TABLE OF CONTENTS

O-LEVEL (840) COMPUTER SYLLABUS 6
A'LEVEL SUB ICT (S850) SYLLABUS 7
INTRODUCTION TO COMPUTERS 8
COMPUTER 8
FUNCTIONS OF COMPUTERS 8
CHARACTERISTICS OF MODERN COMPUTERS 9
APPLICATION AREAS OF COMPUTERS IN OUR SOCIETY TODAY 9
BOOTING A COMPUTER 10
THE COMPUTER LABORATORY 10
Characteristics/Elements/ components of a computer lab. 10
Factors considered when setting a computer laboratory. 11
COMPUTER AND LABORATORY CARE 11
THE HISTORY OF COMPUTERS 11
THE MECHANICAL COMPUTERS THE MECHANICAL ERA 12
ELECTRONIC DIGITAL COMPUTER 13
COMPUTER GENERATION 13
THE FIRST GENERATION OF COMPUTERS (1940-1959) 13
SPECIAL DISCOVERIES IN THE FIRST GENEARATION 14
THE SECOND GENERATION OF COMPUTERS (1959-1964) 14
SPECIAL DISCOVERIES IN THE 2ND GENERATION 14
3. THE 3RD GENERATION OF COMPUTERS (1964-1972) 14
CHARACTERISTICS 14
4. THE 4TH GENERATION OF COMPUTERS (172-date) 15
CLASSIFICATION OF COMPUTERS 15
Classification by Type 15
Classification of computers by size and operational speed 16
SUPER COMPUTERS 16
Characteristics of super computers 16
MAIN FRAME 16
Characteristics of Mainframe 16

MINI COMPUTES 16
Characteristics of mini computers 16
MICRO COMPURERS (PERSONAL COMPUTERS) 17
PORTABLE COMPUTERS 17
Characteristics of portable computers 17
Classification of Computers by processor type and speed 17
Classification of computers by purpose 17
COMPUTER SYSTEM 18
COMPUTER HARDWARE 18
Hardware elements are classified into 18
1. CENTRAL PROCESSING UNIT (CPU) 18
Main memory 18
THE RANDOM ACCESS MEMORY (RAM) 19
THE READ ONLY MEMORY (ROM) 19
A. THE MROM 19
UNITS OF STORAGE CAPACITY AND MEMORY CALCULATIONS 20
2. INPUT DEVICE 21
Examples of input devices; 21
A Keyboard consists of: 24
THE MOUSE 25
SCANNER 26
THE DIGITAL CAMERA: 26
VOICE RECOGNITION EQUIPMENT 26
BAR CODE READER 26
OPTICAL CHARACTER READER (OCR) 27
OPTICAL MARK READER (OMR) 27
MAGNETIC INK CHARACTER READER (MICR) 27
LIGHT PEN 27
OUTPUT DEVICE 27
OTHER OUTPUT 27
Both Input–Output Devices: 27
THE MONITOR (VDU) 29
COMPARISON OF LCD AND CRT: 30
LCD: 30

PRINTERS: 30
IMPACT PRINTERS 30
DOT MATRIX PRINTERS 30
DAISY WHEEL PRINTERS 31
THERMAL PRINTER 31
Characteristics of Impact Printers 31
NON-IMPACT PRINTERS 31
Differences between impact and non-impact printers 32
PLOTTERS 32
SECONDARY STORAGE DEVICES AND MEDIA 32
THE OPERATING SYSTEM (OS) 34
FUNCTIONS OF AN OPERATING SYSTEM (OS) 35
CLASSIFICATION OF OPERATING SYSTEMS. 35
UTILITY SOFTWARE 36
PROGRAMMING LANGUAGES 36
LANGUAGE TRANSLATORS / LANGUAGE PROCESSORS 37
Advantages of off-shelf packages over customized packages 38
INTRODUCTION TO WORD PROCESSING 39
(MICROSOFT OFFICE WORD) 39
An electronic word processor (word processor) 39
Examples of word processors 39
Advantages of using electronic word processor 39
Creating a document on a blank window 39
Protecting a document with a password. 40
Paragraph formatting. 41
Creating and manipulating tables 42
THE INTERNET AND WORLD WIDE WEB (WWW) 43
THE INTERNET 43
WORLD WIDE WEB (WWW) 43
Basic requirements for the WWW 43
The internet service provider (ISP) 43
Services offered by ISPs 44
Advantages of using internet 44
Disadvantages of using internet. 44

INTERNET TERMINOLOGIES..... 45
Characteristics of server computer. 45
Elements of an email address. 46
FACTORS THAT AFFECT THE SPEED OF THE INTERNET 47
NETTIQUETE 48
Netiquette for E-mail communication 48
Netiquette for online group Discussion 48
COMPUTER MALWARE, VIRUSES AND WORMS 48
VIRUSES: 49
WORMS 52
HOW VIRUSES SPREAD 52
HOW TO STOP THE THREAT OF VIRUSES AND OTHER MALWARE PROGRAMS 53
DATA COMMUNICATION & NETWORKING 53
Elements of data communication 53
DATA COMMUNICATION TOOLS. 54
DATA TRANSMISSION MEDIA 54
TYPES OF TRANSIMISSION MEDIA 54
Wireless data transmission media. 55
Categories of wireless transmission media. 55
COMPUTER NETWORKS 55
BASIC REQUIREMENTS FOR SETTING UP COMPUTER NETWORKS 56
Bridges come in three basic types: 57
Advantages of Computer Networks 58
Disadvantages of Computer Networks 59
Types Of Computer Networks 60
TYPES OF NETWORK MODELS 61
Peer-to-peer (P2P) 61
Peer-to-peer (P2P) 61
Network structure/topology (not examinable at A' Level) 61
TYPES OF NETWORK TOPOLOGY 62
BUS Topology 62
RING Topology 62
STAR Topology 63
MESH Topology 64

TREE Topology 64
HYBRID Topology 65
Features of Hybrid Topology 65
INTRODUCTION TO DATABASE 66
(MICROSOFT ACCESS) 66
Functions of a database software. 66
Database models. 66
Features of a database management software. 66
Guidelines for designing a good database. 67
Description of field data types. 67
Terms used in relation to database. 67
INTRODUCTION TO SPREADSHEETS (Microsoft office excel) 69
CELL REFERENCE. 70
SYSTEM SECURITY AND ICT ETHICAL ISSUES. 78

