors.*
5. *The room should be properly ventilated to avoid dizziness caused by lack of adequate oxygen and to allow the computers to cool.*
6. *The walls of the computer room should not be painted with over bright reflection oil paints and the screens should face away from the window to avoid glare caused by bright backgrounds.*
7. *Overcrowding in the computer room is not allowed.*
8. *Running and playing in the computer room is not allowed.*

CAUSES OF DATA LOSS IN A COMPUTER LABORATORY.

The vital part of a computer system is the data. In fact, data is exposed to a number of risks and great care should be adopted to protect against them. The risks to data are;

1. *Accidental deletion of data.*
2. *Computer crime e.g. hacking.*
3. *System failures.*
4. *Computer viruses.*
5. *Use of aging storage devices.*
6. *Improper re-installation of operating system on a computer set.*
7. *Saving in a wrong file format.*
8. *Power failure during activities of generating data e.g. report card generation using a server.*

MEASURES THAT CAN BE USED TO CONTROL DATA LOSS IN A LABORATORY.

1. *By using passwords.*
2. *Through activating firewalls.*
3. *By frequently backing up data.*
4. *Through having a thorough audit trail.*
5. *By installing antivirus programs to guard against data loss.*
6. *By sensitizing users.*
7. *By enforcing a data protection policy for an organization.*
8. *By use of biometric devices to allow access to the computer*

BIOMETRIC DEVICES

Are devices that authenticate a person's identity by verifying personal characteristics (e.g., fingerprints).

Examples of biometric devices commonly used.

- *A fingerprint scanner, which captures curves and indentations of a fingerprint.*
- *A hand geometry system, which can measure the shape and size of a person's hand.*
- *A face recognition system, which captures a live face image and compares it with a stored image.*

- A voice recognition system, which compares a person's live speech with their stored voice pattern.
- A signature verification system, which recognizes the shape of handwritten signature of a person.
- An iris recognition system, which reads patterns in the tiny blood vessels in the back of the eye, which are as unique as a fingerprint.

Advantages of biometric devices include

- Personal characteristics are unique and cannot be forgotten or misplaced.

Disadvantages of biometric devices include

- Most of the biometric devices are expensive.
- A fingerprint scanner might reject a legitimate user if the user cuts his or her finger.
- Hand geometry readers can transmit germs.
- A signature might not match the one on file when the person is nervous.
- A voice recognition system might reject a legitimate user with a sore throat.

SYSTEM FAILURE.

A system failure is a prolonged malfunction of a computer that can also cause hardware, software, data, or information loss.

CAUSES OF SYSTEM FAILURE IN A SCHOOL.

- Aging hardware
- Natural disaster (e.g., fires, floods, storms, or earthquakes)
- Electrical power variation. Electrical power variations can cause loss of data or equipment.
- Hardware failure due to improper use.
- Network breakdown.
- Computer virus.
- Accumulated dust into the system.
- Program failure.

HEALTH RISKS DAILY USERS ARE BOUND TO FACE.

- Eye strain
- Back pain due to poor sitting posture
- Electromagnetic radiation especially with CRT monitors
- Addiction from use
- Wrist pain due to non-ergonomic devices.
- Repetitive Strain Injury(RSI)
- Headaches
- Neck pain
- Stress due to noise from fans, printers, power inputs
- Ear problems for use of ear phones especially with embedded systems

MEASURES THAT CAN BE PUT IN PLACE TO CONTROL THESE RISKS.

- *Pay attention to sitting posture.*
- *Take a break to stand up, walk around, or stretch every 30 to 60 minutes.*
- *Place the display device about an arm's length away from the eyes with the top of the screen at eye level or below.*
- *Adjust the lighting in the room.*
- *Ensure that the workplace is designed ergonomically.*
- *Ergonomics means adding comfort, efficiency, and safety into the design of items in the workplace.*

COMPUTER LAB EQUIPMENTS:

(a). THE UN INTERRUPTED POWER SUPPLY (UPS)

It has an internal battery that stores power to use for sometime when the main power is cut off.

(b). Air conditioner

1. *It provides a conducive environment for users.*
2. *To dispel insects away from the computer centre.*
3. *To control dust levels in the computer laboratory.*

(c). Fire extinguisher

To enable users fight or stop a fire outbreak.

(d). Wool carpet

1. *To absorb dust that can come in under feet of the users.*
2. *To absorb some moisture in the laboratory.*
3. *To cover some cables that are running on the floor in the laboratory.*

(e). Blower

It is a device required when servicing computers and its main purpose is to flush out dust from the computer's system unit, keyboard, monitor and other peripheral devices.

(f). Antiglare screens

It is used to filter light glare effects from Cathode Ray Tube type of monitor that can easily affect the user.

(g). Water proof covers

These are used to protect computers from getting in touch with water and liquid substances that can damage the computer.

(h). Gaseous fire extinguisher

It is used to stop fire outbreaks in a computer laboratory.

(i). Surge protector

It is used to control effects of intermittent current flow to the computer.

BOOTING A COMPUTER.

This refers to the process of getting the computer started. There are two types that is cold and warm booting

COLD BOOTING(HARD BOOT): This refers to switching on the computer that was originally off using the power switches.

WARM BOOTING (SOFT BOOT). This refers to re-starting the computer when the power is already on. (press Ctrl +Alt +Del)

PROCESS/PROCEDURE.

- Switch on the power from the socket
- Turn the UPS on.
- Turn on the system unit and monitor
- The computer starts by checking all its components to determine whether they are available for work and functioning properly, this process is called POST. (Power-On-Self- Test).
- This process is directed by a special program called basic-input -output -system (BIOS).
- The computer starts by loading the operating system from the hard disk into the primary memory.
- Computers may prompt for user name and password this process is called **logging on.**
- Finally the computer starts.

Log in. This is the process of entering a user name and a password into the computer.

Password. A password is a combination of characters associated with the user name that allow a user to access a computer or a network.

QUALITIES OF A GOOD PASS WORD

- - At least eight characters if supported by the system.
- - A combination of mixed case letters and digits.
- **Do not Use:**
 - - Your name, birth day, ID card number or telephone number
 - - A password of all digits or the entire same letter.
- **Tips for safeguarding your password.**
 - - Do not share your password with others.
 - - Do not write your password.
 - - Change your password frequently.

CIRCUMSTANCES FOR CARRYING OUT A WARM BOOT

1. *When a computer locks or freezes.*
2. *After installing of certain new software program.*
3. *After installing a new hardware device like a flash disk.*
4. *After uninstalling a hardware device.*
5. *After uninstalling a software program.*
6. *When the computer slows down.*
7. *After changing CMOS or BIOS setup.*
8. *Commonly used to recover from errors that cannot be recovered.*

CODE OF CONDUCT.

A code of conduct is a written guideline that helps to determine whether a specific action is ethical or unethical.

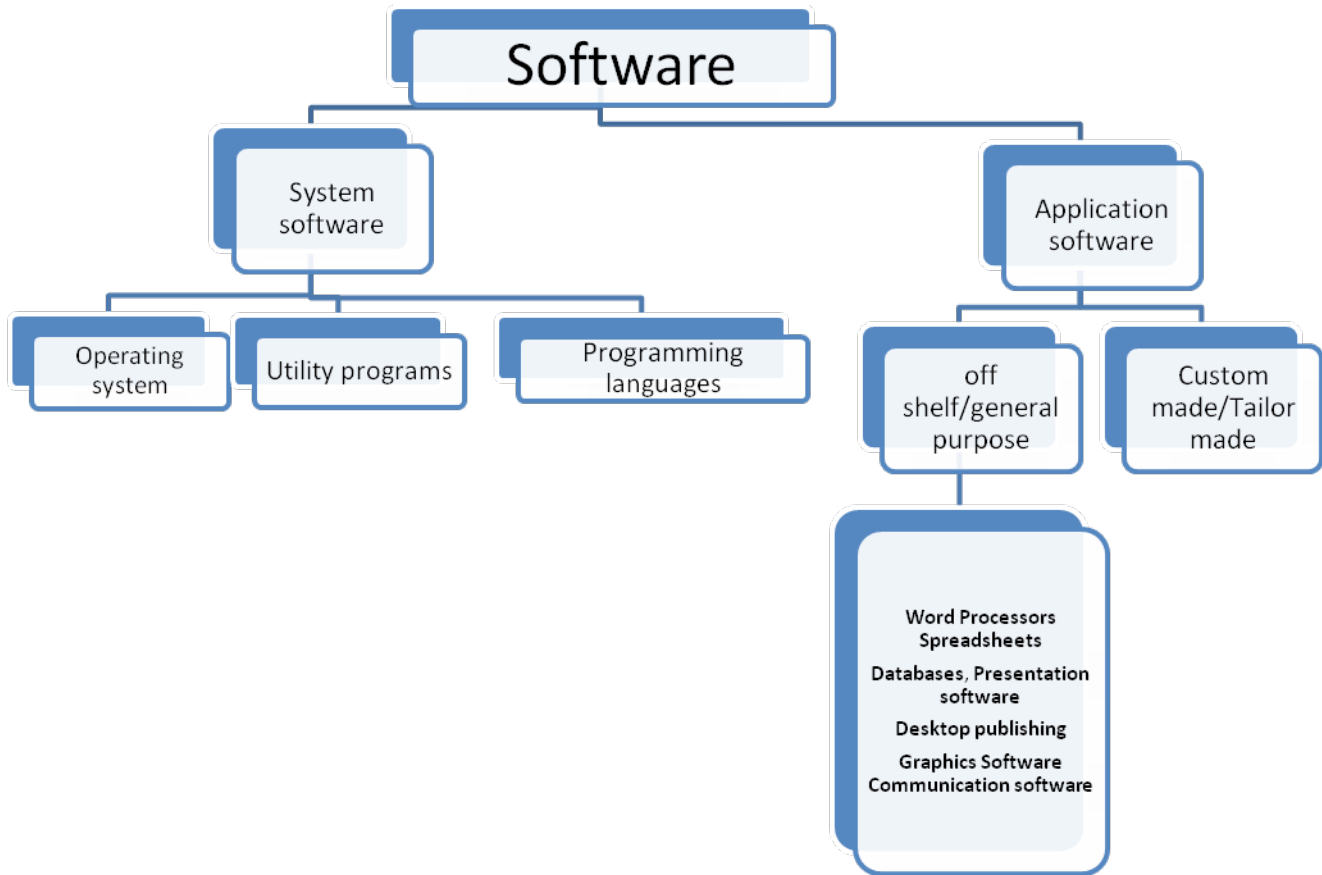
Outline any four IT code of conduct users should observe while in a laboratory.

- *Computers may not be used to harm other people.*
- *Users may not interfere with other's computer work.*
- *Computers may not be used to steal.*
- *Computers may not be used to bear false witness.*
- *Users may not copy or use software illegally.*
- *Users may not use other's computer resources without authorization.*

THE COMPUTER SOFTWARE.

The **computer software** refers to the instructions that make the computer work. The computer software acts as an interpreter between the computer and the user. Components of the software include the system software and the application software.

COMPONENTS OF THE SOFTWARE.



SYSTEM SOFTWARE

This is software responsible for the operation of a computer

This is a special type of program that loads automatically when you start your computer.

Examples include;

1. Operating system (OS) software
2. Utility programs
3. Programming languages

OPERATING SYSTEM.

An operating system is a group of programs that manage all the activities on the computer

It co-ordinates the operation of the hardware components and application software programs of a computer.

It is software through which the user communicates or interacts with the computer. This means that it controls the user's access to the computer facilities like the scanners and printers and the network.

The Operating system is loaded onto the computer's memory (RAM) first. It checks and ensures that all parts of the computer are functioning properly as the computer is booting.

The Operating system acts as a platform on which other programs can be placed. If the operating system is not yet loaded other computer application programs cannot be loaded or used on that computer.

Examples include;

- Windows 2000
- Windows XP
- Windows 7
- Windows 8
- Windows 10
- Windows 3.1
- Windows 95,
- Windows 98,
- Disk operating system (D.O.S)

FUNCTIONS OF THE OPERATING SYSTEM (OS)

Job scheduling. The operating system schedules and monitors jobs for continuous processing by the CPU.

Resource control. The operating system controls the use of input, output and CPU devices.

Processor Management. The operating system decides the program to be allowed into the CPU and time it should spend there.

Providing the user interface. The operating system provides the way the user interacts with the computer.

Memory management. The operating system determines how much memory allocated to particular program.

Error handling. The operating system deals with errors produced during execution and keep the computer running.

File management. The operating system keeps track of the information in the computer and its location.

Booting the computer. The operating system facilitates the starting of the computer.

CLASSIFICATION/CATEGORIES OF OPERATING SYSTEMS

Desktop operating systems

- DOS
- Windows 95,
- Windows 98,
- Windows 7
- Windows 8
- Windows 10
- Windows 2000
- Windows 3x
- O/S 2 (operating system-2)

Network operating systems.

- Novell Netware.
- Windows NT 4.0.
- Unix
- Windows 7
- Windows 8
- Windows 10
- Windows XP .
- Linux.

Personal Digital Assistants operating systems.

- Windows C.E
- Palm operating system
- EPO
- Pocket PC 2002

OTHER WAYS OF CATEGORISING OPERATING SYSTEMS

There are several other ways of categorizing operating systems and these include:-

- i. According to the number of users it can support simultaneously.
- ii. According to the number of tasks it can perform simultaneously.
- iii. According the user interface it provides.

a) ACCORDING TO THE NUMBER OF USERS

Single-user operating systems

A single user or single tasking system allows one user to operate one program at a time. It can not support more than one person and supports only one user program at a time. An example is MS-DOS.

Multi-user operating system

A multi-user computer can be accessed by several users or applications simultaneously. They can be installed on a computer that can be accessed by all users in a place. Examples include UNIX, Linux, Novell, Windows NT, Windows 2003 server, etc.

b) ACCORDING TO THE NUMBER OF TASKS

Single tasking operating system or single program operating system

This allows the processing of one application program in the main memory at a time. The user can only run one interactive program at a time. Before one can use another he must first quit the current running one. An example of this is Ms DOS.

Multi- tasking operating systems

This allows the computer to support more than one application program at the same time. The operating system through processor scheduling allocates time and switches from one task to another so quickly that it appears as if they are being executed simultaneously. Examples include almost all windows operating systems including Windows NT/2000, UNIX, Novell, Linux,

c) ACCORDING TO THE USER INTERFACE

Operating systems can be categorized according to the type of user interface they provide to the user. The term user interface refers to the method interaction between the user and the computer. The user interfaces include the following:

- Command line interface (CLI)
- Graphical user interface (GUI)
- Menu driven interface

Operating systems can be classified into three categories according to the user interface

THE USER INTERFACE.

The human computer (user) interface refers to the method of interaction between the computer and the user and determines how easily the user can operate the computer.

TYPES OF INTERFACE

Command line interface: Here the user interacts with the computer by typing commands at the prompt found on the command line.

A computer reads instructions found on the command line and then executes them.

Examples are MS DOS, PC DOS, OS/2 and UNIX.

Advantages of a command-line interface

- *A command-line interface takes up little memory and normally does not require a very fast processor.*
- *Operation is fast because commands can be entered directly through the keyboard.*
- *Many commands can be grouped together as a batch file so that repetitive tasks can be automated.*

Menu driven interface: This type of interface provides the user with a list of options to choose from. The interface is suitable for beginners who may have

difficulties in recalling commands.
Examples are Dos shell or Dos Editor

·
Graphical user interface (GUI): *A Graphical User Interface (GUI) allows a user to use menus and visual images such as icons, buttons, and other graphical objects to issue commands.*

GUI provides a number of features which makes it very user-friendly. These features have been abbreviated as WIMP features. WIMP stands for the following:

Windows

Windows are rectangular work areas provided on the screen. In each window a different program or file can be run. Windows can be moved around the screen and their size and shape can be changed at will.

Icons

These are small pictures that represent commands, files, or windows. Clicking on these icons can execute a command. This makes the computer easier to use even by those who can't read.

Menus

A menu is a list of choices. GUI can allow one to execute a command by clicking at a choice from the menu.

Pointing Device

This refers to a device like the mouse which enables one to select objects by moving the pointer around the screen.

Other features include

Desktop

This is the area on the display screen where icons are grouped. Icons are meant to represent real objects on a real desk.

Pointer

This is a symbol that appears on the screen which is moved to select objects and commands. Normally, it looks like a small angled arrow though it can be changed at will.

Examples of Operating systems which provide GUI include:-

- Windows (95, 98, 2000, XP, me, NT)
- Apple Mac OS
- Linux
- Novell Netware
- Windows vista

Advantages of a graphical user interface

- *A graphical user interface is user-friendly because it is easy to learn and work with.*
- *There is no need to type and memorize any command language.*
- *The interface is similar for any application.*

Disadvantages of a graphical user interface

- *A graphical user interface normally requires more memory as well as a faster processor.*
- *It also occupies more disk space to hold all the files for different functions.*
- *It is difficult to automate functions for expert users.*

This represents commands as small pictures on the screen called icons. It is user friendly

COMMON TECHNOLOGIES ASSOCIATED WITH OPERATING SYSTEMS

(i) Multi-tasking

This refers to having several programs running simultaneously on the computer. For example; you can send a page to print and continue typing a document.

(ii) Multi-threading

Is when each process runs one or more thread when this happens, it appears to the user as if the application is performing several tasks at once. For example; Window 95, which performs a spell check as you type. There is a thread responsible for accepting user input and another for checking the spellings. A thread is the smallest unit of an execution.

(iii) Multi-Processing

Tasks are shared among several processors and run simultaneously.

(iv) Job

A job is a group of tasks taken as a unit of work for a computer, which may include one or more computer programs, files and instructions to the operating system.