O-LEVEL (840) COMPUTER SYLLABUS

SENIOR 1	TERM 1 – 2	TOPIC 1: INTRODUCTION TO COMPUTERS	1.1 Computers Today 1.2 Evolution of Computers 1.3 Uses and Functions of a Computer 1.4 Computer Care and Safety 1.5 Keyboard and Navigation 1.6 Categories of Computers 1.7 Classification of Computers 1.8 The Computer System
	TERM 2 – 3	TOPIC 2: COMPUTER HARDWARE	2.1 Components of Computer Hardware 2.2 Application of Hardware Components
SENIOR 2	TERM 1	TOPIC 3: COMPUTER SOFTWARE	3.1 Introduction to Software 3.2 System Software 3.3 Application Software
	TERM 2	TOPIC 4: WORD PROCESSING	4.1 Introduction to Word Processing 4.2 Word Processing
	TERM 3	TOPIC 5: COMPUTER PRESENTATION	5.1 Introduction to Presentation Software 5.2 Presentations
SENIOR 3	TERM 1	TOPIC 6: SYSTEM START-UP AND CONFIGURATION	6.1 Computer Booting 6.2 System Configuration 6.3 Software Installation 6.4 Computer Troubleshooting
		TOPIC 7: COMPUTER COMMUNICATION AND NETWORKING	7.1 Introduction to Computer Communication 7.2 Computer Networks
	TERM 2	TOPIC 8: SPREADSHEETS	8.1 Introduction to Spreadsheets 8.2 Spreadsheets
	TERM 3	TOPIC 9: WEB DESIGNING	3.1 Introduction to Web Design 3.2Web Design
SENIOR 4	TERM 1	TOPIC 10: DATABASES	10.1 Introduction to Databases 10.2 Database Design
	TERM 2	TOPIC 11: ELEMENTARY COMPUTER PROGRAMMING	11.1 Introduction to Programming 11.2 Developing a Simple Program
	TERM 2 – 3	TOPIC 12: TRENDS IN COMPUTING	12.1 Computer Integrity and Security 12.2 Computer Ethics 12.3 Computers and Society 12.4 Emerging Technologies 12.5 Systems Analysis 12.6 Computer Professions

A'LEVEL SUB ICT (S850) SYLLABUS

S.5 TERM 1	
Introduction to Computing	• Introduction to Computers • World of ICTs • Implications of using ICTs (Advantages and Disadvantages)
Computer Management	• Booting process • File Management • Common Utilities • Print Management
Computer Laboratory Care and Maintenance	• Computer Literacy • Secure Laboratory Environment • Servicing and Maintenance
Computer Word Processing I	• Introduction to Word Processing • Working with Word processing software
S.5 TERM 2	
Computer Hardware	• Input devices • Output devices • Storage devices • Processor Components
Computer software	• System Software • Application software
Electronic spreadsheets I	• Introduction to spreadsheets • Working with spreadsheets • Managing spreadsheets • Formulas and functions
Internet and WWW	• Introduction to the Internet • Wide Web • Internet Services • World Wide Web
S.5 TERM 3	
Computer Word Processing II	• Page Layout • Date tabulation • Use of objects • Document accuracy • Mail merge, document referencing and printing
Electronic Presentation	• Introduction to Electronic Presentation • Working with Presentation software • Developing a presentation • Charts • Graphical objects • Presentation output • Slide show
S.6 TERM 1	
Data communication and Networking	• Introduction to Data Communication • Introduction to Computer networks
Electronic Publication	• Introduction to Electronic Publishing • Publishing Basics • Document Layout • Document Enhancement • Outputs • Complete publication • Web Publishing
S6 TERM 2	
Electronic Spreadsheets II	• Working with Charts • Worksheet Page Layout • Printing a worksheet
Databases	• Databases • Introduction to Databases • Database objects
S.6 TERM 3	
System Security, ICT Ethical issues and Emerging Technologies	• Computer System Security • Privacy and ICT ethical Issues • Emerging Technologies • ICT industry

INTRODUCTION TO COMPUTERS

COMPUTER

It is a programmable electro-mechanical device (machine) that can accept data, stores it, process it, retrieves it and output information.

A computer is a general-purpose machine that performs tasks in response to instructions given to it and stores information.

An automated electronic device operating under the control of instructions, accepts and stores data in its own memory performs arithmetical and logical operation, and produces output at a very high speed.

A computer is capable of storing very large amount of information and carry out data processing extremely fast. The operating speed of a computer is measured in **millions of instructions per second (M/s).** The unit of Measurement is in Megahertz (**MHz**) or in Gigahertz (**GHz**)

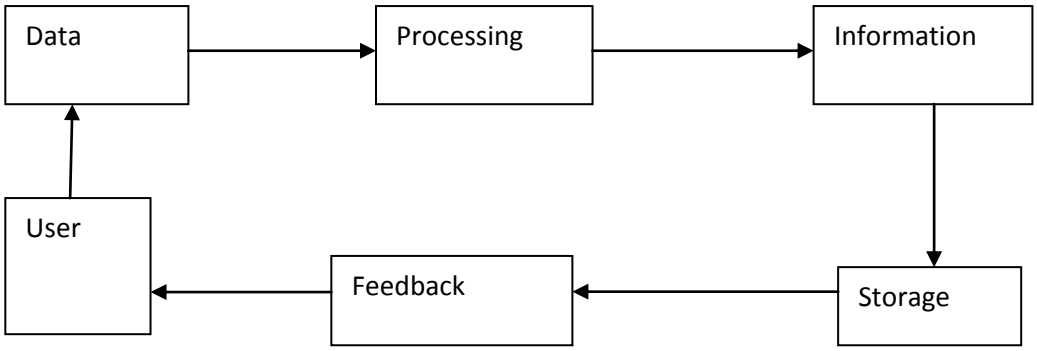
Note:

***Data*;** refers to the raw material input into the computer

Informationis referred to as the Processed Data. Memory is the storage capacity of a computer, or scratch pad on which data or information is stored.

Examples of data include; unsorted names, numbers, figures.

Examples of information include; bank statement, payment receipt, invoices, sorted and arranged names.



FUNCTIONS OF COMPUTERS

1. They are used for communication
2. Writing letters documents and drawing graphics
3. Used for storage of information for future use
4. Used for entertainment
5. for making reports and calculating
6. Used in research and education

CHARACTERISTICS OF MODERN COMPUTERS

1. **SPEED** this is the ability of a computer to do work in a short time.

2. **Accuracy** this is the ability of a computer to do work without mistakes.

3. **Diligence** this is the ability of the computer to do worker repeatedly without getting tired or bored.

4. **Automation / programmable** this is the ability of the computer to follow instructions (Programs) and do work in the absence of the operator. (Which means the computer is Automatic)

5. **Storage** this is the ability of the computer to record and safely keep information or data for both now and future use.