COMPARISON OF DIFFERENT OPERATING SYSTEMS

DOS (CLI)	WINDOWS (GUI)
Requires little memory	More memory
Requires less disk space	More disk space
Not user friendly	User friendly
No ability to multi-tasking	Multi-tasking ability
Cannot be easily corrupted (destroyed) i.e. more stable	Easy to corrupt

FACTORS TO CONSIDER WHEN CHOOSING AN OPERATING SYSTEM

Qn. What factors should be considered when choosing an operating system?

When choosing an operating for a computer the following should be put into consideration.

- The computers specification for example memory capacity, processor speed, hard disk capacity etc.
- The type of computer in terms of size and make. This would tell you to buy

either a PDA or Desktop Operating system

- The application software intended for the computer. This because some applications cannot be supported by particular operating systems
- User friendliness of the operating system
- The cost of the operating system
- Reliability and security provided by the operating system
- The number of processors and hardware it can support
- The number of users it can support

B)UTILITY PROGRAMS/SOFTWARE

This refers to the software that solves normally faced problems relating to the computer management system. These are also called **Service programs**.

- **Anti-virus utilities:** scan for computer viruses and remove them.
- **Backup utilities:** can make a copy of all information stored on a disk, and restore either the entire disk
- **Data compression utilities:** output a smaller file when provided with a stream or file.
- **Disk checkers:** scans the content of a hard disk to find files or areas that are
- **Disk cleaners:** finds files that are unnecessary to computer and can decide to delete.
- **Disk compression utilities:** transparently compress/uncompress the contents of a disk, increasing the capacity of the disk.
- **Disk defragmenters:** increase efficiency by moving data to one side of the disk.
- **Disk partitions:** divides an individual drive into multiple logical drives
- **Disk space analyzers:** to get the size for each folder/ sub folders & files in folder or drive. Showing the distribution of the used space.
- **Disk storage utilities:** ensures that data is stored and files arranged in order of ascending. It also helps the computer to re-arrange data files.
- **Archive utilities:** output a stream or a single file when provided with a directory or a set of files. Archive utilities, unlike archive suites, usually do not include compression or encryption capabilities.
- **File managers:** provide a convenient method of performing routine data management tasks, such as deleting, renaming, cataloging, un cataloging, moving, copying, merging etc.
- **Cryptographic utilities:** encrypt and decrypt streams and files.
- **Text editors:** directly modify the text or data of a file.
- **File Viewer.** Is a utility that displays and copies the content of a file.
- **Diagnostic utility.** A diagnostic utility compiles technical information about a computers hardware and certain system software programs and prepares a report outlining any identified problems.

- **Uninstaller.** This is the utility that removes an application as well as any associated entries in the system files.
- **A debugger** is a special program used to find errors (bugs) in other programs. A **BUG** is a defect in the software or hardware that causes a program to run abnormally.
- **Screen saver.** A screen saver is a utility that causes the monitors screen to display a moving image or blank screen if no keyboard or mouse activity occurs for a specified time period.

Applications of screen saver program

Screen savers were originally developed to prevent a problem called **Ghosting** in which images could be permanently etched on a monitors screen.

- Screen savers can also be used for reasons of security. It prevents unwanted on lookers from accessing information or data on your computer screen.
- Business. (advertisement on the screen)
- Entertainment. Digital photos can be put on your screen as moving pictures.

PROGRAMMING LANGUAGES AND LANGUAGE PROCESSORS

Programming refers to the process of developing computer instructions (programs) used to solve a particular task.

It involves use of special characters, signs and symbols found in a particular programming language to create computer instructions

Programming languages are the means of communicating with the processor. It is the logical flow of instructions in accordance to predetermined rule of grammar (syntax) of that specific language in order to form a program.

Each language has a special order of writing characters usually referred to as syntax.

There are two basic categories of programming languages.

- i. Low Level Languages.
- ii. High Level Languages.

I) LOW LEVEL LANGUAGES

These are called low level languages because they are closely related to the computer processor. Thus these languages are easily understood by the computer than the programmers. This is because they are written in binary format i.e 0s and 1s

There are two examples of low level languages

- Machine Code (Object Code) Language ie 1st Generation Language
- Assembly Language ie 2nd Generation Language

MACHINE CODE LANGUAGE

This is also known as Object Code and is referred to as the 1st Generation Language. It's very difficult to learn and very unfamiliar to humans. It's not user friendly at all. This is because program codes must be written in binary digits only. This makes programming very tiresome and very many errors are bound to occur. Computers understand and use machine code language only. An example of a machine code instruction will look like 1000000001001 on a 16-bit machine.

ASSEMBLY LANGUAGE

This is referred to as the 2nd Generation Language. This was invented to simplify machine code language. Though it closely looks like a machine code language, at least, it is easier to be understood and remembered by humans. This is because it uses few English abbreviations or words e.g. SUB for subtract, FNO for First Number.

These are easier to understand than the binary digits.

ADVANTAGES OF LOW LEVEL LANGUAGES.

1. The C.P.U understands machine language directly without translation.
2. The processor executes them faster because complex instructions are already broken down into smaller simpler ones.
3. They are steady and hardly crash or break down once written.

DISADVANTAGES OF LOW LEVEL LANGUAGES.

They are difficult and cumbersome to use

They require highly trained experts to develop and maintain programs

Removing errors (debugging) is difficult

They are machine dependant

II) HIGH LEVEL LANGUAGES

These were introduced as a further improvement for Assembly Language. They make programming much easier since they shield programmers from knowing all the codes. Fewer instructions are written therefore a lot is done in less time. Most codes are automatically generated. However, these languages cannot be understood by the computer processor.

They are grouped into the 3rd, 4th and 5th generation languages.

Third Generation Language (3GL)

There are over 500 high level languages and those which fall in the 3rd generation include;

- | | |
|---|---------------------|
| · PASCAL (Named after its inventor Pascal) | · TRANslation) |
| · COBOL (Common Business Oriented Language) | · C |
| · BASIC (Beginners All Purpose Symbolic Instruction Code) | · C ⁺ |
| · FORTRAN (FORmula) | · C ⁺⁺ |
| | · Java |
| | · Visual Basic etc. |

Fourth Generation Language (4GL)

These are also classified as high level languages and were designed to make programming even easier.

They consist of mainly predefined functions and procedures which need little customization before they can be used.

With 4GL programming languages one doesn't need to know the details of the actual program codes. The codes are done automatically. The programmer only changes a few codes in order to come up with the program he wants. This has simplified programming and increased productivity.

An example of 4GL is SQL (Structured Query Language) Visual BASIC.

Visual COBOL, Delphi Pascal.

Fifth Generation Language (5GLs)

These are normally used in intelligence based systems such as robots. Unlike 4GLs, which manipulate numbers or data, these manipulate facts and rules to reach a conclusion. Therefore they can 'think', just like humans. This is why they are extensively used in Artificial intelligence projects like in Mars Exploration.

Examples

- PROLOG.
- Mercury.
- LISP.
- OCCAM.
- ALGOZ – Algorithm language

ADVANTAGES OF HIGH LEVEL LANGUAGES

They are portable

They are user friendly and easy to learn

They are more flexible

They are easy to debug

DIS ADVANTAGES OF HIGH LEVEL LANGUAGES

They are slower since they encourage use of many instructions in a word

They have to be interpreted or compiled to machine readable form before the computer can execute them

HTML (Hypertext Markup Language)

HTML is one of the main programming languages used to create web pages for the internet.

This language allows programmers to compose text, pictures, sound animations and video for the screen display.

It also allows the programmer to add attachment of Uniform Resource Locator (URL) which enables the linking (connecting) of different web pages to other pages on the internet.

Language Processors

These are used to translate high level languages into machine code language so that they can be understood by the computer. They work backwards to the processor.

Examples of Language processors include;

- Compilers
- Assemblers
- Interpreters
- Linker

sCompilers

These translate a program written in high level language into machine code or into an assembly code program. The entire program is translated into machine code at compiling time.

Assemblers

These translate assembly instructions into binary code or machine code, a format that is understood by the processor. They normally begin from where compilers stop.

Interpreters

An interpreter translates a source program line by line while the program is running. This is done every time the program is executed and this makes the program to run slowly.

Linkers

These programs combine compiled programs and determine where the program will be located in memory. When the linker has transformed an object code, an executable file is generated. This normally results in files with extensions .exe

APPLICATION SOFTWARE /PROGRAM

This is the type of program that you use for a special task or to solve a particular problem when the operating software has been loaded.

For example

- **Word Processors** (Ms Word, WordPerfect, WordStar, Lotus Notes, Perfect Text Editor, Professional Writer, etc). Used in creation of documents like letters, reports, labels etc.
- **Spreadsheets** (Ms Excel, Lotus 1-2-3, Quattro Pro. VisiCalc.) used in creation and maintenance of numerical data and carrying out calculations).
- **Databases**, (Ms Access, dBase III and IV, MySQL, FoxBase, Paradox). They are used to keep records and files
- **Presentation software** (Ms PowerPoint).Used in creation of slides, slide show overheads etc
- **Desktop publishing** (Adobe PageMaker, Ms Publisher, Adobe InDesign) used in designing publications like newspapers, creation of books, magazines etc.
- **Computer Aided Design** (CAD) e.g. AutoCAD. This is used in technical drawing
- **Graphics Software** (Adobe Photoshop, Corel Draw).Designing and manipulating graphics

- **Communication software** e.g. Browsers, internet explorer and e-mail software, Ms Outlook, Ms exchange. Used in sending mails and searching for data on the www

NOTE

- **Firmware** refers to permanent instructions from the manufacturer.
- A **freeware** is a copyrighted software that is free for use.
- A **shareware** is a copyrighted software that is free for a trial period of time.
- A **public domain software** is a free software that has no copyright restrictions
- A **copyright** refers to terms that give authors and artists exclusive rights to duplicate, publish and sell their materials.
- **Software piracy** is the illegal and un authorized duplication of copyrighted software.
- **Intellectual property.** *Intellectual property (IP) refers to work created by inventors, authors, and artists. Intellectual property rights are the rights to which creators are entitled for their work.*

TYPES / CATEGORIES OF APPLICATION SOFTWARE

Custom designed/ tailor made / special purpose/ in – house programs are programs uniquely designed to solve a particular user’s need. They are specifically written and therefore cannot be found in shops

Egs. Report generating systems in schools, financial management programs in SACCOs and banks

Off-shelf programs (general purpose) are pre-written programs purchased from shops by the user.

They are not written to solve a particular problem but are general in nature
Eg. Microsoft word, word perfect, Microsoft excel, Microsoft power point, Microsoft access

ADVANTAGES OF SPECIAL PURPOSE SOFTWARE

- They are not easily affected by viruses.
- They serve exact needs of the organization
- They are adjustable to meet the organizational needs.
- They give the company competitive advantage over other companies.

DISADVANTAGES OF SPECIAL PURPOSE SOFTWARE

- They tend to be more expensive and sell fewer because of being occupation specific.
- They take a long time to completion.
- They are not compatible with many machines.
- They are provided with less documentation.
- They always have errors due to little time for testing.

ADVANTAGES OF GENERAL PURPOSE/OFF-SHELF PACKAGES

- They are relatively low priced since they are sold in large numbers.
- They are easy to use and are suitable for people with little computer knowledge.

- They are usually provided with extensive documentation to help the user.
- They are readily available compared to special purpose programs.
- They can be customized to solve other organizational problems.
- They have less error due to extensive testing.

DISADVANTAGES OF GENERAL PURPOSE PROGRAMS

- It is quite easy to forget the commands to use in the package, if it is not used frequently.
- Sometimes, the package will allow only a clumsy solution to the task at hand.
- They are easily affected by viruses.
- They may not address all organizational problems.
- They require specific system requirements to run on ones computer which may be costly.

SOFTWARE SUITE

A software suite is a collection of individual application software packages sold as a single entity.

EXAMPLES OF COMPUTER SOFTWARE SUITE.

- | | |
|--------------------|----------------------|
| · Microsoft Office | · Polaris Office |
| · Ability Office | · QuickOffice, |
| · EasyOffice | · ShareOffice |
| · Google Docs | · WordPerfect Office |

ADVANTAGES OF USING A SOFTWARE SUITE.

- *Integrated software normally costs significantly less than a software suite, or purchasing each of the application packages separately.*
- *Ease of use because applications within a suite usually use a similar interface and share common features.*

(i). Software update.

*A **software update** provides bug fixes and minor software improvements and is made available by free download. A software update does not provide a full software package installation.*

(ii). Software upgrade.

*A **software upgrade** is a purchase of a newer version of software*

THE WINDOWS OPERATING SYSTEM

This is an example of a G. U. I characterized by use of a mouse and drop down menus.

ELEMENTS /FEATURES OF A WINDOW

Title bar

This is mostly colored blue. It's usually at the top of the window that displays the title of the currently running application or task. However the color can be changed if one wishes to.

It also enables the one to move the window around the desktop by dragging

The title bar also hosts the three buttons on the right hand side i.e. minimize, maximize/restore and the close buttons.

- The minimize button reduces the window to look like a button at the task bar
- The restore or maximize button stretches the window to cover the entire desktop
- The close button is used to close and exit a window.

Menu Bar: This provides a drop list of commands that one can use to perform a task. When you click on any of the options on the Menu bar, what is shown is a **drop down menu**.

Toolbars

These are rows of buttons or tools or icons that represent commands. These icons are shortcuts to the same commands which can also be accessed from the Menu bar.

A Ruler: This is used for setting tabs and indenting paragraphs.

Work space: This is the blank area on the screen where information is typed.

Scroll bars: These are vertical and horizontal lines /bars that help one to view different parts of the document. They work hand in hand with scroll arrows

Insertion point. This is the vertical blinking bar that shows the current typing position. It moves to the right as one types. In some programmed it is called a cursor

The status bar. This is found at the bottom of the screen and shows the current page, language, number of pages, spelling status etc.

The task bar. This is the last bar at the bottom of the window, showing the programs currently running and displays the time.

The document control menu box: This is found at the top left corner of the document window. It is used for moving, minimizing, maximizing and closing a document window

The Application Control Menu box

This is at the extreme top left of the application window. It minimizes maximizes, restores and closes the active program.

The mouse pointer: This is an I beam that shows the current mouse position.

The dialog box. This is the box that appears on the screen with various commands.

Icons: These pictorial representations of programs and short cuts

Buttons: These are icons representing various commands.

USING THE MOUSE

All windows have been written for use with the mouse.

An arrow appears on the screen to indicate the current typing/mouse position.

THE RIGHT SIDE. This is used to access short cut menus. However this will vary depending on the item right clicked

THE LEFT SIDE. This is the normal use of the mouse. It is used to select menus and commands by clicking on the button once. To cancel a drop down menu, click anywhere on the blank space

THE WHEEL INTEL MOUSE

This is used to scroll while in long documents

BASIC MOUSE FUNCTIONS:

MOVING: This refers to moving arrow across the screen.

CLICKING: This refers to pressing the left button once

DOUBLE CLICKING: This refers to pressing the left buttons twice rapidly

DRAGGING This refers to clicking the left button and holding down the button down while moving the mouse

SCROLLING: This refers to moving mouse ball while in long documents.

USING THE KEYBOARD.

TYPING AND INSERTING A TEXT. To enter a text just starts typing. The text will appear where the blinking cursor is located.

THE CAPS LOCK KEY: This is used to change from capital letters to small letters [upper/lower] and vice versa.

THE NUM LOCK KEY: This is used to activate and de activate figures /numbers.

THE TAB KEY: This used to paragraph or create an indent (much space)

ARROW BUTTONS These are used to move the cursor especially when working with tables

THE SPACE BAR: This is used to create space between texts by placing it once

THE SHIFT KEY: This is used to access the top buttons/ letters and symbols (second function). It also changes the text case by holding it down while pressing the key.

THE ENTER KEY: This moves the insertion point to the next line. It is also used to answer commands.

THE BACK SPACE KEY : This removes a character to the left

THE DELETE KEY: This removes the character to the right. It is also used to remove large texts if highlighted.

HOME: This takes the insertion point to the beginning of the line.

END: This takes the insertion point to the end of the line

PAGE UP: Moves the cursor to the previous page

PAGE DOWN: Moves the cursor /insertion point to the next page.

INSERT: Used for overtyping a text

ESC (escape) this is used to close down commands and dialog boxes.

EDITING MODES

Insert mode-the text replaces an existing one

Type over mode- the text is placed at the curser position

Auto complete –completes the word or inserts texts automatically.

WORD PROCESSING

A word processor is an application software that enables a person to create, save, edit, format and print text documents.

Examples of word processing programs include

- Microsoft word
- Word perfect
- Lotus word pro
- Ms Works.
- WordStar.
- Word pad
- NotePad

APPLICATIONS (USES) OF WORD PROCESSORS –DOCUMENTS CREATED

Used for Writing:

- Letters
- Reports
- Projects
- Certificates
- Invoices
- Receipts
- Flyers
- Brochures
- Calenders
- Typing and creating books
- Writing memo
- Designing curriculum vitae
-

CHARACTERISTICS OF WORD PROCESSING:

- Have similar windows.
- Have spelling and grammar checkers
- Allows a user to create a file that can be re-used or edited.
- Allow import and export of data and graphics.

ADVANTAGES OF ELECTRONIC WORD PROCESSOR OVER TYPE WRITERS

- Word processors can save softcopies for future use **while** with a type writer; a document has to be fully retyped if needed again.
- During typing with a word processor, it is possible to undo a mistake, **while** any error made with a type writer is immediately impacted on the printout.
- There is a variety of quick text formatting features such as bold, italic, underline, colour, etc. in a word processor **whereas** there are limited formatting options with a typewriter.
- A word processor provides grammar and spell check options **whereas** a typewriter cannot help in spell checking.
- It is easier to insert graphics and drawings in a word processor **yet** it is not easy to draw with a type writer.
- It is very simple to align text in a document to Left, Centre, Right or Justified **whereas** with a type writer, one has to manually align the text, which is very difficult.

- A word processor has edit features such as Copy and Paste in which repeatedly occurring text in a document can be copied to and pasted from the clipboard **whereas** a type writer has no clipboard.
- A word processor can work on many pages at a go by inserting pages numbers, footers, headers, watermarks, etc. **whereas** a type writer works on one page at a time.
- A type writer makes a lot of noise during its operation as **compared** to a word processor which is relatively quiet.
- All word processors have superior formatting features like colors, bold facing, underline, which make the work attractive and appealing in the eye
- Word processors have the cut, copy and paste commands which help the user to integrate texts from other places.

DISADVANTAGES OF USING ELECTRONIC WORD PROCESSORS

- Word processors cannot be used without Electricity.
- Word processors Use is Expensive due to the cost of computers.
- They have led to Unemployment of typists because one person using a word processor can do a lot of work in a short time, which would be done by many using type writers.
- Many people are Computer illiterate, and cannot use the program.
- Computers have Viruses, which lead to loss of data in soft copies.
- Using word processors on light emitting computer monitors for long leads to eye disorders, which isn't the case with type writers
- Word processors require purchase of hard ware like printers in order to obtain hard copies yet with typewriters, whatever is typed is permanent and instantly available as a hard copy: there is no delay for printing or risk of unintended file deletion.
- It is too easy while using copy and paste to end up with mistakes like 21th March
- Documents with too many different fonts, styles and graphical effects are difficult to read
- Over reliance on spell checkers may end up with grammatical errors like they left their their books

POPULAR FEATURES OF WORD PROCESSING SOFTWARE / TOOLS

- **Word Wrap:** is a feature allows a user to type continuously without pressing the enter key at the end of the end of the line.
- **Find:** allows the user to locate all occurrences of a particular character, word or phrase.
- **Replace:** allows the user to substitute existing characters, words or phrases with the new ones.
- **Spell checker:** allows the user to check spellings of the whole document at once or to check and even correct the spelling of individual words as they are typed (Autocorrect)

- **Thesaurus:** suggests alternative words with the same meaning (synonyms) for use in the document.
- **Automatic page numbering:** numbers the pages automatically in a document
- **Tables:** allow users to organize information into rows and columns.
- **Drop cap** – Formats the first letter in paragraph to be dropped across two or more lines.
- **Clipart:**, refers to pre-made images about various subjects used to illustrate concepts in documents.
- **Word Count:** Establishes the number of words, characters, paragraphs, etc. in a document.
- **Headers and Footers:** Used to insert text in the top and bottom margin through the document.
- **Footnotes** and **Endnotes** are used as references that provide additional information about a word or phrase within a document.
- **Mathematical formulae typesetting.** This allows a user to typeset complex mathematical formulae within the program.
- **MAIL MERGE**

Mail merge is a process of generating personalized letters or documents by combining a main document with an existing data source such as the address book.

MAIL MERGE FILES

- Main document (primary)
- Data source (secondary)
- Merged documents

PRINTING A DOCUMENT

Printing refers to sending information from the system unit to the printer so as to get a permanent and a portable copy.

The output from the printer on paper is called a print out or hard copy

When using office 2007 WYSIWYG (What you see is what you get) which means that what appears on the screen is what you will get on the paper.

BASIC TERMINOLOGY

- **Line spacing** refers to the amount of vertical white space between two lines of text, from baseline to baseline. Line spacing is measured in points.
- **Text alignment** refers to the way lines of text are arranged relative to the edges of a block of text. There are four types of alignment: left, centre, right, and justify.
- **Justification** is the process of aligning text in a document to both the left and right margins at the same time.
- **Indent** is the amount of white space set in between the margin and the beginning of text. Examples of indents include the first line indent, hanging indent and right indent.

- **Formatting text** is the process of changing the appearance of text in a document. Formatting text involves using commands like **bold, italics, underlining, changing font colour**, etc.
- **Editing text** refers to the process of making changes to the content of an existing document. Editing text involves commands like **cut, paste, overtype, undo, insert, and delete**.
- **Copy** – To place selected text on the clipboard, without removing it from its current location.
- **Cut** – To remove selected text from its current position and place it on the clipboard. Copy and paste duplicated text, while Cut and paste moves text to a new location.
- **The clipboard** is an area of memory in which you can store copied or cut text, graphics or any other items temporarily before being pasted into other locations.
- The **paste special** feature helps to avoid pasting text with all its formatting. The paste special feature provides more control over what to paste.
- **Header**- The header refers to text that appears in the top margin of all pages in a document.
- **Footer** - The footer refers to text that appears in the bottom margin of all pages in a document.
- **Ruler** - You can use the ruler to set the indent, margin and tab markers. Avoid using the space bar to align text!
- **Tabs Stops**– tab stops are places where text can be made to line up. You can set a tab stop by clicking on the ruler bar at the desired position.
- **Hard Copy**– A copy of a document printed out on physical paper.
- **Soft Copy**– A copy of a document that is stored on a disk or other computer storage device.
- **Paragraph** – The text between one paragraph break and the next. A paragraph break is inserted by pressing Enter key.
- **Save** – To write the document's current state from RAM to a storage device.
- **Proofreading** is the process of reviewing a document to ensure the accuracy of its content. Proof reading tools include spelling and grammar check (F7), thesaurus, etc.
- **Page orientation** - is the layout of a page in which a rectangular page is oriented for normal viewing.

Type of orientation

Portrait is the layout of a page in which the height of a page is greater than the width

Landscape is the layout of a page where the width is greater than the height

- **Paragraph spacing**. This determines the amount of space above or below a paragraph.
- **Formatting a document**. Is the process of improving on the appearance of a document involving formatting text, setting margins, borders and shading, page layout, paper size and orientation

- **Document views.** These include;

Normal view, which shows formatting such as; line spacing, font, point size, italics, etc.

Web layout view enables you to view your document as it would appear in a browser.

Print layout view shows the document as it will look when it is printed.

Reading layout formats your screen to make reading your document more comfortable.

Outline view, displays the document in outline form

- **Sorting.** Is the arranging of a list of text say paragraphs, lines, words, etc, in either Ascending or Descending order Alphabetically
- A **superscript**. Is a word processing tool that places text above another, e.g. X^2
- A **subscript**. Is a word processing tool that places text below another, e.g. X_2
- **Borders and shadings.** This involves enclosing text or objects in a frame and a decoration or painting.
- **Page margins.** Are the blank spaces around the edges of the page. Text & graphics are inserted in the printable area between margins. However, headers, footers and page numbers can be inserted in the margins
- **Blocking or highlighting text.** Is the selecting of text to make it ready for manipulation and modification

SELECTING A TEXT OR A DOCUMENT

This refers to blocking/highlighting text. Before any editing or formatting is made, the text has to be lighted.

STYLES/ METHODS

ONE WORD..... Move the mouse pointer over the word and double click

A LINE OF WORDS..... Move the mouse pointer to the left of the line and click

A PARAGRAPH..... Triple click within it

ENTIRE DOCUMENT..... Click on edit /select all or hold down the Ctrl and click the left margins of the window or press Ctrl+ A.

SEVERAL WORDS / LINES: Drag over them.

KEY BOARD SHORTCUTS

Ctrl + A =Select All

Ctrl+B = Bold
Ctrl+C =Copy
Ctrl+click= Select Sentence
Ctrl+Enter=Break—page
Ctrl+F =Find
Ctrl+H=Replace
Ctrl+I =Italics
Ctrl+J =Justify—Full
Ctrl+K =Hyperlink
Ctrl+L =AlignLeft
Ctrl+N= New document
Ctrl+O=Open a document
Ctrl+P =Print
Ctrl+R =AlignRight
Ctrl+S =Save
Ctrl+U=Underline
Ctrl+V =Paste
Ctrl+W=Close
Ctrl+X =Cut
Ctrl+Y =Repeat/Redo

INTRODUCTION TO SPREAD SHEETS

A spreadsheet is a grid of rows and columns that accepts entry of data, allows editing, formatting and manipulation of numeric data. Spreadsheets can also display data graphically with the help of charts and graphs.

TYPES OF SPREADSHEETS

1. **Manual spreadsheets.** The manual spreadsheet is the most commonly used type by book keepers as a ledger book with many sheets of papers divided into rows and columns on which various amounts of money is entered manually using a pen or a pencil and manipulated manually with the help of a calculator.
2. **Electronic spreadsheets.** An electronic spreadsheet is a spreadsheet prepared using a computer program that enables the user to enter values in rows and columns to manipulate them using formulae and functions automatically.

Examples of electronic spreadsheet programs;

ViscCalc,	Microsoft Works,
Lotus 1-2-3,	Multiplan,
Microsoft Office Excel,	View sheet
Quattro Pro,	· V.P Planner

ADVANTAGES OF ELECTRONIC SPREADSHEETS OVER MANUAL

1. They have pre-existing tables, thus, no need to draw gridlines
2. They have in-built formulas and functions, enabling automation in calculations and work manipulations
3. There are minimal errors and in case of any, they are easily corrected
4. They have very large worksheets that can store a lot of work easily and for long
5. Extra columns and rows can be inserted and deleted without any bad effect
6. The work can be protected with passwords thus ensuring security
7. Work can be enhanced to look very attractive with various formats to suit the user's needs
8. The records can be sorted and filtered to get only those that you want
9. They allow printing of multiple copies without re-creation

DISADVANTAGES OF ELECTRONIC SPREADSHEETS

1. They are expensive to buy and maintain
2. They are electronic, thus cannot be used without electricity
3. They require computer skills and continuous training
4. There is data loss due to virus attacks and system failure
5. There are privacy problems like unauthorised access over networks
6. Health related hazards as they are associated with use of computers

FEATURES OF ELECTRONIC SPREADSHEET SOFTWARE

Workbook. This is a collection of multiple worksheets in a single file . Each excel file is called a workbook

1. **Worksheet.** This is a single page of a workbook. It is an equivalent of a work area in Microsoft Word. A worksheet is made up of rows and columns which intersect to form cells. Worksheets are labelled sheet1, sheet2, sheet3 by default, but they can be renamed. A workbook by default has 3 worksheets, however, these can be increased in the user's interest and renamed
2. **Columns.** These are vertical lines which run through the worksheet. Worksheet columns are labelled by letters; A, B, C, D, E... which are displayed in grey buttons across the top of the worksheet
3. **Rows.** Are horizontal lines across a worksheet. Worksheet rows are labelled by numbers; 1, 2, 3, 4, 5... which are displayed in grey buttons across the left of the worksheet

A **cell.** This is an intersection of a column and a row. Each cell on the spreadsheet has a cell address. A cell address is a unique name of a cell. It is given by the column letter and row number, e.g. A1, B5, G6, D12, etc. Cells can contain; text, numbers, formulas, etc. Only one cell is active at a time.

The active cell has a thick a thick boarder around it.

4. **Range.** It is a group of adjacent cells defined as a single unit. A range address is a reference to a particular range. It has a format of top left cell address : bottom right cell address. e.g. D5:G10
5. **Value.** This is a numerical entry in a cell. All values are right aligned in a cell by default.
6. **Labels.** This is a text entry in a cell. All labels are left aligned in a cell by default
7. **Name box.** This displays the address of the selected cell or cells. Also you can rename a selected cell or cells using the name box
8. **Formula bar.** Is a bar at the top of the Excel window that you use to enter or edit values or formulas in cells or charts.
9. **Autofill.** This is the feature that allows you to quickly fill cells with repetitive or sequential data such as chronological dates or numbers, and repeated text. To use this feature, you type one or two initial values or text entries, and then Autofill does the rest using the fill handle, which is the small black square in the lower-right corner of the selection. When you point to the fill handle, the pointer changes to a black cross. Autofill recognises series of numbers, dates, months, times and certain labels.
10. **Sorting data** is to arrange records in either ascending or descending order.
11. **Filtering data** is the displaying of records that satisfy the set condition from the parent list.
12. **Database.** These are data values that can be entered in the cells of the spreadsheet and managed by special spreadsheet features found on the data menu. **The special**

spreadsheet features include; cell referencing, data replication, automatic recalculation, formulas and functions, data filtering, copy, cut and paste, clip art.

13. Graphs. A graph is a pictorial representation of the base data on a worksheet. Most spreadsheets refer to graphs as charts. **A chart** is a graphical representation of data.

14. What-if analysis. Is a process of changing the values in cells to see how those changes affect the outcome of formulas on the worksheet. For example, varying the interest rate that is used in the paying-back table to determine the amount of the payments.

15. Freezing panes. This is where rows and columns are frozen such that they remain visible as you scroll through the data especially if the database is too big to fit on one screen.

USES/APPLICATIONS OF SPREADSHEETS

1. Preparation of budgets
2. Preparation of cash flow analysis
3. Preparations of financial statements
4. Processing basic business information, like, job costing, payment schedules, stock control, tax records
5. Analysis of data from questionnaires
6. Presentation of information in tabular form, graphical or charts forms
7. Mathematical techniques and computation like trigonometry
8. Statistical computations like standard deviations.
9. Presentation of information for example using graphs and charts.

OPERATORS

Operators specify the type of calculation that you want to perform on the elements of a formula. There is a default order in which calculations occur, but you can change this order by using brackets.

Types of Operators

There are four types of calculation operators: arithmetic, comparison, text concatenation, and reference.

Arithmetic operators

These are used to perform basic mathematical operations such as addition, subtraction, division or multiplication; combine numbers; and produce numeric results.

Arithmetic operator	Meaning	Example
+ (plus sign)	Addition	3+3
– (minus sign)	Subtraction	3–1
	Negation	–1
* (asterisk)	Multiplication	3*3
/ (forward slash)	Division	3/3
% (percent sign)	Percent	20%

^ (caret) Exponentiation 3^2

Comparison Operators

These are used to compare two values, and the result is a logical value either TRUE or FALSE.

Comparison operator	Meaning	Example
= (equal sign)	Equal to	A1=B1
> (greater than sign)	Greater than	A1>B1
< (less than sign)	Less than	A1<B1
>= (greater than or equal to sign)	Greater than or equal to	A1>=B1
<= (less than or equal to sign)	Less than or equal to	A1<=B1
<> (not equal to sign)	Not equal to	A1<>B1

Reference Operators combine ranges of cells for calculations. Examples include;

Reference operator	Meaning	Example
:	Range operator, which produces one reference to all the cells, between two references, including the two references	B5:B15
,	Union operator, which combines multiple references into one reference	SUM(B5:B15,D5:D15)
(space)	Intersection operator, which produces one reference to cells common to the two references	B7:D7 C6:C8
& (ampersand)	Connects two values to produce one continuous text value	("North"&"wind")

CELL REFERENCES

A Cell reference is an address given to a particular cell or group of cells on a worksheet. e.g. A2, B6, B3.

There are three types of cell references;

- 1. Relative cell reference** is a cell reference, which changes to reflect the formulas new location as a result of copying it from one position to another. Here, the address of a cell is based on the relative position of the cell that contains the formula and the cell referred to A relative cell reference takes the form: A1, B17
- 2. Absolute cell reference** is a cell reference in which cell address remains the same even when the formula is copied to another location. The exact address of a cell is used in the formula, regardless of the position of the cell that contains the formula. An absolute cell reference takes the form: \$A\$1, \$D\$6
- 3. Mixed cell reference.** This is a type that uses both relative and absolute cell references at once. It may use an absolute column reference and a relative row reference or vice versa, e.g. \$G17, B\$14, D\$2, \$E2.

FORMULAS

Formulas are equations that perform calculations on values in your worksheet and return a value in a chosen cell, e.g. =A2+B2, =(A3+B3)/4, =A6*B4, =C4-D4, =E10/G10

ERROR ALERTS

Microsoft Excel displays an error value in a cell when it cannot properly calculate the formula for that cell. Below are some common error values and their meanings.

Error message	Meaning
1. #####	Column is not wide enough, or a negative date or time is used.
2. #DIV/0!	A number is divided by zero
3. #N/A!	A value is not available to a function or formula
4. #NAME?	Microsoft Office Excel does not recognise text in a formula.
5. #NULL!	You specified an intersection of two areas that do not intersect
6. #NUM!	The numeric values used in a formula or function are invalid
7. #REF!	The cell reference is not valid, e.g. 6E instead of E6
8. #VALUE!	An argument or operand used is of wrong type

FUNCTIONS

Functions is a predefined formula that perform calculations by using specific values called arguments

Function	Description	Example
SUM	Adds all the numbers in a range of cells	=SUM(B2:G2)
PRODUCT	Multiplies numbers given as arguments to return product	=PRODUCT(A2:D2)
MAX	Returns the largest value in a set of values	=MAX(D4:D10)
MIN	Returns the smallest number in a set of values	=MIN(A2:A12)
LARGE	Returns largest value in a data set, e.g. 5th largest value	=LARGE(B1:B9,5)
COUNT	Counts number of cells in a range that contains numbers	=COUNT(A1:E9)
COUNTIF	Counts number of cells in a range that meet given criteria	=COUNTIF(A1:C9,"<10")
COUNTBLANK	Counts number of empty cells in specified range of cells	=COUNTBLANK(A2:H8)
AVERAGE	Returns the average (arithmetic mean) of the arguments	=AVERAGE(B2:B15)
MEDIAN	Returns number in the middle of the set of given numbers	=MEDIAN(D4:D10)
MODE	Frequently occurring value in arange of data.	=MODE(C2:C9)
RANK	Returns the size of a number relative to other	=RANK(F3,\$F\$3:\$F\$1

	values in a list of numbers.	1,0)
SQRT	Returns a positive square root	=SQRT(B5)
IF	Returns one value if a condition you specify evaluates to TRUE and another value if it evaluates to FALSE.	=IF(A2<50,"fail", "pass")
VLOOKUP	Searches for a value in the first column of a table array and returns a value in the same row from another column.	=VLOOKUP(lookup_value,lookup_table, column)
HLOOKUP	Searches for a value in the top row of a table array and returns a value in the same column from a row you specify in the table or array	=HLOOKUP(lookup_value,lookup_table, column_index)

Examples of functions in MS Office Excel include the following:

DATABASES.