6. **Interactive** this is the ability of a computer to respond to instructions of the user or operator in order to process data.

7. **Communication** this is the ability of a computer to share information with another computer especially in networking.

8. **Versatility** this is the ability of a computer to perform tasks in many different ways or skills.

APPLICATION AREAS OF COMPUTERS IN OUR SOCIETY TODAY

1. Industry computers are used in industries to carry out process and also manage quality control e.g. in car industry

2. Education they are used in education as teaching aids nowadays. Computers are used for long distance learning were a student interacts with a teacher via the computer. It is called E-learning (electronic learning

3. Police and defense computer s are used in military and police departments to analyze and finger prints of criminals and keep information.

4. Research computers are widely used in collection data and analyzing data to produce organized information. They are also used to analyze scientific research institutions.

5. Heath and care computers are used in hospitals to monitor patients in critical conditions. They are also used in hospital laboratories to analyze diseases and their medical care.

6. Leisure and home computers are used for leisure and entertainment because of availability of computer games. They are used in homes for shopping through the internet.

7. Communication in the telephone industry, computers have played a great role in relieving calls, determining their periods of transmission plus sending messages in case of error. They are also used in weather forecasts to predict weather conditions and on the internet to receive and send message using the **Electronic Mail (E-Mail**) and the **Internet Relay Control** (IRC) tool

8. Process control computers can be used to control-bio-chemical processes in laboratories and in manufacturing plants, car assembling plants.

BOOTING A COMPUTER

Booting is a process by which a computer is started (set) or restarted (reset). There are two basic ways of booting a computer and these include.

Cold booting: this the process in which a computer I started using the on and off button given that it was not previously on

Procedure followed

- switch on the wall switch/socket
- switch on UPS
- switch on CPU
- switch on Monitor
- password (if any)

Warm booting:

This is the process of restarting computer which has been previously on. This is normally done by ***Alt + Ctrl + Del*** keys at the same time.

Procedure followed.

- click on start
- select shut down/turn off/log off
- click on re-start option

Shutting down a computer

To shut down a computer system one should ensure that there is no program running currently. The person can then follow the following procedures to shut down

- Click Start button
- Click shut down / turn off button on the start menu
- Click Switch off / turn off

OR

- Press Alt + Ctrl + Del combination keys
- Click shut down / switch off

THE COMPUTER LABORATORY

A computer laboratory is a special room set aside and prepared for safe installation and use of computers and where computer practical and lessons are carried out.

In schools, a computer laboratory provides a safe place where teaching and learning of ITC and computer studies and related disciplines are done.

Characteristics/Elements/ components of a computer lab.

- it should be well ventilated
- Windows should be wide enough and with bugler proofs to avoid un authorized entry through the window.
- Windows should have curtains to regulate the amount of light from outside.
- It should have a qualified lab attendant and technician.
- The flow should be dust free and should have a carpet.
- The surrounding vegetation should be covered with green vegetation to avoid dust from outside.
- Computers should be well spaced to allow privacy for the users.

- ❖ Computers in the lab should be well connected with power stabilizers to avoid power shock.
- ❖ The cabling system should be done well to avoid danger to the users.
- ❖ The veranda should extend away to avoid rain drops.
- ❖ There should be covers to cover the computer to protect them from dust.

Factors considered when setting a computer laboratory.

The following are the factors considered when setting a computer lab.

- ✓ Number of users.
- ✓ Number of computers to install.
- ✓ Access to stable power supply.
- ✓ Access to network.
- ✓ Security of computers and users.

COMPUTER AND LABORATORY CARE

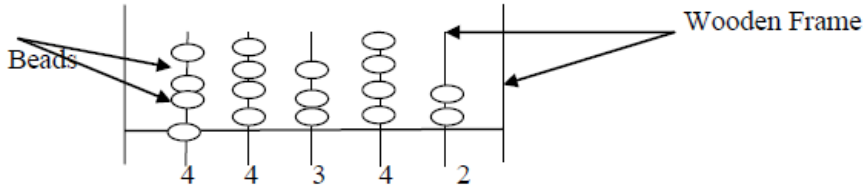
- ✓ The Lab. should be dust free, should be air-conditioned to regulate the temperature.
- ✓ The Micro-computers should not be exposed t direct sunlight.
- ✓ The computers should be regularly serviced at least once a year or frequently if the environment is dusty, the service should normally include blowing dust from the systems unit, cleaning floppy drives and disk, cleaning the keyboard including all the keys and cleaning the monitor externally.
- ✓ Food and drinks shouldn't be allowed near the computers
- ✓ The peripheral devices such as printers and mouse should be regularly serviced.
- ✓ In areas where the power is unstable, it is important to use stabilizers or UPS(Uninterrupted Power Supply)
- ✓ The computer should be kept away from both magnetic and electrical materials.

THE HISTORY OF COMPUTERS

Computers were introduced due to a need for storage and quick processing of data into information for immediate and future use. The increasing demand for such quick and efficient methods to achieve high productivity during the industrial revolution led to the birth of the famous ***Mechanical era*** of ***1623 – 1945***.
It was a period of invention of huge mechanical devices that were supported and run by large power houses and managed by professional expertise.

A. THE ABACUS

The expansion of trade and commerce together with the need for accurate records created a demand for tools needed for calculating. One of such a tool was the Abacus; which appeared in many forms depending on various designs from the Chinese, Babylonians and other kingdoms that were involved in major trade systems at the time. It basically consisted of knots in strings, pebbles in trays and beads on a wooden frame. These were moved up and down in order to make calculations.



The early versions are said to have been developed by the Chinese and the Babylonians between 500 -1000BC. However, the most widely used form of the abacus was made of the beads and wires/rods. By moving the beads on the rod/wire, the user was able to perform addition and subtraction more rapidly.

B. NAPIER'S BONES

In 1615, John Napier a Scottish mathematician invented a computing device that could make multiplication and division easy. This device used a number of sticks made from Ivory which were marked in a manner similar to some currently used multiplication tables. The devices become known as Napier's bones because of the ivory sticks that looked like human bones. The principle of Napier's bones was later used by William Oustraight who in 1620 invented the first Slide Rule. The rule was used for the next 350 years by business men and scientists until it was replaced by the pocket calculator in the 1970's.