Database is a collection of logically related data with descriptions designed to meet the information needs of an organisation. **Databank** is an enormous/large collection of two or more databases for several users within and outside an organisation.

Common database papers include;

- Telephone books
- Recipe books
- Dictionaries
- Television guides

Database management system (DBMS) is software system that allows multiple users to define, create, store, maintain and control access to the database.

Examples of DBMSs include;

- Microsoft Access,
- Oracle, Microsoft
- SQL Server,
- Dbase,
- Fox Pro,
- Sysbase

TYPES OF DATABASES

1. **Flat databases.** These consist of one table
2. **Relational databases.** These consist of two or more tables and manipulate data by relating the tables.

FUNCTIONS OF A DATABASE MANAGEMENT SYSTEM

1. Takes care of storage, retrieval and management of large data sets in a database
2. Used to creates a database structure to accommodate data that may be text, numbers, objects, video, sound
3. It lets you easily add new records, delete out-dated records, update records
4. Allows one to organises records in different ways, i.e. sorted and indexed order
5. Helps to locate specific records, i.e. search, find and replace

6. Eliminates duplicate data say by editing, e.g. deleting and retyping
7. Used to create relationships between tables
8. You can ask questions about your data and get answers using queries
9. Used to create data entry forms
10. Used to create professional good-looking reports
11. Used to change appearance of information, i.e. perform some formatting, etc.

ADVANTAGES OF DATABASE MANAGEMENT SYSTEMS

1. **Sharing of data.** Data is easily shared among different users and applications
2. **Data persistence.** Data exists beyond the scope of the process that it was created for.
3. **Data security.** Data is protected from unauthorised access using passwords. It also provides protection of databases through security, control and recovery facilities
4. **Data validity, integrity & correctness.** Data should be correct with respect to the real entity that they represent. Auditing or error check and correction are easily done
5. **Consistency of data.** The system always produces consistent values with respect to the relationships
6. **Data integrity.** Refers to both correctness and consistency of data. Correctness is being free from errors while consistence is having no conflicts among related data items
7. **Large data storage.** It is capable of storing enormous data amounts for personal and organisational use
8. **Non-redundancy.** Eliminates or decreases duplication of data in the same container. No two data items in a database should represent the same real-world entity.
9. **Data independence.** Both the data and the user program can be altered independently of each other.

DISADVANTAGES OF DATABASE MANAGEMENT SYSTEMS

1. **Complexity.** The systems are complex, costly, and take much time to develop, e.g. they include sophisticated software programs that may require special hardware.
2. **Need for substantial conversion effort.** Changing from a traditional file oriented system to a computerised database system can involve large-scale reorganisation of data and programs. This can create user resistance
3. **Organisation security** may be compromised since a database is used by many people, departments or personnel who may cause havoc by leaking out vital secrets
4. They are difficult to thoroughly test and audit errors
5. **Initial expense.** Because of their complexity and efficiency, they include sophisticated database systems which can be expensive to setup
6. **Requires special skills to handle.** Being complex and enormous, databases require skilled personnel to develop, establish and maintain
7. **Vulnerability.** Data in the database may be exposed to software and hardware failures, sabotage, theft, destruction, virus attacks, etc.

8. **Routine back-up.** Requires back-up systems, which are inconveniencing, complex, tedious and expensive

DISADVANTAGES OF PAPER/MANUAL/FILE-BASED/FLAT DATABASES

Before computerised databases management systems and even now data may be kept and managed manually on paper files and filing cabinets. This system has the following drawbacks or deficiencies

1. Data redundancy. Data are often repeated in more than one file.
2. Updating difficulties. Keeping all files up-to-date can be problematic
3. Data dispersion. Scattered data are difficult for programs and people to share
4. Under-utilisation of data. Dispersed data cannot usually be used to full advantage
5. Not durable. Data on manual papers does not last for long
6. Exposed to risks. Data can be easily lost due to fire, rot, termites, rats, etc.
7. Data dependence. Programs may be dependent on the data formats and file organisation.

DATABASE OBJECTS

1. **Table.** Is a collection of data arranged and stored in rows and columns. It is the basic/primary object where all other objects derive data from.
2. **Query.** Is used to ask questions on table data and find qualifying answers.
3. **Form.** Is a tool for displaying data from data tables easily and for entering & editing data in the data tables.
4. **Report.** Is a summarised and good-looking display of data from tables and queries. It is for output only.

DEFINITION OF TERMINOLOGIES

- **File.** Refers to the entire collection of data in the database.
- **Field.** This is the entire column that contains similar data items
- **Field name.** This is the name/title of a particular field
- **Field type.** This refers to how particular data items are stored in a table
- **Field properties.** This refers to specific characteristics of particular fields
- **Record.** This refers to particulars within a file, or a set of entire data items in a row
- **Macro.** This is an automated procedure of action in a computer
- **Attribute.** This refers to a group of fields or columns in a table
- **Primary key.** This is a unique record identifier in the table. It is used to ensure that there are no duplicate fields in the table. It is also used to create relationships among tables.
- **A foreign key,** is a copy of the primary key in another table
- **A view.** Is a virtual table that does not necessarily exist in its own right but may be dynamically derived from one or more base tables
- **Relationships.** This refers to how two or more entities/tables share information in the database structure. That is, how data in one table are related to data in another table.

Relationships are of three types; one-to-one (1:1), one-to-many (1:M) and many-to-many (M:M)

· **Datasheet view.** This is a table view which allows you to update, edit, format and delete information from the table.

· **Design view** is a table view which provides tools for creating fields in a table, i.e. specify field names, data types, field properties and descriptions (a view for creating the table)

CHARACTERISTICS OF DATABASE APPLICATIONS

- Data is organised in rows and columns
- Each column has a distinct name and represents an attribute of table entities
- All values in a column must conform to the same data format or data type.
- Each row represents a single entity occurrence (entity instance)
- It contains tools known as database objects such as; forms, queries and reports

DATA TYPES, FIELD PROPERTIES, VALIDATION CHECKS AND ERRORS

DATA TYPES

Data type specifies and determines the kind/category of values or information entered in the field containers. There are various data types applied in Microsoft Access and these include;

1. **Text.** Are alphabetic letters or numbers that cannot be calculated. Examples of such fields are; names, addresses, subject names, course names, telephone numbers, etc. it can contain up to 255 characters.
2. **Number.** Refers to numerical data you can calculate but not relating to money, e.g. age, height, weight, course duration, score, number of items in stock. It can be whole number or fraction.
3. **Currency.** Are numerical monetary values that can be calculated and may have a currency symbol or not such as £56000.05, 59000.89, \$5362, €4563, etc. It is suitable for field like; salary, gross pay, net pay, PAYE, school fees, amount paid, etc.
4. **Memo.** It is for lengthy descriptive text and numbers usually several sentences or paragraphs. It can contain a maximum of 32,000 characters. It is suitable for fields like; remarks, comments, particulars, descriptions.
5. **Date/Time.** For months, date and time values that are in the form; **dd/mm/yy** or **dd-mm-yy**, i.e. date/month/year for dates and **Hr:Min:sec**, i.e. Hour:Minutes:Seconds for time values. It is suitable for fields like; date of birth, date of joining, on/off set date/time, date/time of departure/arrival, etc.
6. **AutoNumber.** A number that automatically increments for each record you enter. It stores sequential numbers entered automatically by Microsoft Access starting with one. They are unique and can make a good primary key. It is suitable for fields like; registration number, ID number, membership number, etc

7. **Yes/No.** Here you can enter and store only one value or answer out of the available two options but not both. It is suitable for fields like; true/false, on/off, smoker/non-smoker, Ugandan/Non-Ugandan, in/out, etc.
8. **Object linking and embedding (OLE object).** For object data and other binary information such as; sounds, symbols, graphics/pictures such as; signatures, thumbprints, company logos, one's photo, etc.
9. **Hyperlink.** Stores data in form of hyperlinks, which are the blue-coloured hotspots or connections that can be clicked to open other pages or documents, e.g. e-mail address, website, bookmarks, etc.
10. **Lookup wizard.** Refers to a list of items in form of a list-box from which you can choose the desired item during data entry, especially if that data exists in another table or form. It is suitable for repetitive data such as marital status; single, married, separated, divorced, widowed, etc
11. **Calculated data type.** This new data type lets you create a field that is based on a calculation of other fields in the same table. For example, you might create a Line Total field that contains the product of a Quantity field and a Unit Price field. Then, if you update the Quantity or Unit Price field, the Line Total is updated automatically
12. **Attachment.** This is the preferred data type for storing digital images and any type of binary file, like; Pictures, Images, Office files

FIELD PROPERTIES

These are traits or characteristics defining data entered in particular fields. Common properties include

- **Field size.** This specifies the maximum length of a field. That is, the maximum number of characters to be stored in the field. e.g. if you specify field size as 5, only 5 or less characters will be allowed in the column.
- **Format.** Specifies the way that the field appears by default when displayed or printed.
- **Decimal Places.** It is used to specify the number of decimal places to use when displaying numbers
- **Input Mask.** Specifies the pattern or format for data to be entered in that field, e.g. (---/---/---) for date.
- **Caption.** Used to set the text displayed by default in labels for forms, reports, and queries.
- **Default Value.** A value that appears in the field automatically even before you enter there anything.
- **Validation Rule.** An expression that must be true whenever you add or change the value in a given field. e.g. ≥ 10 for age, "married" or "single" for marital status, etc.
- **Validation Text.** A message displayed when a value violates the expression in the Validation Rule property. e.g. "please, marital status is either single or married"
- **Required.** Specifies whether or not an entry must be entered in that field. That is, if **yes**, you must type an entry, but if **no**, you may proceed without entering anything.

- **Allow Zero Length.** A provision for a field to be left blank in case of unavailable data to be entered later even if the setting for required is yes. Nulls indicate that data may exist but it is unknown. To enter a null, leave the required property as no and leave the field blank, e.g. a company without a fax number
- **Indexed.** It specifies whether or not duplicates in the field should be allowed in order to speed up the data search, sort, filter, etc.
- **Text Align.** Specifies the default alignment of text within a control.
- **New Values.** Specifies whether an AutoNumber field is incremented or assigned a random value when a new record is added

DATA VALIDATION

Validation is the process of comparing the data entered with a set of predefined rules or values to check if the data is acceptable. Validation is the name for the checks that detect incorrect data, display an error message and request another input or just reject the data.

Data validation is the checking of input data for errors (e.g. of the correct data type) before processing. Common data validation checks include; presence/existence or completeness check, range check, limit check, data type check or character check or alphanumeric check, format check, consistency check, control total check, and hash total check.

ERRORS

An error is a fault or an issue that arises unexpectedly causing the program not to function properly and to close. Common types of errors include; transcription errors and transposition errors. Transpositions errors include; error of omission, error of addition, random error, overflows error, rounding up error, and truncation errors.

PRESENTATION SOFTWARE

This is application software used to create presentations, which can communicate ideas and other information to a group of audience. The presentation can be viewed as a slide show, which usually displays on a large monitor or projected screen.

Examples of popular electronic presentation software include;

Microsoft PowerPoint,
Corel Presentations,
Lotus Freelance Graphics,
Microsoft Producer,
Open Office Presentation, etc.

Applications of Presentation Software

1. Presenting learning materials to students in schools (CAL)
2. Presenting speeches and minutes in meeting

3. Used in training sessions
4. Used in presenting campaign manifestos
5. Used in conferences and seminars
6. Used in sales promotions to market products
7. Used in business shows, mobile kiosks and clinics

Principles of a Good Presentation

When preparing a presentation, you must consider the following principles. This improves the quality of your presentation, makes it more effective and enjoyable and in the long run saves you time and effort.

- **Simplicity of the presentation.** The best slide is usually simple, easy and to the point. The audience may need more time to understand complicated slides while time is always limited during presentations.
- **Know the audience and their expectations** in order to give the right message to the right people. e.g. are they children, matures or a mixture. Are they clients or seniors of the organisation
- **Relevance of the content.** Ensure that the content of your slides is relevant to the topic of discussion in order to capture the attention of the audience
- **Use of images, graphics and diagrams.** Slides are visual aid to help you explain complex ideas in an easy way. Therefore, use the right and relevant images, graphics and charts to represent your ideas visually.
- **Make the right choice of colours, font styles, font sizes, transitions, animations, links** which suit the viewers

Advantages of Presentation Software

1. Presentation software usually provides a wide variety of presentation formats and layouts for the slides
2. Multimedia components such as clip art images, video clips and audio clips can be incorporated into slides
3. The timing of the slides can be set so that the presentation automatically displays the next slide after a predetermined period of time.
4. Special transition effects can be applied between each slide
5. The presentation can normally be viewed and printed in different formats

FEATURES OF ELECTRONIC PRESENTATION SOFTWARE

- **Presentation.** This is a PowerPoint file made up of a series of slides, audience hand-outs, speaker's notes and outline among others.
- **Slide.** Is an individual page of a presentation
- **A slide master.** Is the top slide in a hierarchy of slides that stores information about the theme and slide layouts of a presentation, including the background colour, fonts, effects, placeholder sizes, and positioning.

- **A PowerPoint template.** This contains layouts, theme colours, theme fonts, theme effects, background styles, and even content.
- **Animation.** Refers to special effects for introducing text in a slide during a slide show.
- **Placeholder.** Placeholders are the containers in layouts that hold such content as text (including body text, bulleted lists, and titles), tables, charts, SmartArt graphics, movies, sounds, pictures, and clip art.
- **Transition effects.** This refers to different styles in which slides come and leave the screen during a presentation. **Slide transition** is a special effect for introducing an entire slide during a slide show
- **Graphics.** A general term used to mean pictures, images, charts, photo, tables, etc, that you can add to a presentation
- **ClipArt.** A general term for a library of pictures in the computer. **Presenter's notes**, these contain ideas you want to discuss for each slide in your presentation.
- **Action buttons.** Are ready-made buttons that can be inserted into your presentation. These enable you to perform actions upon clicking or moving mouse over them
- **Auto content wizard.** This is a presentation wizard that contains data from which one can select and edit to create a personalised or customised presentation.
- **Slide layout.** Slide layouts contain formatting, positioning, and placeholders for all the content that appears on a slide. Layout contains the theme (colours, fonts, effects, and the background) of a slide. **Master layout** is a term applied to a presentation's overall design.
- **Timing.** Is a technique by which slides or text appear on the screen during a presentation, i.e. on mouse click or automatically after a defined period.

PowerPoint Views

- **Normal view.** Is a Tri-pane window that provides the text outline of the entire presentation on the left, the current slide on the upper-right, and speaker's notes on the lower-right. This is the default PowerPoint view
- **Outline view.** This enables one to edit and display all presentation text in one location instead of one slide at a time. It appears without the objects or images in the slide.
- **Slide view.** Shows a graphic view of the current slide for editing and viewing
- **Slide sorter view.** This displays the entire presentation so that one can add, delete and move slide.
- **Notes page.** Provides a large area to view or type speaker's notes on a slide
- **Slide show.** Is a collection of slides moving in a defined sequence at a present timing that one can control and change with special effects

WORKING WITH MASTERS

Every major component of a presentation follows a format of a master.

The formatting depends on the design template applied to the presentation.

Every slide that you add to your presentation has a uniform colour and back ground as well as the same font and bullet styles for the text place holders all based on the slide master or Title master for title slides

SLIDE MASTER

This controls the appearance of all the slides in your presentation

TITLE MASTER

This determines the appearance of the special title slides that you use at the beginning of a presentation or wherever you want to set off distinct sections.

HAND OUT MASTER

This controls the format of how your slides will be printed for audience hand outs.

NOTES MASTER

This controls how the format of your notes pages will be printed and viewed.

WEBSITE PUBLISHING

Is the process involved in making information available on the World-Wide Web. Which includes designing, organizing and uploading of web pages onto web servers.

IMPORTANT TERMS

Content management: The activity of acquiring, collecting, editing, tracking, accessing digital content to include in a web site.

A **content management system (CMS)** - System with **predesigned** templates used to manage the content of a Web site.

It allows the content manager or author, who may not know Hypertext Markup Language (**HTML**), to manage the creation, modification or removal of content from a Website without needing the expertise of a Webmaster

Examples of CMS include **WordPress, Joomla, MS front page, Macromedia Dreamweaver.**

Webmaster - is a person who Creates and manages the information content (words and pictures) and organization of a Web site or Manages the computer server and technical programming aspects of a Web site Or does both.

Website Hosting - Service that allows individuals and organizations to have their own websites accommodated on a particular web server from which they are accessed by others on the World Wide Web.

Web hosts- are companies that provide space (web hosting) on a server they own for use by their clients. A web site can also be hosted on a home or private server in a home or local area network.

Website - Collection of related hyperlinked web pages hosted on a particular webserver on the World Wide Web. Each Web site may contain one or more web pages. Each site has a home page,

Webpage - Is a document, typically written in HTML that is accessible via HTTP (hypertext transfer Protocol), a protocol that transfers information from the Web server to display in the user's Web browser.

Hyperlink - is the reference or navigation element in a document to another section of the same document or to another document that may be on a different website.

Home page - A home page is the first or introductory page of a website; it contains the introductory information about the site..