THE MECHANICAL COMPUTERS THE MECHANICAL ERA [PERIOD] OF 1623 - 1945 ***Definition:*** The mechanical era is a period in which computers were characterized by rotating parts such as motors, conveyor belts, mechanical relays and dials and used punched cards to input and output data and information. The devices in this period were manually run together with the help of other power sources. There were a number of machines that were produced in this period; among which we have:

C. PASCAL'S ARITHMENTIC MACHINE

In 1642, a Frenchman called Blaise Pascal is given credit for having invented the first mechanical adding and subtracting machine that used a system of gears and wheels. It had digits from 1 - 9 arranged on wheels similar to an odometer on a motor car. His device was known as the ***Arithmetique***Machine

D. VON GOTTFRIED LEIBNITZ'S STEPPED RECKONER

In 1694, Von Leibnitz, a German mathematician improved Pascal's arithmetique machine from one that could only add and subtract to one that could also perform multiplication and divisions. He renamed the machine the ***Stepped Reckoner.***

E. THE ARITHEMOMETER

In 1620, another Frenchman called Thomas Decolommal invented a calculating machine which he called the ***arithmemometer***. He produced many of these machines and later made an industry.

F. JACQUARD'S LOOM

Joseph Marie Jacquard was the first Frenchman to invent a machine that was used in the weaving industry. It used metallic cards punched with holes for storing data (designs). This method of storage was known as the Hole and Hole method. The machine was automatic and could weave threads into tapestries. The patterns of design were based on

pre-set instruction in the punched cards. He named his machine the LOOM and become the first weaving device at the time

G. THE ANALYTICAL ENGINE [CHARLES BABBAGE]

In 1822-1834, Charles Babbage invented an Analytical Engine. The machine was programmable and big as a house with six (6) steam engines for power. It used punched cards to input and the storage mechanism of the engine; Babbage called the two main parts of the engine —sheer‖ and —Mill‖. The store was where numbers were held and the mill was manipulated into new results. In other words, the mill was the modern day processor and the sheer was the modern day RAM or memory. He wrote a 20-paged manual describing how the machine was to be operated. He is known as the father of all computers because his device had all the features of the modern computer. However, he did not complete the engine and died just before he fully used it. An American lady known as Lovelace Ada Byron took over the project and turned the machine into an automatic system. She changed the rectangular punched cards into circular one by creating a sequence of holes on the card thus making the machine automatic. It could pick instructions from any point on the punched card since it was circular. With is idea of programming loops, she became the first world programmer and she added 50 pages to the 20-paged manual of Babbage.

H. HERMAN HOLLERITH'S TABULATOR

Herman Hollerith invented a tabulating machine that used punched cards to store and tabulate data. In 1890, the USA government used his machine to carry out its census. He later started a company that could produce these tabulators and sell them over the world. This company later combined with others to form the famous IBM (International Business Machine) company.

ELECTRONIC DIGITAL COMPUTER

The first digital computer was made in Germany in 1941 by Zuse Conrad. It was destroyed during the world war and it had not been known yet outside Germany.

COMPUTER GENERATION

A computer generation refers to the period when computers changed from simple technology to advanced technology. Or a computer generation refers to the change of technology of computers over years. There are a number of generations where computers have changed these include

THE FIRST GENERATION OF COMPUTERS (1940-1959)

i. This existed between 1945 and 1959.
ii. They were large in size and could fill a very big room.
iii. They used large quantities of Electricity and could give off a lot of heat.
iv. The y used vacuum tubes as their primary electronic component
v. They used punched cards to input and output data
vi. They were expensive

vii. They were programmed in low level languages such as Assemble and machine languages

viii. They could store little information because they used Magnetic drums which had limited memory.

SPECIAL DISCOVERIES IN THE FIRST GENEARATION

Discovery of the **UNIVAC** (Universal Atomic Computer) Discovery of the **ENIARC** (Electronic Numerical Atomic Research Computer)

THE SECOND GENERATION OF COMPUTERS (1959-1964)

Characteristics

i. They existed between the 1959 and 1964

ii. They were smaller in size compared to the first Generation computers.

iii. They used less quantities of Electricity than in the first Generation computers.

iv. In the first generation of computers they use Vacuum tubes but in the second Generation they used transistors as their primary electronic component.

v. They entered and used magnetic tapes to input and output data

vi. They were cheap than the first generation computers

vii. They were programmed in High level Languages such as FORTRAN (FORmaulaTRAnslation) **COBOL (Common Business Oriented Language)**

viii. Computers in the second generations had to increase speed and reliability

SPECIAL DISCOVERIES IN THE 2ND GENERATION

Introduction of Supper computers such as **IBM** 730 and **LARC** (Liver More Atomic Research Computer)

3. THE 3RD GENERATION OF COMPUTERS (1964-1972)

CHARACTERISTICS

i. They existed between 1964 and 1972.

ii. They are smaller than the first and second generation. In terms of size

iii. There was introduction of Operating System such as MULTICS.*(is OP which produces information in butches i.e. every information is put first then process is done at once. Online OS similar to Macintosh OS2) it follows processes one after the other*

iv. There was introduction of Large Scale Integration (LSI) technology, it's the kind of technology were 100-10000 transistors are brought together onto a single chip.

v. There was introduction of Integrated Circuit (ICs), *a device that brings together many electronic components onto a single package. Electronic components are normally transistors.*

vi. They stored information on Magnetic devices called **Metal Oxide Semi-conductors** (CMOS)

vii. They were programmed in simple languages such as **BASIC** (Beginners all Purpose Symbolic Instruction Code)

viii. There was introduction of **Micro- computers**. Kind of computers which used Micro-processors

4. THE 4TH GENERATION OF COMPUTERS (172-date)

Characteristics

i. It spanned since 1972

ii. It stored information on **Complementary Metal Oxide Semi-conductor** (CMOS) other storage devices included Compact Disks CDs, Zip Jazz Diskettes, 2 inch Diskettes.

iii. Programmed in special scientific Programs such as **FORmulaTRAslation** (FORTRAN) **COBOL** (Common Business Oriented Language C+, C++., Visual Basic, HTML (Hyper text Mark-up Language)

iv. Introduction of Portable Computers such as Laptops

v. Introduction of Networking Technology and Operating Systems.

vi. Introduction of **Very Large Scale Integration (VLSI**) technology, a kind of technology that where more than 10000 transistors are brought together into a single-chip

CLASSIFICATION OF COMPUTERS

Computers are classified according **to size, speed, processor, purpose and Mode of operation type or power**

Classification by Type

Computers are basically categorized into two groups; that is to say:

i. Digital computers

This is the kind of computers which represent information in form of 0's and 1's. it can be defined as a computer. It represents information using discrete values of 0's and 1's. They use 0's for off and 1's for on. ***Examples*** include; Digital watches, Digital cameras, Mobile Phones, Pocket calculators.