CHARACTERISTICS OF A GOOD WEB SITE

- It should be easy to navigate with well arranged, easy to see navigation buttons.
- It should have a Simple and clear layout of **sections** and **content** which makes it user friendly, that is, the visitors should be able to find content easily.
- It must be pleasing to the eye to encourage visitors to the site.
- It should load quickly to avoid disappointing potential visitors to the site.
- It should have readable font, web safe eye pleasing colours so that visitors can read the content easily.
- It should be interactive with contact information, possibility of e-mail, online communication forum and chats. Message boards etc.
- It should have active links which enable visitors to access other references. Dead link can frustrate visitors.
- It should be frequently updated and must have a date of last update. The visitors to the site expect to find up to date useful information.
- The web pages must have web page titles and brief summaries about the page or site.
- All pages in the web site should have a uniform layout. Consistent colors, layouts and type enhance the image of the owners.

USES OF A WEB PAGE OR WEB SITE

- A web site is a Publicity tool or exposure to the public of organisations such as a business or school.
- It is a Communication tool for information exchange between an organization and the public or a group of people.
- A website provides a convenient and cheap base of operation for individuals and businesses. For example, owners of websites can easily advertise on their websites.
- A website is Useful in Marketing of products.
- Web sites can be a source of income to advertisers and web site developers. Space can also be hired for advertisements.

RELEVANCE OF SCHOOL WEBSITES

School academic work can be posted on a school website for students to access. Homework assignments may be included along with web-based activities that students can complete after school.

Web Quests and research activities may be posted on to a school web site, with relevant links for the students to access. Then students can post the work they have completed based on their research.

A Web Quest is an inquiry-based approach to learning involving students in a wide range of activities that make good use of Internet-based resources. During this activity, questions or problems are often researched, and learners work cooperatively to find solutions. Teachers can share ideas with other teachers and make them available to everyone else on the Website.

- It is possible to Communication to parents and the general public.
- Parents can have private access to their **child's class work** and keep abreast of homework/ prep assignments, field trips and other events.
- The school website is used to show school information and policy. Such information as school History, Mission, plans, alumni, anthem and address. School policy information might include use of the Internet in school, promotion requirements, dress code, absences, and behavior expectations.
- The site can be used to encourage parent involvement in school activities by keeping them informed of opportunities such as volunteering,
- PTA meetings, and fundraising activities-enabling parents find the activities that fit their time and schedule constraints as well as their interests.
- It helps to develop school spirit by allowing Students to submit articles, reports on class trips, and special school events in form of newsletters.
- Involving students gives them a chance to share their thoughts in writing and build school spirit.

DESIGNING A WEB PAGE

- Designing is the initial process of web publishing through which a web page is created.
- A web page is created using a language called, Hypertext Markup Language, better known as HTML Code. You can write your own coding within a plain text editor, such as Notepad, or use an HTML editor, which will write the code for you.
HTML codes, also referred to as HTML tags, are enclosed by the less than (<) and greater than (>) brackets (angled brackets) and may be written in capital or lower case letters.
- The opening bracket is followed by an element, which is a browser command, and ends with the closing bracket. For example,
an element may also be followed by attributes, which are words describing the properties of the element, and further instruct the browser.
- Attributes are only contained in the opening HTML tags to the right of the element and are separated by a space and followed by an equal (=) sign.

STRUCTURE OF WEBPAGE DOCUMENT

```
<html>
<head>
<title>your document title goes here</title>
</head>
<body>
your document text goes here
```

</body>

</html>

HEAD - The second tag in your document. Enclosed within the beginning tag: <HEAD> and the ending tag: </HEAD> is information about the document that will not display in the body of the document.

TITLE - The document title, which is enclosed with a begin title tag: <TITLE> and an end title tag: </TITLE>, all of which is enclosed with the HEAD tags above. The title does not display as part of the document itself, but appears in the browser window title. It is also what is used to name your document in a bookmark list.

BODY - The complete text of your document is wrapped by a begin body tag: <BODY> and an end body tag: </BODY>.

HTML EDITORS - An HTML editor is a software application for creating web pages. Although the HTML markup of a web page can be written with any text editor such as Note pad, specialized HTML editors can offer convenience and added functionality. For example, many HTML editors work not only with HTML, but also with related technologies such as CSS, XML and JavaScript or ECMAScript, and PHP. In some cases they also manage communication with remote web servers via FTP and WebDAV, and version management systems such as CVS or Subversion.

There are many HTML Editors for purchase or download. Recent versions of Word and WordPerfect have HTML Editors, or you can choose to use a dedicated HTML editor such as FrontPage or Dreamweaver.

When using a word processing application to create an HTML file, open the word processed document, then select the menu option FILE : Save As HTML or choose to use the MsWord web page wizard.

COMPUTER COMMUNICATION, INTERNET, INTRANET AND ETHERNET

Introduction

With dynamics in information technology (IT), computers have shifted from being used for typing, editing and printing documents to act as a medium for communication.

Communication is a process that allows organisms to exchange information through several methods.

THE INTERNET

Is the global connection of computers to enhance access to information world wide. It is a world wide system of inter-connected computers.

The internet is not a physical thing (wires, cables and computers) but rather a set of standards that allow computers of any brand or model to connect with any kind of

wiring (connection). It is just a technology for getting all kinds of computers to communicate with one another and exchange data.

These standards or rules which control the transfer of data and communication between computers are called **Internet Protocols (IP)**

TCP/IP is the set of rules that govern computers to communicate on a network including the internet.

To use the internet, you use a tool called a “**client**”. It’s this client which contacts a distant computer where the information is located. This computer which keeps the information being requested for by the client is called server.

TERMINOLOGIES

WWW - (World Wide Web).

A system of interlinked hypertext documents that are accessed via the internet

HTTP

Stands for hypertext transfer protocol. It’s a set of rules and regulations that is used to send a page or pages containing hypertext from one PC to another.

Hyper means over or beyond and thus hypertext is that text that will lead users to other related information on demand through hyper link.

Website

A website is a collection of pages on the web owned by an individual or organization. It’s the location of the web domain name in a computer somewhere on the internet.

A computer with a domain name is called a site. The computer may be located at the office owning that particular website but may also be located somewhere else entirely.

The first page a website is known as a Home Page. Every web page has a unique address. This address is what is known as the URL (Uniform Resource Locator).

The URL usually begins with <http://www> and tells the web browser that it is looking for a web page.

Examples of URLs include:-

<http://www.bbc.co.uk>, <http://www.makerere.ac.ug>

The text after the www shows the domain name or the organization’s name. For example, bbc, the type of site e.g. co and com are commercial companies. ac is an academic community and country e.g. uk is United Kingdom.

If there is no country name, this often means that the website is American.

Web page

It is a document on the World Wide Web that can include text, picture, sound and video.

Home Page

This is the first page that is displayed on a website. It acts like the title page of a book. The home page or a welcome page identifies the website and contains links to other pages at the site.

Link

It's a connection from one webpage to another using hypertext. These web pages are not physically connected but just contain the address of the page that should be displayed. A link is also known as a hyperlink.

A hyperlink is a piece of text or some image that takes you to another web page or somewhere else within the current web page.

Hyperlinks always appear as in different colors (usually blue) or are underlined. Normally a pointing finger appears when the mouse is hover above the hyperlink.

Buried beneath each hyperlink is an address called Uniform Resource Locator (URL) this is what links to the new page

When you click at a hyperlink, your browser locates the computer on the internet that has the document you requested for. If the document is available, the browser copies the document to your computer and displays it on the screen.

The text got over the internet is usually referred to as **hypertext**. Hyper means over or beyond. Hypertext is that text that will lead users to other related information on demand through hyperlinks. The term hypertext was coined by Ted Nelson in 1965.

Hypertexts usually perform various tasks when one clicks or hovers over it. For example;

- An application program opens
- Definition appears
- Web page loads
- Video clip runs

A Browser

▪ This is a software application used to retrieve and display contents from the world wide web

Web browsers, enable the user to view web pages that may contain text, images, videos, and other multimedia items and navigate between them while using hyperlinks.

A browser is also known as a web browser

Examples of browsers include; Internet Explorer, Mozilla Firefox, Netscape Navigator, Safari, Opera, Konqueror, Epiphany, AOL Explorer, Google Chrome, *Flock* etc

Basically (typically), a browser is used for the following services.

- Connecting to the source computer whose address is specified in the hyperlink.
- Requesting the new page from the source.
- Receiving the page.

- Displaying contents on the world wide web
- Closing the connection.

Web Address

Each computer on the internet has a unique address. This address is contained in the hyperlink text of a document. The browser software uses this address to connect to the server over the network.

Client

This is a computer that is requesting for some information e.g. a web page from another computer.

Server

This is a computer that actually services the requests of other computers. It is also known as host. It is usually a powerful computer with large memory and hard disk containing many relevant documents.

Bandwidth

The rate of speed of data through a channel and is expressed in bits per second. The difference between the lowest and highest frequencies transmitted.

Connection

This is the actual process by which the browser contacts the server computer over the network.

Directory

A collection of files in a given storage medium or drive

It's a search tool that provides lists of several categories of websites classified by topic such as business, financial, sports, health, dating, pen pals etc. its purpose is to allow you access information in specific categories by clicking on the hyper text link. Directories are useful for browsing-looking at web pages in a general category and finding items of interest. Examples of directories include:- Yahoo, Hotmail etc.

Browsing

Browsing means searching for particular or specific item on the world wide web

Surfing

It means moving from place to place on the internet searching for topics on the internet.

Search Engines

These are tools that allow you to find specific documents through key word search and menu choices. Keyword or phrases are entered in the space provided. It runs a program that searches its own database for an up-to-date list of websites and provides you with a lot of 'hints' i.e. sites that contain the keywords.

Search engines.

Search Engine	URL
AltaVista	www.altavista.com
Excite	www.excite.com

Google	www.google.com
Lycos	www.lycos.com
WebCrawler	www.webcrawler.com
Yahoo!	www.yahoo.com

Limitations of search Engines

- Ambiguity of the language.
- Some search titles alters the whole document
- They can not discriminate between valuable documents and dubious quality.

URL (Uniform Resource Locator)

This is an address, which is typed in the address box to get a web page or website. It is a standard way to give the address of any resource on the World Wide Web.

It contains the protocol to use when accessing the server, the internet domain name of the site i.e. the server computer on which the requested page resides, the name of the resource.

The URL address specifies the document type, its name and the precise location on the internet.

FUNCTIONS OF THE INTERNET

- It enables the receiving and sending of electronic mails around the world. These mails are delivered instantly around the world.
- Downloading programs and other files
- Net banking (internet banking). This has replaced the conventional way banking. Now you can bank at any time of the day and in any place where you have an account.
- Enables online education- internet enables students to study from their areas. This has facilitated long distance learning. Students can now not only register and attend classes but also do examinations online.
- On-line employment system with job seekers can register and obtain information on vacancies with/from various companies e.g. data entry.
- E-Library (E-books) - Internet allows access to current and up-to-date reading texts, for instructors, teachers and students.
- Journals and Research literature- Internet allows one to have access to libraries and databases. A researcher therefore is able to review numerous journals and relevant up-to-date literature.
- Joint Research- Internet increases co-operation efforts in selected joint research project of common interest especially on basic technology e.g. use of telematic technologies in the field of telemedicine in the fight against major health scourges such as AIDS.
- News and information- Internet allows you to headlines and hi-depth stories on everything as it/they happen. This is can be on politics, technology weather vagaries e.t.c. it's a virtual

treasure of information. Any information on any topic under the sun by use of search engines.

- News groups- News groups or electronic discussion groups allow people to discuss and exchange information on a vast array of topics.
- Finding people and organizations.
- Leisure and entertainment.
- Health- daily news about health care as well as a number of health resources.
- Shopping- Many online stores and sites that can be used to look for products and buy them using credit card. No need to leave the house.
- Online chat- makes new friends and meets new people and stay in touch with old ones.

DISADVANTAGES OF THE INTERNET

- Pornography- This is a serious issue concerning the internet especially when it comes to young children. There are thousands of pornographic sites on the internet that can be easily found and can be a determinant to letting children use the internet.
- Moral and Cultural effects- cartoons and networks which facilitate access to pornography and other negative morals which has made fight against several problems of HIV/AIDS, bad sexual behaviors, drugs more complicated.
- Spamming- Sending of unsolicited e-mails in bulk which serve no purpose and unnecessarily clog up the entire system.
- Personal Information- If you use the internet, your personal information such as; name, address etc. can be accessed by other people. The credit card information can also be got if at all it's used to shop online. This is akin to giving a blank cheque.
- Health- People who spend a lot of time sitting in front of a computer. Radiation emitted by computer's screen is harmful to eyes. Sitting for long time is also harmful to the spine. People who spend a lot of time seated because they need not to go home get weather (monotony).
- Addiction- Some people can't just live without it. They have no real friends and when internet is down, they get furious. They live sedentary life styles.
- Costs- The initial costs of buying network hardware and software in addition to employing experts to do the work is very high.
- Virus- A virus is a program that disrupts the normal functioning of your computer system. Computers connected to the internet are more vulnerable/prone to virus attacks and they can end up crashing the whole hard disk, causing undesirable effects.
- Spread of terrorism and drug trafficking- provides a rich recruitment for all illegal activities because of ease in communication.

REQUIREMENTS FOR CONNECTING TO THE INTERNET

To gain access to internet connection, you need three things.

- **A computer:** Computer equipment is a sizeable investment and thus you should select a computer carefully, understand your needs and choose carefully/accordingly. Check the warranty and the after sales service.
- **NIC**-Network Interface Card.
- **Modem**- Acronym for modulator demodulator. An electronic device that attaches to a computer and links that computer to the internet through a telephone link. Modems are available for any computer and can be either internal or external.
- **A physical connection** such as telephone line.
- **An internet service provider** (ISP) to supply the internet.
- **Internet software**- e.g. protocol to make Pcs compatible, web browser etc.

FACTORS AFFECTING INTERNET CONNECTION SPEED

- The speed of the modem 56k (Maximum dial up rate) type, number of users online, distance from the central office.
- The quality of the phone line used.
- The amount of traffic on the internet.
- The power of the computer (processor speed).
- The software used (Browser or Operating system).
- The ISP-they may have too many modems in not enough band width out
- Satellite – For those who use the satellite face different several problems, wind, rain, cloud cover, solar flares, satellite dish, poorly configured bandwidth.

THE INTERNET SERVICE PROVIDER (ISP)

An ISP is a company or an individual that sells/supplies internet services. ISPs can be local, regional or international in scope.

FACTORS TO CONSIDER WHEN CHOOSING AN INTERNET SERVICE PROVIDER.

(a) **Services offered.** When choosing an ISP, one should ensure that the ISP supports the services you want to access on the internet. Some ISPs do not supports all services available on the internet.

(b) **Costs for internet access.** Some ISPs charge depending on the services accessed, amount of time spend on the internet, standard fee per a given period say a month e.t.c

(c) **Type of communication offered.** This refers to the modes by which your computer connects to the ISP for the internet access. Some ISPs offer some of the methods an not others. Find out whether the mode of connection you are interested in is supported by the ISP.

(d) **Technical support.** It is good to know how much (if any) support you can expect from the ISP. Find out whether it is free or charged, whether it is available on phone and for how long. Some local ISPs send a service technician to your house when you have a problem installing software, dialing into their systems e.t.c...

(e) **Security.** Security is very important to protect your activities on your system. If you do not want some one to access your e-mail box, ask for the ISP how they manage security and whether they support any kind of encryption, firewalls, virus guards e.t.c....

(f) **Software.** If you are using an online service provider, you may need special software to access their systems. Although this software is free, you need to learn them. Some systems don't work well with common application packages. Check with the ISP and find out whether your applications work.

EXAMPLES OF ISPs

Infocom - UTL- MTN-Uganda – Airtel-Africel

SERVICES OFFERED BY THE INTERNET

The internet offers a number of services including:

- The world wide web
- E-mail
- E-commerce
- E-learning
- News and media on the net
- Health information on the net
- Music and entertainment
- Chatting

E-commerce

Many companies are increasingly using the internet to sell and buy goods and services.

This new business strategy where goods and services are sold over the internet is called **electronic commerce or e-commerce**

E-commerce is advantageous because one can access customers all over the world because it is not limited by geographical space and time.

It also reduces the operational costs for companies. Companies can buy directly from international dealers by placing orders on their websites.

However, people don't get to meet physically and therefore no rapport (friendship) is developed between customer and the business.

Also, there are no laws in place at the moment governing e-commerce. One may not get court redress incase one gets a raw deal.

E-learning

This is learning through interaction special programs on the computer. It can also be called online education or learning

Internet fax

Fax settings can be configured on ones computer on the internet to enable one receive and send fax with local fax device attached on to the computer.

Newsgroups: *also called a discussion group, is an online area where users conduct written discussions about a particular subject.*

Chat rooms: *is a location on an Internet server that permits users to chat with each other by typing lines of text on the computer.*

Instant messaging: *is a real-time communications service that notifies a user when one or more people are online and then allows the user to exchange messages or files with them.*

Internet telephony: *sometimes called Voice over IP (VoIP), is a Web-based telephone service that allows a user to talk to others for just the cost of the Internet connection.*

Videoconferencing: *is a meeting between two or more geographically separated people who use a network or the Internet to transmit audio and video data. A videoconference conducted over the Internet, using Web browsers and Web servers to deliver the service, is called a Web conference*

Advantages of using Videoconferencing.

1. *Enables people to communicate using both visual and audio elements simultaneously.*
2. *The meeting can be recorded and played back for future purposes.*
3. *It is cheap in terms of cost and time.*
4. *Communication is instant or immediate.*

Telecommuting is a work arrangement in which employees work away from a company's standard workplace and often communicate with the office using some type of communication technology.

• Advantages of using Telecommuting.