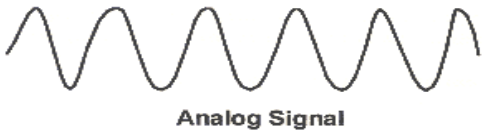
ii. Analog computers

This is a kind of computers which transmit the information or represent their information in form or using physical quantities such as Temperature, Pressure, and Distance etc. they can also be defined as Computers which represent information using continuous values on physical quantities or measuring quantities of temperature, Pressure, distance etc. ***examples*** include Thermometers, voltmeters, barometer, Anemometer, Analog watches

iii. **Hybrid computer** it is as a combination of both Digital and Analog computer technologies. They are commonly used present like in weather stations, air trafficking. **Hybrid computers** Hybrid computers are a combination of Analog and digital technologies. In this type, some calculations are performed in digital system of a computer while others are performed on the Analog portion of the computer. Such computers are used for scientific applications and in industrial processes. ***Examples*** of Hybrid include

- ✓ Satellite

- ✓ The WAT 1001 mainframe computer that connects the internet to the satellite
- ✓ Typical computers (laptop)



Analog Signal

Digital Signal

Classification of computers by size and operational speed

From the biggest to the smallest, we have.

SUPER COMPUTERS

These are the largest computers with faster processing power using multiple processors and superior technology. They are used for complex work or tasks which require a lot of computation power. They are also used in complex application such as weather forecasting.

Characteristics of super computers

a) They are large in size

b) They have higher processing speed than the mainframes

c) They have a higher storage capacity than Mainframes

MAIN FRAME

They are large computers in terms of capacity and speed.

Characteristics of Mainframe

a) They are very large computers with a very high capacity of main storage

b) They have large data storage

c) They transfer data at high speed

d) They are operated by special qualified operators and programmers

e) They should be kept in air-conditioned huge rooms since they are sensitive to temperature changes, humidity and dust.

f) They can accommodate more than one user ie 100-500 on one machine

MINI COMPUTES

Mini computers are widely used in real time applications such as Air-trafficking control and Factory automation systems.

Characteristics of mini computers

a) They are physically smaller than mainframe

b) They have lower speed compare to mainframe.
c) Their storage capacity is less than that of mainframe
d) They can't support a number of concurrent users e 50- 100 users per computer
e) Minicomputer scan support a limited range of peripheral devices.

MICRO COMPURERS (PERSONAL COMPUTERS)

Personal computer systems are the smallest general manipulators that can be programmed to process a countless number of applications.

Characteristics of Micro computers

a) Relatively cheap

b) Smaller in size than mini computers.

c) They are fast in processing data

NB: micro computers have a wide application in the computer industry due to their size and cost.

PORTABLE COMPUTERS

These are small computers using micro processor like the Micro computers but can be carried from place to place unlike the Desk-top PCs examples include of Laptops, Palmtops, Notebook computers

Characteristics of portable computers

a) They are potable due to their size

b) Relatively cheap

c) Smaller in size than mini computers

d) They are fast in processing data

Classification of Computers by processor type and speed

Due to the rapid change in technology, processor power has also increased and the computers are getting faster and faster. The higher the processors power the faster the computer. Earlier computers had power less than 0.4MIPS [Millions of instructions Per Second] but today 15MIPS is the minimum. People classify computers (Micro computers) by the type of processor power they possess. Examples are show in the table below

Classification of computers by purpose

a) Special purpose computers can only do what they are programmed to do. They can't do other tasks outside that which they are programmed to do. E.g. watches, calculator, pagers etc.

b) General Purpose computers are designed to carry out many tasks without specifications. They can be turned into special purpose by use of special written program to instruct them to do exactly that special task. E.g. desktop computers.

COMPUTER SYSTEM

A computer system is a set of three components, apparatus, materials and user to process data.

A computer system is composed of three (3) parts:

1) **Hardware,**
2) **Software&**
3) **Human ware or personal ware.**

COMPUTER HARDWARE

Computer hardware is/are the parts of a computer that can be physically touched, feel and see. Or Hardware refers to the physical parts of a computer.

A micro computer system hardware consist so a **System Unit, a Monitor Keyboard Mouse**.

Hardware elements are classified into

1. *CENTRALPROCESSING UNIT*

2. INPUT DEVICES AND OUT PUT DEVICES

3. STRORAGE DEVICES

1. CENTRAL PROCESSING UNIT (CPU)

The CPU is further divided into three

i. The **Arithmetic Logic Unit (ALU)**

The ALU is the part of the CPU which manages all the mathematical and logical operations within the computer.

ii. **Control Unit**

The Control Unit Manages/ controls the incoming and outgoing of data in the CPU and the issuing of processing instructions to the CPU.

iii. **The Internal Registry/Cache Memory**

This temporarily stores immediately processed data from the CPU and can also hold temporarily data waiting to enter the processor for processing. It uses charges to store this data and information and these charges must be renewed almost every passing second hence the data and information in this kind of memory is always withdrawn by the processor before the charges run out.

Main memory

Main memory is used for holding data and information required immediately by the CPU. It is characterized by fast access to information, low capacity and high expressivity. There are two types of main memory and these include

I. Random Access Memory

II. Read Only Memory

III. Cache memory

THE RANDOM ACCESS MEMORY (RAM)RAM can be both read in order to retrieve information or it can be written into to store information. The name means that any data in Memory can be reached or accessed in the same amount of time. RAM is used in large quantities in the main memory and every computer must specify its size e.g. the base RAM size for Micro-computers is 640KB (1Kilobyte = 1024byte). RAM can be either Static or Dynamic

CHARACTERISTICS OF RAM

I. RAM is volatile i.e. it loses its contents when power goes off

II. RAM is a primary storage device

III. RAM can be changed or moved

Since RAM is a primary storage device, it stores information as one is currently working on the computer. A computer will be slow with little RAM.

Types of RAM:

There two types of RAM and these include:

- ***Static RAM*** (sram): The contents stored are not regularly ***refreshed*** but still volatile.
- ***Dynamic RAM*** (dram): is a type of random-access memory that stores each bit of data in a separate capacitor within an integrated circuit. The capacitor can be either charged or discharged; these two states are taken to represent the two values of a bit, conventionally called 0 and 1. Since capacitors lose charge, the information eventually fades unless the capacitor charge is ***refreshed*** periodically. Because of this refresh requirement, it is a *dynamic* memory as opposed to SRAM and other *static* memory. Examples of DRAM include: DDR-SDRAM (ddr1) and DDR2, Thyristor RAM (T-RAM), Zero-capacitor (Z-RAM)

THE READ ONLY MEMORY (ROM)

ROM contains instructions which are permanently recorded in the main memory. ROM provides permanent or semi permanent storage only. The Re-written during normal computer operations. ROMs are used in computers for permanent storage of instructions or programmes such as the booting programs NB booting is the starting or restarting a computer. ROMs are usually provided by the manufacturers of software. There are four main types of ROMs used today and these include Masked ROM, PROM, EPROM, EEPROM, and EAPROM.