1. *Reduces the time and expenses for traveling to and from work.*
2. *Eliminates traveling during unsafe weather conditions.*
3. *Allows a flexible work schedule for employees.*
4. *Provide a convenient, comfortable work environment for disabled employees or those recovering from injury or illness.*
5. *Reduces air pollution caused by vehicles driven to and from work.*
6. *Employers reduce costs due to less office space and furniture is required.*

E-MAIL (ELECTRONIC MAIL)

- E-mail refers to the sending and receiving of electronic letters/messages and documents over/on the internet.
- It is a service that enables the exchange of electronic messages over ICT devices. It is also the transmission of messages to one or more recipients over a network.
- Each individual connected to the internet has a unique email address that acts like a post office box; which handles physical mails. One can receive and send mails/messages to or from all over the world.
- Unlike the paper mail (snail mail) where the recipient would take hours or days to receive mails, e-mail is very fast, because it takes few seconds to reach the recipient regardless of where they are in the world.
- E-mails can be sent over the internet or LAN. Unlike in paper mails where it is only the recipient who needs to have an address, in e-mails, for people to communicate both the sender and the recipient must have e-mail addresses.
- Like the normal postal address, an e-mail address directs the computers on the internet on where to deliver the e-mail message. This delivery process like the internet is configured to some protocols (rules)
- The e-mail system can be configured to use any of these 3 protocols. These are:-
 - SMTP (Simple Mail Transfer Protocol)
 - POP3 (Post Office Protocol version 3)
 - IMAP (Internet Message Access Protocol)

E-mail systems exist in 3 different modes depending on the type of protocol being used.

- **Local E-mail system:** This one is designed to work within organization boundary. For example, on a company's LAN. It normally uses SMTP
 - **International E-mail System:** This type of mail system is designed for wide area coverage normally on a company's WAN, extranet or via the internet.
 - **Dual mail system:** This works well in both environments. It can be used for local e-mail messages as well as international e-mail messages. Some of these e-mail systems use some standardized application packages like Lotus Domino, Lotus cc: mail server, Eudora Pro, Quick Mail office, Microsoft outlook, Pegasus, Turnpike etc.
- The choice of an e-mail package mainly depends on the number of individuals to be connected and the affordability of the system requirements of that particular application. Most of these e-mail applications require vast storage space among others.

E-mail software falls under a special group of application packages called **Communication Software**.

E-Mail Addresses

An e-mail account or e-mail address may consist of simple names or words while others may consist of complicated phrases of words. This will always depend on the e-mail system being used. For example, an e-mail address for a LAN may need only your username like peter, whereas in an international setting, the server name and the country initials may be necessary or a prerequisite. Normally e-mail accounts take up the general form of:-

- Username@servername.country initials. For example; guma@yahoo.co.ug indicates that the user name is guma which is at a server called yahoo which is a company in Uganda.
- Or an e-mail address like guma@yahoo.com indicates that the user name guma is at a server called yahoo which is a commercial site.

Components of an E-mail

An e-mail consists of the following parts:

- **To:** This part carries or requires the e-mail address of the recipient
- **From:** This part carries the sender's e-mail address
- **cc:** This stands for Carbon Copy. It enables copies of the same mail to be sent to a third party while acknowledging the other recipients.
- **Bcc:** This stands for Blind Carbon Copy. Enables copies of the e-mail to be sent to a third party without acknowledging any other recipient.
- **Send:** This is the button clicked at for the mail to be sent
- **Forward:** This enables one to send the received mail to another or other persons

- **Delete:** This part enables one to delete the e-mail.
- **Subject:** This part carries the theme or reason for the e-mail

Parts of an E-mail Address

- **Username;** for example guma is a username in the email address gumagb@yahoo.com. It identifies the owner of the address. It is coined by the user (owner) during account registration process called **Sign up**
- **@;** This symbol is read as 'at'. It separates the username from the rest of the address
- **Server name;** for example yahoo in the address guma@yahoo.com. It indicates that the server computer that hosts the e-mail address for guma is yahoo. Other e-mail hosts or servers include Gmail by Google, hotmail, breakthrough, myway etc.
- **The period (.);** This is read as 'dot'. It is used to separate different parts of an e-mail address.
- **Domain name;** for example com, identifies the type of institution offering a particular service. For example com, co.uk, ac.ug, sc.ug and others. Some common domain names include:
 - .edu**----- educational institution
 - .gov**----- government institution
 - .org**----- Non-governmental organization
 - .mil**----- military institution
 - .com**----- Commercial organization
 - .co**----- Company
 - .sc**----- school
 - .ac**----- academic institution especially higher institution
 - .net** ----- internet service provider

In some instances another two letter extension is added after the domain name to show the country where the website is located. For example;

- **.ug** Uganda
- **.de** Germany
- **.fr** France
- **.jp** Japan
- **.ke** Kenya
- **.uk** United Kingdom
- **.tz** Tanzania
- **.com** United States

Advantages of Using E-Mails over Snail Mail or Postal Mail

1. Some e-mail addresses are given free of charge. It is also free to send e-mails over the internet. Some servers like yahoo do not charge the sender.
2. The message is delivered instantly. There are no delays over the network and the message is read the next time the recipient looks in his inbox

3. E-mails are more secure than the snail mail since it is only the owner who can access the inbox. They are password protected and they remain secretive unless the owner reveals it.
4. The messages can be received anywhere anytime especially now that e-mails can be accessed on phones
5. Any type of file let it be large text files, picture, audio and video; can be sent using the same means at no cost.
6. They can send to multiple recipients simultaneously at the same cost or no cost at all.
7. It is a very efficient method of sending messages over long distances and to many people in a short time.
8. Any size of message can be sent at the cost of a short call
9. They are time saving for example one can travel abroad as the paper to present is being prepared at home and then later be sent to him instead of delaying in the name of waiting for it.
10. Very easy to send a reply as soon as it is received by using the reply button
11. No transport costs, no stamp costs,
12. Can send multimedia files
13. Assurance on whether the mail has been delivered is always given as soon as it is delivered

Disadvantages

1. Only those with internet connection can be e-mailed and those with e-mail addresses
2. Needs some skills to use it
3. Internet connection and service is still expensive in some countries especially the developing countries
4. They increase personal insecurity because the network can be hacked into and the communications be tapped (eavesdropping) into, which may put some individuals into jeopardy
5. The internet and the e-mails are good grounds for breeding viruses, which can be sent by malicious unscrupulous individuals
6. They don't suit rural African settings especially where electricity has to be used.

COMPUTER NETWORKING

A computer network is a group of computers connected together with a purpose of sharing resources like printers, computer programs, fax etc.

Transmission media refers to any physical or non-physical link between two or more computers or devices through which a signal can be made to flow from source to destination. Examples include cables, hubs, bridges, switches, routers, Ethernet, etc.

Networks can link micro computers, terminals, minicomputers, mainframes, and other computing devices such as printers, programs, fax machines, modems, storage devices, communication links etc.

NETWORKING DEVICES:

MODEM – This is a device that converts signals from digital to analog and vice versa for the purpose of transmission over analog or digital media.

MODEM is an acronym for Modulator Demodulator. Modulation is changing data to be transmitted from digital to analog. Demodulation refers to changing data from digital to analog.

Functions of a Modem

- Enables a computer to send and receive data over a telephone line
- Provides continuous connection to the internet
- It converts data into sound so that it can be sent through a phone line
- They can send and receive fax; these are usually referred to as **Fax Modems**.

Hub

It is a component that connects computers on a network and is able to relay signals from one computer to another on the same network.

Router

Routers are the traffic directors of the global internet. All routers maintain complex routing tables which allow them to determine appropriate paths for packets destined for any address. Routers communicate with each other, and forward network packets out of or into a network.

Repeater

A repeater electrically amplifies the signal it receives and rebroadcasts it. They are used when the total length of your network cable exceeds the standards set for the type of cable being used.

Bridge

A bridge is a device that allows you to segment a large network into two smaller, more efficient networks. It performs the following functions:

- *If you are adding to an older wiring scheme and want the new network to be up-to-date, a bridge can connect the two.*
- *The bridge manages the traffic to maintain optimum performance on both sides of the network.*
- *You might say that the bridge is like a traffic cop at a busy intersection during rush hour.*
- *It keeps information flowing on both sides of the network, but it does not allow unnecessary traffic through.*
- *Bridges can be used to connect different types of cabling, or physical topologies. They must, however, be used between networks with the same protocol*

Gateway

It is a device that can be configured to provide access to wide area network or internet.

*A **Switch** is a component that forwards a packet of data directly to the address mode without broadcasting. It transmits the packet using a point – to – point transmission.*

Network interface cards (NIC) – This is a device which creates a physical link between the computer and transmission media like an Ethernet cable.

TERMINOLOGIES USED IN NETWORKING

TOPOLOGY – This is the physical (real) and logical (virtual) arrangement computer systems and other devices in a network e.g. Star topology, Ring topology, Bus topology etc.

PROTOCOL – This is a set of rules that govern communication of computers on the same network. There are four major types of protocols used in configuring a network. They include:

TCP/IP (Transmission Control Protocol/Internet Protocol)

-Governs the way data is transmitted across networks.

-It enables the computers to communicate over a network including the internet..

-It breaks data into small parts called packets transmitted (routed) over the network.

FTP (File Transfer Protocol) –

-This is a set of rules which enable files to be transferred from one computer to another.

-It also enables large files to be transferred from a client computer to a remote computer and vice versa.

-It helps in uploading and downloading files.

HTTP (Hypertext Transfer Protocol)

-This is a protocol that governs the transfer or sending and receiving of hypermedia and hypertext documents.

TELNET –

It is a protocol that enables one to remotely log in or establish connection to another computer on a local network.

IPX/SPX (Internet Packet Exchange/Sequential Packet Exchange) – This is designed for Novell's network environment

ATM (Asynchronous Transfer Mode). ATM is a dedicated connection switching technology that organises digital data into 53 bytes cell units and transmits them over a physical medium using digital signal technology.

WAP.WAP (Wireless Application Protocol): *is a technical standard for accessing information over a mobile wireless network. A WAP browser is a web browser for mobile devices such as mobile phones that uses the protocol.*

Bluetooth. Bluetooth is a wireless technology standard for exchanging data over short distances from fixed and mobile devices(*about 10 meters*)

Wi-Fi is the name of a popular [wireless](#) networking technology that uses radio waves to provide wireless high-speed [Internet](#) and [network](#) connections. A common misconception is that the term Wi-Fi is short for "wireless fidelity," however this is not the case. Wi-Fi is simply a trademarked phrase that means *IEEE 802.11x*.

INTRANET - An internal network of an organization that uses TCP/IP protocols supports multimedia web pages and is accessible via a web browser. In an intranet many LANs are connected because different departments or faculties' individual LANs are connected together to make one big LAN. This type of network is restricted to only authorized people for example employees only. An intranet that extends to authorize users outside the company is called an **Extranet**.

EXTRANETS – These are Wide Area Networks (WANs) but their accessibility is only limited to those authorized to do so. For example, if the Uganda Government connected all its embassies abroad on a single network which is only accessed by the diplomatic staff around the world, this arrangement will be called an **Extranet**

FACTORS YOU WILL CONSIDER BEFORE SETTING UP A COMPUTER NETWORK.

- *Cost of installation.*
- *Number of computers and other devices.*
- *Architecture of the building to be used.*
- *Purpose of the network.*
- *Distance of connectivity.*
- *Safety provisions of the network.*
- *Personnel provisions/technicalities involved.*
- *Ease in accessing the network/ speed on the network.*
- *Future growth of the organization and expansion of the network*

TYPES OF NETWORKS

There are various computer networks but the most common ones include:

- Local Area Network (LAN)
- Metropolitan Area Network (MAN)
- Wide area Network (WAN)

LOCAL AREA NETWORK (LAN)

This is a network which spans a relatively small physical/geographical area such as a single office, building or office complex. It connects computers in a limited geographical area such as a school lab. A LAN can be owned by one organization. It usually has a server and client computers. It is configured such that each workstation has its own central processing unit with which it executes programs; but it is also able to access data and devices anywhere on the LAN.

Characteristics of LANs

- Generally limited in the distance over which data must travel.
- They are of low cost depending on the area to be covered.
- Relatively error free.
- They are capable of transferring data at high speed

Advantages of LANs

- Enables sharing of resources for example peripheral devices like printers
- Enables easy transfer of data and easy communication between the users
- Enables easy management of software for example one program can be shared instead of installing it on every computer on the network.
- Enables easy storage and easy backup of data. The manager will quickly access the data from all the computers just from his computer and save it.
- It enables easy management and easy security due to central management. The network manager can control access by setting access rights and user permissions, checking viruses, file downloads and auditing computer use.
- Reduces the operational and management costs through sharing of programs, devices and data.

Types of LANs

Peer to Peer

This is a type of LAN where computers are connected directly to each other without relying on a server.

Client/Server

This is a type of LAN that is managed by a central computer called the **server**. The other computers or workstations or nodes are called **Clients**.

METROPOLITAN AREA NETWORK (MAN)

This is a network that covers a metropolitan area like a town or a city. This type of network covers a radius of between 5 to 50 kilometres.

The MAN infrastructure may be owned by a single company that has offices across a metropolitan area or by a service provider who provides network services to subscribers in the area. It is made up of many LANs in that metropolitan area.

Characteristics of MANs

- More extensive in their geographical coverage than LANs
- More sophisticated and complex than LANs
- Capable of sending data, videos, and audio transmission across a network
- Functional over longer distance than LANs
- Expensive to build
- Able to interconnect many LANs
- Not capable of handling the same greater distance as WANs

WIDE AREA NETWORKS

A WAN is larger than a MAN and covers a very large geographical area such as a country, continent or even the whole world. It consists of many LANs and MANs connected together to form one large network such as the internet.

Characteristics of WANs

- Capable of covering a very wide area
- Often used to interconnect several MANs and LANs
- Slower than LANs and MANs because of the greater distance they cover.
- Prone to more errors than LANs and MANs

FUNCTIONS /ADVANTAGES OF NETWORKING COMPUTERS

- Enables electronic exchange of information and sharing of files.
- Allows the users to access the same application program at the same time
- Sharing of expensive hardware resources like printer, hard disk, fax etc.
- Email scheduling
- Centralized administration and support and control.
- The cost of buying equipment can reduce drastically since one printer can serve the whole organization, software resources can be shared instead of buying for each pc
- Security is centralized, improved and easy. The network administrator can control access by setting access rights, user permissions and auditing computer use; checking viruses, file downloads etc
- Backup becomes easy. Instead of asking every user to back up their data the administrator will quickly do it using the network.

DISADVANTAGES/PROBLEMS OF USING NETWORKS

- It is more costly running computers on a network than stand alone computers
- Networks are more vulnerable to virus attacks than stand alone computers
- Require skilled knowledge and expertise because very many issues arise with network usage
- They are vulnerable to frequent crashes
- High maintenance costs in terms of software costs and hardware replacement.

NETWORK TOPOLOGIES

This is the physical layout of devices on a computer network. It can also be the physical (real) and logical (virtual) arrangement or mapping of computer systems and other devices in a network.

Topologies dictate how data is passed from one computer or device to another.

Network topology can be grouped into two categories:

- Physical topology
- Logical/Signal topology

1. Physical Topology

This refers to the physical layout or arrangement of components on a network. Examples of physical topology include:

- Star topology
- Bus topology
- Ring topology
- Mesh topology
- Tree/ Hierarchical topology
- Hybrid topology
- Point to Point topology

a) Star Topology

In star topology, all devices are connected to a central hub or switch. Devices connect to the hub using Unshielded Twisted Pair (UTP) Ethernet.

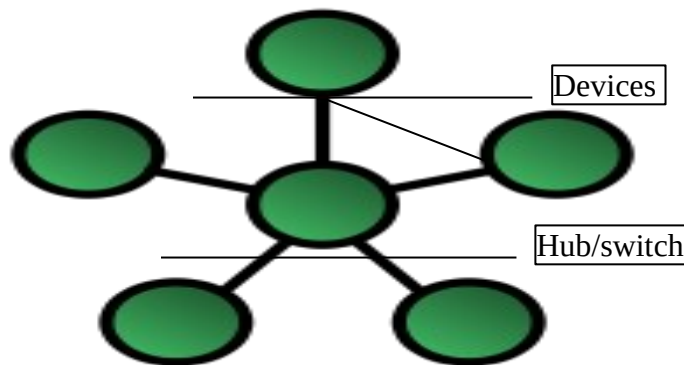
It is designed in a way that each node (file server, work station and other peripherals) are connected directly to a central network hub or concentrator.

When the hub receives data from a transmitting computer (server) it broadcasts the message to all nodes on the network.

It is common with mini computers and mainframe environments.

*

Layout of star topology



Advantages of star topology

- Easy to configure or setup
- No disruptions when connecting or removing devices
- Easy to detect faults and to remove parts
- It allows centralization of key networking resources like concentrators and server hence few devices are used.

Disadvantages

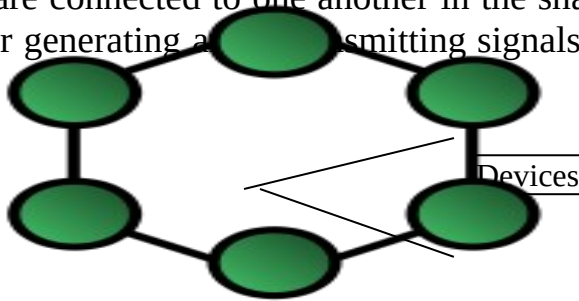
- It is expensive because it requires one complete cable per computer. Each workstation is connected directly to the concentrator by its own dedicated line
- If the central hub fails, the entire network will be down

- Installing it is time consuming because each node forms a segment of its own,
- More expensive than the linear bus because of the cost of concentrators

b) Ring Topology

In ring topology, all devices are connected to one another in the shape of a closed loop. Each station is responsible for generating and transmitting signals around the network to its neighbors.