A. THE MROM

Mask Programmable Read Only Memory that can be only produced by the manufacturer. ROM is advantageous in that it has a high bit density, it is non-volatile and it has a low cost. Examples include *phone ring tones.* There are three disadvantages of ROM and these include

i. They are expensive to produce
ii. They are time consuming
iii. One produced, it can never be altered or changed, because of the above disadvantages other types of ROM have been introduced

B. **THE PROM (Programmable read Only memory)**

PROM is a read only memory that can be programmed directly by the user using special PROM programmer. PROM, still have one disadvantage i.e. once programmed, it cannot be changed hence its expensive not practical to use. It's sometimes called *THE FUSIBLE-LINK*

C. **THE EPROM (Erasable Programmed Read Only Memory)**
This is a kind of ROM which uses programmable and can be reprogrammed a number of times e.g. the Mobile phone book

D. **THE EEPROM (Electronically Erasable Read Only Memory)**
The EEPROM can be read from and written to. It is not good for general purpose read / write memory. EEPROMs are used in critical industries and military operations.

UNITS OF STORAGE CAPACITY AND MEMORY CALCULATIONS

The bit

The bit is the baric unit of a memory and it is got from the work **binary digit.**

A bit is represented either by 0 or 1 (zero or one). The zero representing availability (ON) and the one representing unavailable (OFF).

The NibbleThis is abyte which is usually a group of 4bits.

Band widthIs the number of bytes that can be taken and processed by one instruction.

The byteOne byte consists of 8bits or 2nibbles. A single character (letter or number) occupies one byte.
E.g. the WORD **GIRLFRIEND** has ten bytes or 20 nibbles or 80 bits
Example.

How many bits are in the word?
***hanny.com*?**
No. of characters = 9, Note that no. of characters = no. of bytes, so no. of bytes = 9, No. of bits = 9 * 8 =72 Other Binary Code Systems The computer memories today are designed to hold more densities which include the below:

- ✓ ASCII: *The **American Standard Code for Information Interchange** is a character-encoding scheme originally based on the English alphabet. ASCII codes represent text in computers, communications equipment, and other devices that use text. Most modern character-encoding schemes are based on ASCII, though they support many more characters than ASCII does.*
- ✓ BCD: **binary-coded decimal** *(**BCD**) is a digital encoding method for numbers using decimal notation, with each decimal digit represented by its own binary sequence. In BCD, a numeral is usually represented by four bits which, in general, represent the decimal range 0 through 9.*
- ✓ EBCDIC: ***Extended Binary Coded Decimal Interchange Code** (**EBCDIC**) is an 8-bit character encoding used mainly on IBM mainframe and IBM midrange computer operating systems. EBCDIC descended from the code used with punched cards and the corresponding six bit binary-coded decimal code used with most of IBM's computer peripherals of the late 1950s and early 1960s.*

2. INPUT DEVICE

These are devices/hardware components that are used to enter data into and instructions the computer.

These are devices that are used to enter data into the computer.
Input device has two duties to perform.
1. To read the data from the medium on which it is stored

2. To change the data into a suitable and understandable form That is; translating signals from high level languages to Low Level Languages that can be understood by the processor.

Examples of input devices;

a) Graphics Tablets
b) Cameras
c) Video Capture
Hardware
d) Trackballs
e) Barcode reader
f) Digital camera
g) Gamepad
h) Joystick
i) Keyboard
j) Microphone
k) MIDI keyboard
l) Mouse
m) Scanner
n) Webcam
o) Touchpads
p) Pen Input
q) Microphone
r) Electronic
Whiteboard

KEYBOARD

TRUCK BALL

JOY STICK

GRAGHIC TABLET

JOYSTICK

FLASH DISK

MICROPHONE

WEB CAM

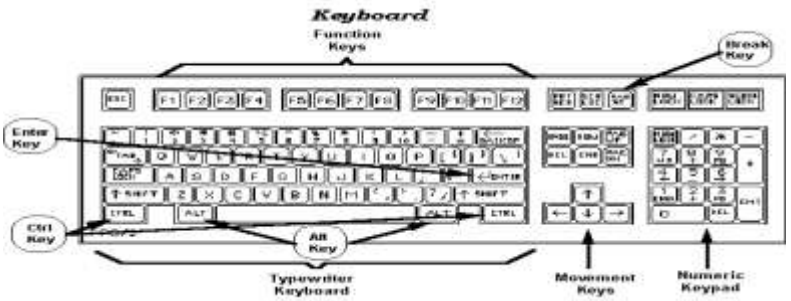
LIGHT PEN

JOY STICK

DOCUMENT READER

HEADSETS

The Key board The keyboard which is typically resembles a type-writer is the most common input device for micro-computer systems



A Keyboard consists of:

a) **Function Keys (F1-F12)**

A **function key** is a key on a computer or terminal keyboard which can be programmed so as to cause an operating system command interpreter or application program to perform certain actions. On some keyboards/computers, function keys may have default actions, accessible on power-on. These are used to perform specific functions depending on the applications packages being used e.g. most applications use F1 for help

b) **The Numeric Key Pad:**

c) A **numeric keypad**, **num pad** or **ten key**, is the small, palm-sized, seventeen key section of a computer keyboard, usually on the very far right. The numeric keypad features

Digits 0 to 9, addition (+), subtraction (−), multiplication (*) and division (/) symbols, a decimal point (.) and Num Lock and Enter keys. Laptop keyboards often do not have a ***numpad***, but may provide numpad input by holding a modifier key (typically labeled "Fn") and operating keys on the standard keyboard. Numeric keypads usually operate in two modes: when Num Lock is off, keys 8, 6, 2, 4 act like arrow keys and 7, 9, 3, 1 act like Home, PgUp, PgDn and End; when Num Lock is on, digits keys produce corresponding digits. The arrangement of digits on numeric keypads is different from that of telephone ―Touch-Tone‖ keypads, which have the 1-2-3 keys on top and 7-8-9 keys on the third row, instead of the reverse used on a numeric keypad.[*why?*] This layout, which matches most modern calculators and cash registers, may be confusing for those who use one of these

arrangements more often. **T**hese are mainly used to enter data (numeric data) very fast into the computer.

c) **Alphanumeric Keys/Typewriter Keyboard**: these are used for normal operations such as typing text an entering numeric data.

d) **The Toggle/Control keys:** these include shift, tab, Caps. Lock, Alt, Ctrl, Esc. These are used in combination with other keys or on their own to perform specific tasks. *E.g. Shift + any letter → capital of that letter (Shift +a →A, shift + 5 → 5%, ctrl +Alt + Del → Restarts computer (worm booting).* The escape key is used by most applications to exit from a program or to;move back one step to the previous operation.

e) **Navigation Keys/Movement Keys:** Used to move the cursor in the four compass directions on a workspace. They are equivalent to the Page Up and Page Down keys.

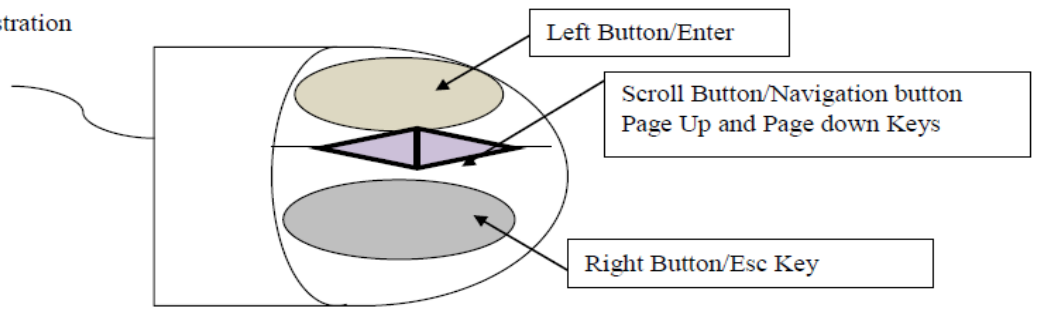
f) **END/Home Keys:** These move the cursor or pointer to either the end of the last typed in statement or to beginning point of that statement respectively.

g) **Application Key: The Menu key** or **Application key** is a key found on Microsoft Windows-oriented computer keyboards, introduced at the same time as the ***Windows logo key***. Its symbol is usually a small icon depicting a pointer hovering above a menu, and it is typically found on the right side of the keyboard between the right Windows logo key and the right Control key (or between the right Alt key and the right Control key). While the Windows Key is present on the vast majority of keyboards intended for use with the Windows operating system, the Menu key is frequently omitted in the interest of space, particularly on portable and laptop keyboards.
The key's primary function is to launch a context menu with the keyboard rather than with the usual right-mouse button. It can be used when the right-mouse button is not present on a mouse.

THE MOUSE

A **mouse** is a pointing device that functions by detecting two-dimensional motion relative to its supporting surface. Physically, a mouse consists of an object held under one of the user's hands, with one or more buttons. The mouse is another input device commonly used on GUI (graphical User Interface) systems. It is used to issue commands to the computer by activating certain points on the screen. It has two or three buttons and a ball is used to move the cursor on the screen, the buttons represents the Enter key (left button) and the Escape key (right button). A click of either button is the same as placing the equivalent on the keyboard.

Illustration



Left Button/Enter Key
Scroll Button/Navigation button Page Up and Page down Keys
There are three basic types of mice:

1. **Mechanical:** Has a rubber or metal ball on its underside that can roll in all directions. Mechanical sensors within the mouse detect the direction the ball is rolling and move the screen pointer accordingly.
2. Opt mechanical: Same as a mechanical mouse, but uses optical sensors to detect motion of the ball.
3. Optical: Uses a laser to detect the mouse's movement. You must move the mouse along a special mat with a grid so that the optical mechanism has a frame of reference. Optical mice have no mechanical moving parts. They respond more quickly and precisely than mechanical and opt mechanical mice, but they are also more expensive.
Right Button/Esc
Mice connect to PCs in one of several ways:
1. **Serial mice** connect directly to an RS-232C serial port or a PS/2 port. This is the simplest type of connection.
2. **PS/2 mice** connect to a PS/2 port. ***(PS/2 = Personal System/2)***
3. USB mice.(***USB =Universal Serial Bus***)

Cordless mice aren't physically connected at all. Instead they rely on infrared or radio waves to communicate with the computer. Cordless mice are more expensive than both serial and bus mice, but they do eliminate the cord, which can sometimes get in the way.

SCANNER

This is an input device used to translate hard copy data or information to soft copy data or information to the computer. A scanner can be used to copy photographs, designs or text from paper into the computer.

THE DIGITAL CAMERA:

This is used to import photographs directly into the computer

VOICE RECOGNITION EQUIPMENT

These are equipments or devices that import information or data using audio systems. They include microphones.

BAR CODE READER

Each item in a shop or store is marked with a Universal Product Code (UPC) which identifies the item. The code is in terms of bars with coded spacing and thickness. A bar code reader (wand) is moved across the bars by the shopkeeper and the details of the price, date of manufacture, catalog number etc are read or displayed.

OPTICAL CHARACTER READER (OCR) The optical character reader can detect both a mark on a paper and also recognize its shape and identify characters. It uses light to detect marks on paper.

OPTICAL MARK READER (OMR) It is a device which can detect the presence or absence of a mark on the paper. It uses the same principle of light reflection like the ORC, where light is shone onto the paper and reflected and detected. If there is a mark on the paper, the reflection of the light from the mark will be less compared that from a point where there isn't a mark.

MAGNETIC INK CHARACTER READER (MICR)MICR systems use special ink to print characters. The characters can then be read and decoded by special Magnetic device. This system is widely used by bands for processing cheques

LIGHT PEN. It consists of a stylus connected by a cable to the computer. The position of the stylus is noted and a dot appears on the screen. When the stylus is brought into contact in the screen, a light pen is the only instrument that allows th3e user to point directly to an object on the screen. Therefore, identifying it to the system, this makes it possible to make a choice from a menu displayed on the screen. Lines and curves may also be drawn by moving the stylus on the screen

OUTPUT DEVICE

These are devices through which computers communicate with the users. The use of output results from the computer.

The common outputs include

i. Monitor,
ii. Printers,
iii. Plotters
iv. Speakers

OTHER OUTPUT

1. Monitor
2. Printers (all types)
3. Plotters
4. Projector
5. LCD Projection Panels
6. Computer Output Microfilm (COM)
7. Speaker(s)

Both Input–Output Devices:

1. Modems
2. Network cards
3. Touch Screen

4. Headsets (Headset consists of Speakers and Microphone. Speaker act Output Device and Microphone act as Input device)

5. Facsimile (FAX) (It has scanner to scan the document and also have printer to Print the document)

6. Audio Cards / Sound Card

PRINTER

MONITOR

PROJECTOR

Headphone/ SPEAKER

DIGITAL CAMERA

THE MONITOR (VDU) The monitor is sometimes called the Visual Display Unit and is an output device. It is a screen when the typed data appears (soft copy) and can be manipulated into information and still the results are displayed on the screen. The monitor can be either a Cathode Ray Tube (CRT) as for most desktop computers or the Liquid Crystal Display (LCD) as in Laptops, Notebook computers and other flat panels. There are different types of Monitors based on display resolutions and color. They are monochrome or colored.