Layout of Ring topology



A token is used to exchange data from one station to another. A token can be viewed as an envelope or a bag where data is placed for transmission around the network.

Advantages of Ring Topology

- They use short length cable
- It is simple to install
- The system is not dependent on a central computer / server

Disadvantages

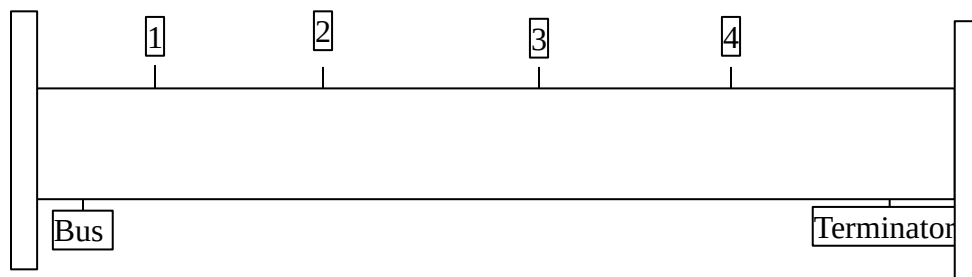
- Modification may be difficult because adding or removing a device can disrupt the entire network
- Troubleshooting can be difficult
- One device breakdown may affect the entire network. However in IBM token ring where a device called Multi-station Access Unit (MSAU) is used for station bypass in the event of a station failing.

c) Bus Topology (Linear Bus Topology)

All devices are connected to a central cable called the bus or backbone. It uses a single cable often referred to as a trunk or bus.

All network clients and the file servers are connected to this single cable. Data is transmitted in either direction along the cable. Each client or server attaches itself to the backbone using a drop cable which has a connector at both ends (connector and PC ends)

Layout of bus topology



The cable can carry only one message at a time and each workstation on the network must be able to know when it can and when it can not transmit through shared medium. A terminator attached to each end of cable to avoid signals from bouncing back and forth of the signal thus distorting.

Advantages of Bus topology

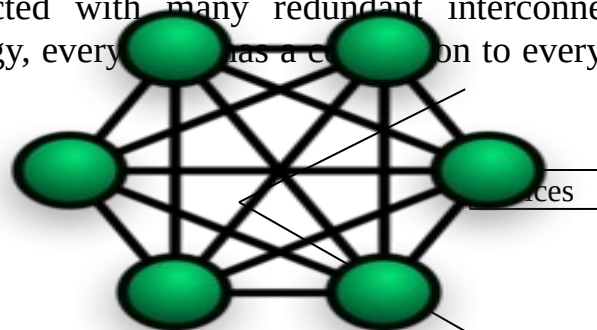
- Easy to install
- It is less costly. Does not require a complete cable length per computer.
- If one fails its malfunction does not affect the rest.

Disadvantages

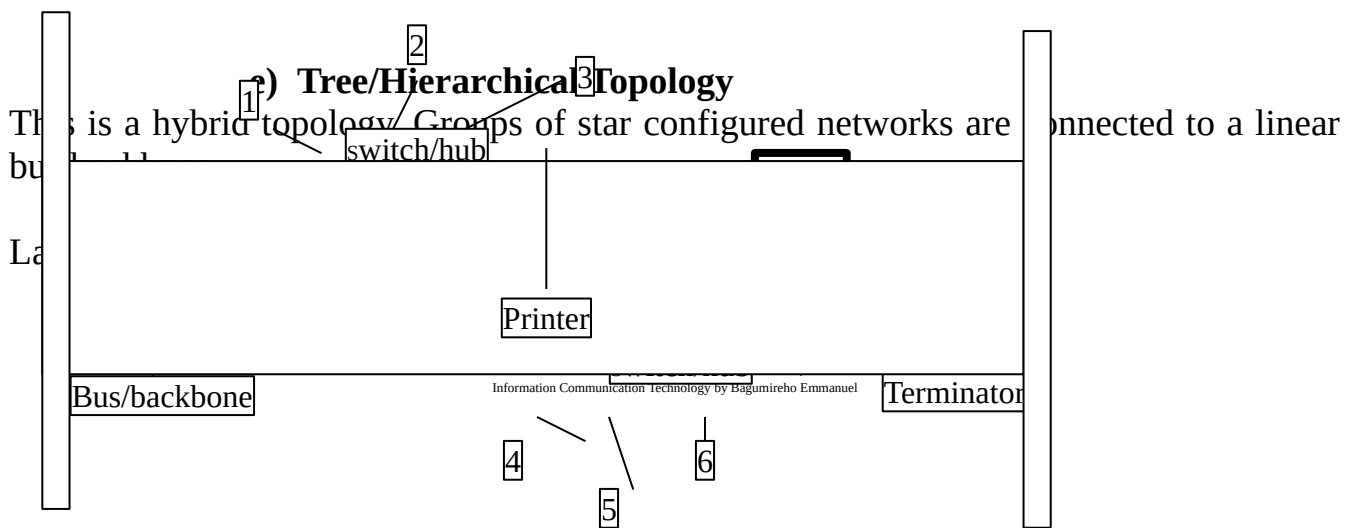
- A breakdown in any section of the central cable brings down the whole network.
- Troubleshooting the cable fault is difficult because a fault could be anywhere on the cable. It is difficult to locate point of failure.
- It limits the number of computers that can be connected to the cable because each computer is listening to the cable in order to transmit. An increase in the number results in an increased collision as machines compete for transmission

d) Mesh Topology

This is the most common topology used in WAN where there are many paths between different locations. Devices are connected with many redundant interconnections between the nodes. In a true mesh topology, every node has a connection to every other node in the network.



Layout of a mesh topology



2. Logical Topology

Logical topology is also known as signal topology. It deals with the way data passes from one device (node) to another on a network. Logical topologies are determined by the network protocols.

Examples of logical topologies are:

- Ethernet
- Token ring

It should be noted that networks with different physical layout may have the same logical topology.

a) Ethernet

All computers listen to the network media and can only send data when none of the others is sending.

b) Token Ring Topology

In token ring topology, a special packet of data called a token goes around the network and only the computer whose address is on the data held in the token will take up the token and it read up the data before releasing the token.

This token can then be captured by another computer which needs to transmit data.

DATA COMMUNICATION

Data communication.

It refers to the process of transmitting data signals from one point to another through a network.

A data signal cannot be sent from one place to another without a medium of communication. A data communication medium is a pathway used for carrying data and information from one point to another.

The communication medium more often than not dictates the type of signal that would be used to transmit the message.

Data transmission media is divided into two categories:-

1. Bounded Media (wired)

There are several types of bounded media but the common ones are:-

- 2-wire open line cables
- Twisted pair cables
- Coaxial cables
- Fiber optic cables

Advantages of wired networks

- *Very inexpensive in cost.*
- *Wired networks transfer information faster.*
- *Wired networks are more secure than wireless networks.*

Disadvantages of wired networks

- *Network cables can disconnect or become faulty causing connection to fail.*
- *Adding more terminals / workstations / clients / computer to a wired network may be expensive and slow.*
- *Network cables can look disorganized.*
- *Running wires from one room to another can be a difficult task.*

2. Wireless Communication (unbounded media)

UNBOUNDED (WIRELESS) COMMUNICATION MEDIA TYPES.

- ***Broadcast radio:*** *data can be transmitted over radio waves communication.*
- ***Microwaves:*** *in microwave transmission, signals travel in a straight line and therefore, the transmitter and receiver must be in a direct line of sight of each other.*
- ***Communications satellites:*** *in this transmission, microwave signal is transmitted from antennae from the ground to the satellite on the orbit around the earth. The satellite on a specific frequency called the uplink it is received and amplified then rebroadcasted on a different frequency called downlink. The satellite transmits the signals back to the earth stations to form a point to multipoint transmissions.*
- ***Infrared (IR):*** *communication through this medium is achieved by having infrared transmitters and receivers. The transmitter and receiver of infrared signals must be within a line of sight in the same room.*

ADVANTAGES OF WIRELESS COMMUNICATION IN AN ORGANIZATION.

- ***Mobility*** - *With a laptop computer or mobile device, access can be available throughout a school, at the mall, on an airplane, etc.*
- ***Fast setup*** - *If your computer has a wireless adapter, locating a wireless network can be as simple as clicking "Connect to a Network" -- in some cases, you will connect automatically to networks within range.*
- ***Cost*** - *Setting up a wireless network can be much more cost effective than buying and installing cables.*
- ***Expandability*** - *Adding new computers to a wireless network is as easy as turning the computer on (as long as you do not exceed the maximum number of devices).*
- ***Disadvantages of wireless networks:***
- ***Security*** - *Be careful. Be vigilant. Protect your sensitive data with backups, isolated private networks, strong encryption and passwords, and monitor network access traffic to and from your wireless network.*

- **Interference** - Because wireless networks use radio signals and similar techniques for transmission, they are susceptible to interference from lights and electronic devices.
- **Inconsistent connections** - how many times you have heard "Wait a minute, I just lost my connection?" Because of the interference caused by electrical devices and/or items blocking the path of transmission, wireless connections are not nearly as stable as those through a dedicated cable.
- **Speed** - The transmission speed of wireless networks is improving; however, faster options (such as gigabit Ethernet) are available via cables. If you are only using wireless for internet access, the actual internet connection for your home or school is generally slower than the wireless network devices, so that connection is the bottleneck. If you are also moving large amounts of data around a private network, a cabled connection will enable that work to proceed much faster.

ELEMENTS OF A DATA COMMUNICATION CHANNEL.

The basic model for computer communications consists of:

- A **sending device** that initiates an instruction to transmit data, instruction, or information. e.g., Computer A, which sends out signals to another computer (e.g., Computer B).
 - A **communications device** that converts the data, instruction, or information from the sending device into signals that can be carried by a communications channel. e.g., Modem A, which converts the computer's digital signals into analog signals.
 - A **communications channel**, or path, over which the signals are sent. e.g., a standard telephone line, along which the analog signals are sent. Communication channels takes the following methods:
 - A **communications device** that receives the signals from the communications channel and converts them into a form understood by the receiving device. e.g., Modem B, which converts the analog signals back into digital signals.
 - A **receiving device** (i.e., Computer B) that accepts the signals from Computer A.
 - **Communications software**, which consists of programs that manage the transmission of data, instructions, and information between computers.
- **Modes of data communication**
 - **Simplex** refers to communication in only one direction eg TV and radio
 - **Half duplex** refers to communication in both directions but one direction at a time eg radio calls
 - **Full duplex** refers to communication in both directions simultaneously eg telephones, computers

COMPUTER VIRUSES, WORMS AND BUGS

A computer virus is a program/code that copies itself and infects the computer without the knowledge of the user.

A virus is designed to infect and affect the computer's performance negatively.

TYPES OF VIRUSES

Viruses are categorized according to the way they behave or the way they hide. Types of viruses as categorized according to the way they behave include

- **Boot sector viruses**

This destroys the booting information on the computer or storage devices. It affects the booting files and causes boot failure.

File viruses

These attach themselves to computer files. They usually delete files or cause erratic behaviors in the file system.

Trojans / Trojan horse

This is a small program code hidden within legitimate software. The software continues to work normally until such a time when the code is activated to cause trouble. A Trojan horse does not have the capacity to replicate (copy) itself like a worm or a virus. The program does irritating actions like flickering of the screen and the cursor disappearing.

Worms

This sticks in the computer memory and re-writes (replicate) itself in the memory until it can't multiply anymore. This causes the computer to stop working because the memory is full.

Backdoors

This may be a Trojan or a worm that allows hidden access to a computer system.

Droppers

These are programs that have been written to perform useful tasks like compressing files, previewing video clips etc. but end up introducing viruses in the system in the process of performing their functions.

Time bombs

A program code that's activated in conjunction with predetermined days/events. For example, Valentines, Fools' Day, Friday 13th etc. These use logical calculations to determine their trigger days. A virus or a Trojan may have a virtual logic in it.

Jokes

A joke is a harmless program that does amusing things on the screen. E.g. Messages like-"Your computer is about to explode in five minutes, please run away....." These messages appear and disappear in few seconds.

Partition Sector Viruses

This is the first sector on a hard disk which contains information about the disk specifications like the number of sectors and tracks in each partition, where DOS partition starts.

When a partition sector virus attacks a computer, it modifies the code located here, causing the computer not to boot fully.

Macro Viruses

With the introduction of macro programming languages in some applications, macro viruses have emerged. These can cause some toolbar icons to work differently. Macro viruses are common in Microsoft word documents.

Multipartite Viruses

These are viruses that use a combination of techniques to infect the different executable files, boot sectors and or partition sectors.

They are normally difficult to trap.

SOURCES OF VIRUSES

Viruses spread in various ways but the most common ways are:-

Fake Games

Computers games are a common source of viruses because most games are irresistible. Virus designers design fake games and attach virus onto them. Once a game is executed, a virus is run and activated.

Contaminated systems

Contaminated computer systems can spread virus if used freely. For example, installation diskettes for a particular application program can introduce viruses on to a system whenever that application is installed. There by spreading the virus. It is also common for pirated software.

Freeware and shareware

These soft wares are usually given/downloaded free of charge. These are good grounds for distributing viruses.

Legitimate Software Updates

Software may get a virus from software house during programming by unscrupulous virus authors or during the distribution say through a network, where they get viruses from the wild viruses across the internet.

Pirated software

The use of pirated software introduces the risk that the software may be contaminated by virus code or amended to perform some other destructive function which may affect the system. Pirated software is that which was copied illegally with an aim of making profit

WAYS OF SPREADING VIRUSES

Viruses are commonly spread or activated in 3 basic ways:

- Opening an infected file
- Running an infected program
- Starting up the computer with an infected floppy diskette
- Use of infected storage devices like floppy diskettes, hard disk etc.
- Through E-mails or distributed maliciously through the internet.
- Through downloads from the internet especially free ones
- Through freeware and shareware.

SYMPTOMS OF VIRUSES

- The computer slows down in operation.
- Executable files increase in number.
- The computer reboots suddenly
- Disk accesses seeming excessive for simple tasks
- Unusual error messages occurring more frequently
- Less memory available than usual
- Access lights turning on for non referred devices.
- Programs and files disappearing mysteriously.
- Computer indicating that the storage devices are full.

DISASTERS CAUSED BY VIRUS

- Damaging programs/software
- Deleting files/data on storage devices
- Formatting the hard disk.
- Boot failure
- Take up / fill up the computer memory
- Causes system crashes.
- Corruption of files
- Slows down the speed of the computer

PRECAUTIONS TAKEN AGAINST VIRUSES (CONTROL MEASURES)

- Ensure that there are regulations and a policy on the usage of computers and their protection (e.g. no foreign diskettes unless first scanned)
- Ensure that the e-mails are from a trusted source before opening them or e-mail attachments
- Avoid opening e-mails before scanning them for viruses
- Install anti-virus utility and update its virus definitions frequently for detecting and removing viruses.
- Avoid sharing of information on storage devices whose source is not clear.
- Purchase software from only authorised dealers.
- Scan for viruses before installing any application software.
- Avoid sharing data on storage devices
- Never start up a PC with a floppy diskette in the drive.
- Scan all the drives and files for possible virus infection before using them.
- Write protect the recovery disk before using it.
- Back up important files regularly.

Anti-Virus Utility/ Program

An anti-virus utility is a program that prevents, detects and removes viruses from a computer's memory or storage devices. This utility is installed into the computer by the computer user or owner to perform the very purpose identified above.

Avast

Avira

Norton
AVG
Penicillin

Mc Afee
Kaspersky

BUGS

A computer bug is an error in a computer system (software or hardware), which causes undesirable results or unwanted procedures.

A bug error can be both software and hardware problem or a programming oversight.

A bug may lead to the program crash or freeze leading to the disruption of service.

DATA SECURITY AND CONTROLS

Computer security risk.

Computer security risk is any event or action that causes a loss or damage to computer hardware, software, data, or information.

With the rise of the information age and society, the need to protect data and information against unauthorized access, disclosure and damage has become very paramount.

Information has been seen as a scarce resource which makes it vulnerable to various threats from malicious and self-seeking individuals.

Data and information security involves:-

- Protection against unauthorized access or modification
- Denial of data and information to unauthorized users
- Provision of data and information to authorized users

Data and Information privacy

Private data or information is that data or information which belongs to an individual and must not be accessed by or disclosed to any other person without direct permission from the owner.

Data or information held by a government or an organization about people is **confidential data**. Private data or confidential data may be seen or accessed by authorized people without the knowledge of the owner. However, it should not be used for commercial gain or any other unofficial purpose without the owner being informed.

Security Threats and Control Measures

Data Security threats may include the following:

1. Viruses
2. Unauthorized access
3. Computer errors and accidental access
4. Theft

1. VIRUSES

This is a computer program that attaches itself to other files and installs itself without the permission of the computer user when the files are opened for use.

2. UNAUTHORIZED ACCESS

This means access to data without permission. Such people will usually have bad intentions either to commit fraud, steal the information and destroy or corrupt the data.

Unauthorized access may take the following forms:

i. Eavesdropping

This is tapping into communication channels to get information. Hackers mainly use eavesdropping to get information. For example to obtain credit card numbers

ii. Surveillance (Monitoring)

This is where a person may keep a profile of all computer activities done by another person. The information gathered may be used for one reason or the other e.g. spreading propaganda and sabotage. Many websites keep track of your activities using special programs called **cookies**.

iii. Industrial Espionage

Spying on your competitor to get information that you can use to counter or finish off the competitor. This is mostly done with an aim of getting ideas on how to counter by developing similar approach or sabotage.

iv. An employee who is not supposed to view or see sensitive data but gets it by mistake or design.

v. Strangers may also stray into the computer room when nobody is there.

vi. Forced Entry into the computer room through weak access points

vii. Network Access incase the computers are networked and connected to the external world.

CONTROL MEASURES AGAINST UNAUTHORIZED ACCESS

- Enforce data and information access control policies on all employees
- Encrypt the data and information during transmission
- Keep the computer room closed when nobody is using it
- Reinforce the weak access points like doors and windows with metallic grills and burglar alarms.
- Enforce network security measures
- Use file passwords to deter any persons who may get electronic files

3. Computer Errors and Accidental Access

Sometimes, threats to data and information come from people making mistakes like printing sensitive reports and unsuspectingly giving them to unauthorized person(s). Also, too much privilege that allows them to change or access sensitive files on the computer then accidental access mistakes may occur.

People downloading features from the internet which they are not familiar with Some of the programs or files downloaded may self-install themselves on the computer and may affect the system.

Measures against errors and accidents

- Give various file privileges and roles to the end users and technical staff in the organization. For example deny access to certain groups of users for certain file and computers.
- Set up comprehensive error recovery strategy in the organization

4. Theft

Data is commonly stolen by competitors or government spies. This can be done paying heavily the person who can access the information.

Measures against Theft

- Employ guards to keep watch over the data centers and their backups
- Burglar proof the computer room
- Reinforce the weak points like windows, doors and roofing with metallic grills and strong padlocks
- Create backups in locations away from the main computing centre.

COMPUTER Cyber crime

Cybercrime refers to online or Internet-based illegal acts.

CYBER CRIMES COMMONLY PRACTICED BY COMPUTER USERS.

- | | |
|------------|--------------|
| · Trespass | · Piracy |
| · Hacking | · Fraud |
| · Tapping | · Sabotage |
| · Cracking | · Alteration |

Trespass

This refers to illegal physical entry to restricted places where computer hardware, software and backed up data is kept. It may also mean accessing information illegally on a local remote computer over a network.

Hacking

A hacker is a person who intentionally breaks codes and passwords to gain unauthorized entry to computer system, data and information files. The hacker therefore violates the security measures put in place such as breaking through passwords or finding weak access points in software.

The hackers usually are:-

- Motivated to take up the challenge and usually feel great after succeeding
- Others do it for companies that produce software to test the security of their system. This is called **professional hacking**.

Tapping

A person sends an intelligent program on a host computer that sends him information from the computer

Another way is to spy on a networked computer using special programs that are able to intercept messages being sent and received by the unsuspecting computer.

Cracking

This refers to the use of guesswork over and over again until one discovers a weakness in the security policies or codes of software.

Cracking is usually done by people who have some idea of passwords or usernames of authorized staff.

Weak access points can also be found in software programs. These weak points can be sealed using another program (special) corrective program) prepared for that. These corrective programs are called **patches**.

Installing the latest patches in software is therefore advisable

Piracy

This refers to making illegal copies of copyrighted software, information or data for commercial gain or personal benefit.

Software, information and data is protected by the copyright law. However there are other ways of reducing piracy, which include:

- Enact laws that protect owners of data and information against piracy (accord patent rights)
- Make software cheap enough to increase affordability
- Use licenses and certificates to identify originals
- Set installation passwords that deter illegal installation of software.

Fraud

This refers to the use of computer to conceal information or cheat other people with an intention of gaining money or information.

People who carry out fraud are called **fraudsters**. These can either be employees of the company or outsiders who are smart enough to defraud the unsuspecting people. Fraudsters;

- Use fake documents
- Ask for account numbers
- Offer huge sums of money for sharing
- Promise fat benefits with terms and conditions

Sabotage This is the illegal destruction of data and information with an aim of crippling service delivery or causing great loss to the organization. It is usually done by disgruntled employees or competitors to harm the organization.

Alteration

This refers to changing data and information without permission with an aim of gaining or misinforming the authorized users. It is usually done by people who want to hide the truth

PROTECTION AND DETECTION OF COMPUTER CRIMES

Data Encryption

This is mixing up data so that only the reader or receiver is able to understand by reconstructing the original message from the mix.

Audit Trail

This refers to a careful study of the information by the experts in order to establish or find out all the weaknesses in the system that could lead to security threats and weak access points for crimesters

Log files

These are special system files that keep a record (log) of events on the use of computers and resources of the information system.

Firewalls

A device or software system that filters the data and information exchanged between different networks by enforcing the host networks access policy.

It monitors and controls access to or from protected networks. People who do not have permission can not access the network.

DATA PROCESSING.

Data processing cycle refers to input – process and output stages that data goes through to be transformed into information.

Data collection refers to data gathering or fact finding.

DATA PROCESSING CYCLE. (STAGES)

Data input

Data processing

Information output

Storage

TYPES OF DATA PROCESSING

Manual- using pen and paper

Mechanical- using devices like typewriters

Electronical- using computers.

STAGES OF DATA COLLECTION.

Data creation. This refers to the process of putting together facts in an organised format

Data preparation (transcription)

This refers to conversion of data from the source document to a machine readable form.

Media conversion. This is changing it from one medium to another for example from a floppy disk to hard disk.

Input validation. These are validity checks by the computers to reduce errors.

Sorting. This refers to arranging of data in a predefined order.

NB. DATA INPUT refers to the process where the collected data is converted from human form to machine readable form.

This takes place at an input device.

Data processing refers to the change of data.

Output refers to making information available to those who need it. (Dissemination)

Distribution/ dissemination can be through;

- Production of hard copies.
- Sending messages over the internet.
- Sending messages over telephone lines.
- Presentation over the radio and television.

ELECTRONIC DATA PROCESSING MODES.

On-line processing

In online data processing data is processed immediately it is received. The computer is connected directly to the data input unit via communication links. Examples of online data processing include internet banking and online payment systems using credit cards.

Real-time processing

A real time processing system is one that processes data without significant delay.

In real time processing the computer processes the incoming data as soon as it occurs, up-dates the transaction file and gives an immediate response that would affect the events as they happen. An example of real time processing is making a reservation for airline seats.

Distributed data processing

Distributed data processing refers to dividing (distributing) processing tasks into two or more computers that are located on physically separate sites but connected by data transmission media. There may be a central computer that receives input from remote computers (terminals), processes the data and updates the master file. If required the output can be communicated back to the remote computers. For example in banks

Batch processing

In batch processing, data is accumulated as a group (batch) over a specified period of time and then processed at once. For example in a payroll processing system, processing report cards for students.

Multiprocessing

Multiprocessing refers to a coordinated type of processing that involves more than one processing unit working on a task at the same time. This is possible in computers such as mainframes and network servers. In such systems, a computer may contain more than one independent central processing unit which works together in a coordinated way.

Multiprogramming

Multiprogramming also called multi-tasking refers to the type of processing where more than one program are processed apparently at the same time by a single central processing unit. As opposed to **Multiprocessing**, in **Multiprogramming** a computer has only one central processing unit. The operating system allocates each program a time slice and decides what order they will be executed.

Interactive processing

An interactive processing system is one that involves communication between the user and the computer during processing.

In interactive data processing, there is continuous dialogue between the user and the computer. As the program executes, it keeps on prompting the user to provide input or respond to prompts displayed on the screen.

Examples of an interactive processing system include :Electronic funds transfer systems, ticket reservation systems and point of sale systems

COMPUTER FILES.

A **file** is a collection of related data or information stored under a given name.

A computer file extension is commonly a three character addition that follows the name of a file. A few of the more common file extensions include

.DOC or .DOCX Microsoft Word for Windows/Word7

.PPT or .PPTX PowerPoint

.XLS or .XLSX Excel spreadsheet

.MDB	MS Access database
.AVI	Multimedia Audio/Video
.BAT	PC batch file
.RTF	Rich Text Format
.EXE	PC Application
.MID or .MIDI	MIDI sound
.TXT	ASCII text (Mac text does not contain line feeds--use DOS Washer Utility to fix)
.ZIP	PC Zip Compressed Archive

THE FUTURE OF COMPUTERS AND THE INTERNET

Some technological advancements and trends are recognisable and can be predicted. It is easy to predict that the computers and related equipment will get faster in memory, smaller and cheaper. Computer technology will find new application and manufacturers will strive to make computing easier and cheaper. As costs decline and performance and ease of use rises, LAN's play a bigger role in corporate information systems.

Possible future trends in computer capabilities, physical size, price and software.

(a) **Future computer capabilities.** On the capabilities fronts, computers are going to evolve. They;

- are going to have more powerful, smaller processor and faster access to memory.
- Will have operating systems that will handle real time data analysis and object oriented.
- Will have improved user interfaces that offer users easier and more intuitive access to information.
- Will have multi-media applications that will be fully incorporated into some information systems because data is easy to interpret when presented as a combination of sight, sound and motion.

(b) **Physical size.** Most hardware components will get smaller and faster. This means computers will become smaller and do more.

(c) **Price.** As technology advances, the price of computers will go down. Every sphere of life will be permeated by computers, which will be common even among people of average earning.

(d) **Software.** Software development will also develop to allow users easily operate computer systems. To facilitate document, the best programming and operating systems

are moving towards object-oriented system. OS will play an integral part in giving the user more control over how data are linked and shared. New operating systems will focus on object linking, message passing and data sharing.

(e) **Artificial intelligence.** Artificial intelligence is the process of building computer systems that simulate human thought processes and actions. The goal of artificial intelligence is not to replace human intelligence which is not replaceable; rather it is to help people to become more productive. In the past, computers used calculating power to solve structured problems. This field of artificial intelligence is moving in the mainstream of data processing.

Artificial intelligence attempts to develop computer systems that can mimic or simulate human thought processes and actions. This include reasoning and learning from past actions. True artificial intelligence that corresponds to human intelligence is still a long way off. However, several tools that emulate human problem solving and information processing have been developed. Many of these tools have practical applications for business. They include expert systems, natural language processing, artificial neural network and robots.

Expert systems. Expert systems are computer programs that essentially emulate the knowledge of human experts skilled in a particular field for example of a geologist or a medical doctor. They have both textbook knowledge and tricks of trade that an expert acquires after years of experience as a result of the programs that can be really complicated.

Areas of application

Finance/Business planning

Teaching field. They compliment teachers knowledge e.g typing tutor, project planning and monitoring.

Special areas. Act as substitute for retiring human experts.

Natural language processing. Natural language processing is the capacity of computers to “understand” human language and translate it into actions upon which to act. For instance, you could create a list of students from a data base by typing print a list of students with outstanding balance of greater than 100,000. It is expected in future, language processing software will understand language from a speaker ad translate it into any other language upon which to act.

Artificial Neural Networks. Present computers and super markets are relatively slow because of the build in structural limitations. The processor and the main memory are physically separated. Although joined by communication links, the processor spends most of its tie waiting for data to come from or go to memory. The arrangement is known as the Von Neuman Architecture after its originator John Von Neuman. With the scheme known as Neutral networks however, a computer will have a scheme resembling those in human brain and nervous system. It is believed that data will be transmitted to

and from the processor at many times the speed of the old arrangements. This type of network is expected to help in image recognition, handwriting and speech recognition. **Robots..** Robots are machines that are used in factories and can be programmed to do more than one task. Robots are used in the manufacturing industry mainly to reduce costs and increase productivity. They are excellent in executing repetitive tasks that human beings find boring. Robots do not get tired. They are also ideal to replace human beings on hazardous jobs. They are different types of robots which include;

POSSIBLE FUTURE TRENDS OF THE INTERNET

- The internet will continue to expand and change in several ways; faster connections, more users, new multimedia and virtual reality services.
- More interactive services such as multimedia newspapers, livestock market tickers, automatic notification of when pre-destinated events take place anywhere on the internet.
- Internet as universal as a radio and television today.
- Learning will become any time anywhere.

EMERGING TECHNOLOGIES

This refers to technical innovations which represent progressive developments within a field for competitive advantage E.g

Green computing

Cloud computing

Robotics

THE CONCEPT OF GREEN COMPUTING

Green computing, green technology or ICT sustainability.

It refers to environmentally responsible use of computers and IT related resources.

Or **Green computing** is the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems such as monitors, printers, storage devices, and networking and communications systems efficiently and effectively with minimal or no impact on the environment.

It involves the implementation of energy efficient central processing units (CPUs), servers and peripherals as well as reduced resource consumption and proper disposal of electronic waste (e-waste)

GOALS OF GREEN COMPUTING

- 1) To reduce the use of hazardous materials
- 2) To maximise energy efficiency during the product's lifetime
- 3) To promote the recyclability or biodegradability of outdated products and factory waste.
- 4) There is a need to make the use of computers as energy efficient as possible

STEPS THAT CAN BE TAKEN TO IMPLEMENT GREEN COMPUTING:

- Create a power plan which allows the system to automatically turn off components such as monitors and hard drives after set periods of inactivity.
- Avoid using the computers for long periods of time as this may lead to health and safety problems.
- Use liquid-crystal-display (LCD) monitors rather than cathode-ray-tube (CRT) monitors . This is because, CRT monitors emit a lot of electromagnetic radiations.
- Promote the recyclability or biodegradability of malfunctioning products and factory waste.
- Use notebook computers rather than desktop computers whenever possible. Notebooks computers consume less energy emit very little heat and other electromagnetic radiations.
- Minimize the use of paper and properly recycle waste paper.
- Recycle computing equipment as this can keep harmful materials such as lead
- Dispose of e-waste according to federal, state and local regulations. Implement telecommuting (in which workers can accomplish much of their work away from their standard work places preferably from home). This reduces greenhouse gases emitted during travel, increases worker satisfaction and increases profit margins as a result of lower costs for office space, heat, lighting, etc.
- Terminal servers should be used instead of standalone computers. This cuts down power consumption to around 1/8 the amount of energy of a normal workstation, resulting in a decrease of energy costs and consumption.

Advantages of green computing

- Reduced energy usage from green computing helps lower carbondioxide emission that comes from fuel used in power plants and transportation
- Conserving resources means less energy is required to produce , use and dispose off products
- Saving energy and resources saves money

Disadvantages of green computing

It is costly energy efficient equipment are expensive.

It requires extra training to use some gadgets that are energy efficient.

Rapid technological change with its associated disadvantages like loss of competitive advantage to businesses

Cloud computing means storing and accessing data and programs over the internet.

Advantages of cloud computing

- **Less maintenance** – hardware, applications and bandwidth are managed by the provider.
- **Scalability** – you pay only for the applications and data storage you need.
- **Expert service** – services are continuously monitored and maintained by the service provider.
- **Continuous Availability** – public cloud services are available wherever you are

located.

ELECTRONIC PUBLICATION

Publishing is the process of production and dissemination of information. The activity of making information available to the general public.

Publishing involves the creation, compilation, and mass reproduction of graphic and text images.

EXAMPLES OF ELECTRONIC PUBLISHING SOFTWARE

Adobe FrameMaker, Adobe InDesign, Adobe PageMaker, Adobe HomePublisher, Microsoft Office Publisher

EXAMPLES OF PRINT PUBLICATIONS

- | | | |
|----------------------|------------------|--------------------|
| · Advertisements | · Business Forms | · Greeting Cards |
| · Award Certificates | · Calendars | · Invitation Cards |
| · Banners. | · Catalogs | · Menus |
| · Brochures | · Envelopes | · Newsletters |
| · Business Cards | · Flyers | |

Electronic publishing involves

- a) **Online Publishing** -putting content on internet
- b) **Web publishing** -putting content on website
- c) **Desktop publishing** -The production of printed matter by means of a printer linked to a desktop computer, with special software

ADVANTAGES OF ELECTRONIC PUBLISHING

1. Products are easy to produce and edit
2. Products can be made available immediately on the Internet
3. Content can be very rich in form of, Video, Audio, Text.
4. Product can be used on many devices including Computer, Smart Phone, Tablet media players
5. From a financial standpoint, it is often a cheaper option
6. The actual time it takes for a book to get published is much faster than in traditional publication.
7. Storage in itself is a great advantage to this form of publishing. Unlimited space makes it easy for everyone to maintain files

DISADVANTAGES:

1. A computer or other electronic device is required for use
2. Electronic media is easier to steal

3. Securing media is possible but more expensive
4. Consumers are more likely to pirate media than traditionally published materials
5. Some consumers prefer traditionally published material
6. Technological fears
7. Difficulties in viewing content

COMPUTER CAREERS:

Computer and information system manager. *These professionals serve as technology managers and decision makers within an institution or on a consulting basis. They ensure that the information technology and telecommunications of the company work and run smoothly.*

Computer scientists. *He can perform a wide range of jobs in information technology and related fields. A computer scientist often uses current forms of technology, or creates new ones, in order to solve complex problems, thus applying information technology principles to real-world situations.*

Computer support specialist. *A computer support specialist assists people when they are having technical trouble with their computers. It is their responsibility to identify any technological problems and then try to fix them.*

System analyst. *Computer systems analysts are responsible for using their information technology skills to help different businesses and organizations operate at maximum potential. The analysts formulate a plan and design (or perfect) systems that will help the company achieve their goals.*

System designer. *Those who work in computer systems design create computer and IT systems that allow businesses and other entities to operate effectively and efficiently.*

Computer programmer. *Computer programmers often work with software engineers to convert a newly designed application into functional computer code so that the computer can understand the instructions and run the program. Computer programmers also maintain and update already existing applications. They can repair buggy programs.*

Database administrator. *Database administrators are responsible for handling the information stored on the computer databases of various businesses and organizations.*

Network administrator. *Network administrators are responsible for building, maintaining, managing, and repairing an organization's computer networks.*

Software engineer. *Software engineers create and develop all kinds of software programs, such as video games, computer operating systems, network systems, business applications, and so on.*

GOOD LUCK