COMPARISON OF LCD AND CRT:

- High contrast ratio
- High speed response
- Full range light output level control
- Large size
- Large weight
- Geometric distortion in some CRTs
- Greater power consumption than LCD.
- Prone to moiré effect at highest resolution
- Can display natively in almost any resolution
- Intolerant of damp conditions
- Small risk of implosion (due to internal vacuum) if the picture tube glass is broken

LCD:

- Very poor contrast ratio (e.g. 20:1)
- High visible noise if used in more than 8 color mode (3 bit color depth).
- Very slow response (moving images barely viewable)
- Some suffer horizontal & vertical ghosting
- Very small size
- Very low weight
- Very low power consumption
- Lower cost than TFT LCDs.
- Zero geometric distortion

PRINTERS:

While monitors can produce softcopies (Intangible Displays), printers can produce a permanent record (hard copy) on the output paper or any other printing media. There are two major categories of computers' printers i.e. Impact and Non-Impact printers.

IMPACT PRINTERS

Impact printer are printer that print whose print head strike the printing media directly in order to form characters, examples include

i. DOT Matrix
ii. Daisy –Wheel and
iii. Direct Thermal Printers

DOT MATRIX PRINTERS

In the general sense many printers rely on a matrix of pixels, or dots, that together form the larger image. However, the term dot matrix printer is specifically used for impact printers that use a matrix of small pins to create precise dots. The advantage of dot-matrix over other impact printers is that they can produce graphical images in addition to text; however the text is generally of poorer quality than impact printers that use letterforms (*type*). Dot-matrix printers can be broadly divided into two major classes:

i. Ballistic wire printers
ii. Stored energy printers

Dot matrix printers can either be ***character-based*** or ***line-based*** (that is, a single horizontal series of pixels across the page), referring to the configuration of the print head. At one time, dot matrix printers were one of the more common types of printers used for general use - such as for home and small office use. Such printers would have either 9 or 24 pins on the print head. 24-pin print heads were able to print at a higher quality. Once the price of inkjet printers dropped to the point where they were competitive with dot matrix printers, dot matrix printers began to fall out of favor for general use.

DAISY WHEEL PRINTERS

A **daisy wheel printer** is a type of computer printer that produces high-quality type, and was often referred to during the 1980s as a letter-quality printer (in contrast to high-quality dot matrix printers, capable of so-called near letter quality (NLQ) output). There were also, and still are, **daisy wheel typewriters**, based on the same principle.

THERMAL PRINTER

A **thermal printer** (or **direct thermal printer**) produces a printed image by selectively heating coated thermo-chromic paper, or thermal paper as it is commonly known, when the paper passes over the thermal print head. The coating turns black in the areas where it is heated, producing an image. Two-color direct thermal printers are capable of printing both black and an additional color (often red), by applying heat at two different temperatures.

Thermal transfer printing is a related method that uses a heat-sensitive ribbon instead of heat-sensitive paper.

Characteristics of Impact Printers

1. They make noise while printing.
2. They have low character resolutions.
3. They are cheaper than the non-impact printers.
4. Rarely suffer paper jams.
5. They are slow especially those that use the line printing and character printing methods.

NON-IMPACT PRINTERS

These are printers whose print heads do not directly touch the print media but instead they form characters by use of strings or jet of ink heated up within. They are less noisy compared to the impact printers and they are commercially fast hence they are expensive. Examples include,

i. The Laser Jet
ii. Ink Jet
iii. Bubble Jet

Laser Jet printers which are the same technology as a photocopying machine and operates at a high speed. It changes data into a beam of laser light which becomes to be printed. Other examples include The Ink Jet and the bubble Jet which use the spraying method to form characters. The ink is sprayed from tiny holes of the ink cartridge on to the printing media (paper).

Differences between impact and non-impact printers

Impact	Non impact
They are slow	They are fast
They use an inked ribbon to print	They use ink, thermal and lasser technology.
They are cheap	They are expensive to buy
They produce asingle copy	They produce multiple copies
They are noisy	They are quiet in printing

PLOTTERS

Plotters are mainly used for printing large engineering and architectural drawings. The largest paper size that can be used to print on is A1's size paper. Plotters use pens to plot.

SECONDARY STORAGE DEVICES AND MEDIA

Secondary storage devices/media refers to all the devices that provide an alternative storage of data and information.
They are regarded to as secondary because they are not directly accessible to the CPU.
They provide a back up storage. The backup storage is used when there is no enough space in the main memory for data, information and programs.
Data is written and read directly from the secondary storage device. To write data means to copy, move to the backing storage. To read data means to copy, move to the backing storage.

FIXED STORAGE DEVICE

These are devices that cannot be removed without opening the system unit.
The hard disk is mounted inside the computer and for this is reason we refer to it as affixed disk. Hard disk is the computer permanent storage and the hard disk can hold large amount of data and is not affected when the computer is turned off.

Advantages of hard disks

- Hard disks store much more data than the floppy disks. The storage capacity of a hard disk is Gigabyte ranges.
- Access to data is much faster to access than on floppy disks.
- Hard disks are more reliable than other removable devices.

NB: The hard disk is the main location where all data is stored.

Its disadvantage is that:

Hard disks are usually fixed and can't be removed without opening the system case.

THE DISK DRIVE:

A disk drive is used to read from or write to a floppy disk or a compact disk. Compact drivers are popularly called CD-ROM Drive. Many micro computers have only drives for reading compact disks (CD).

NB: when we need the information from the disk, the disk is inserted in the drive and the copy of the information is loaded into main memory. The original version remains instant on the disk.

REMOVABLE STORAGE MEDIA

These are devices that are not housed inside the system unit where data can be stored and then removed from the computer. Data is written and read from them using drives.

- Magnetic tapes
- Floppy disks
- Flash disks

Examples of removes storage devices include.

- Magnetic tapes
- Floppy disks
- Flash disks
- Memory cards.
- Compact disks
- DVDs

ACCESS TIME.

This is the time taken to read the data from the disk to the main memory. It's the sum of three parameters that's to say:

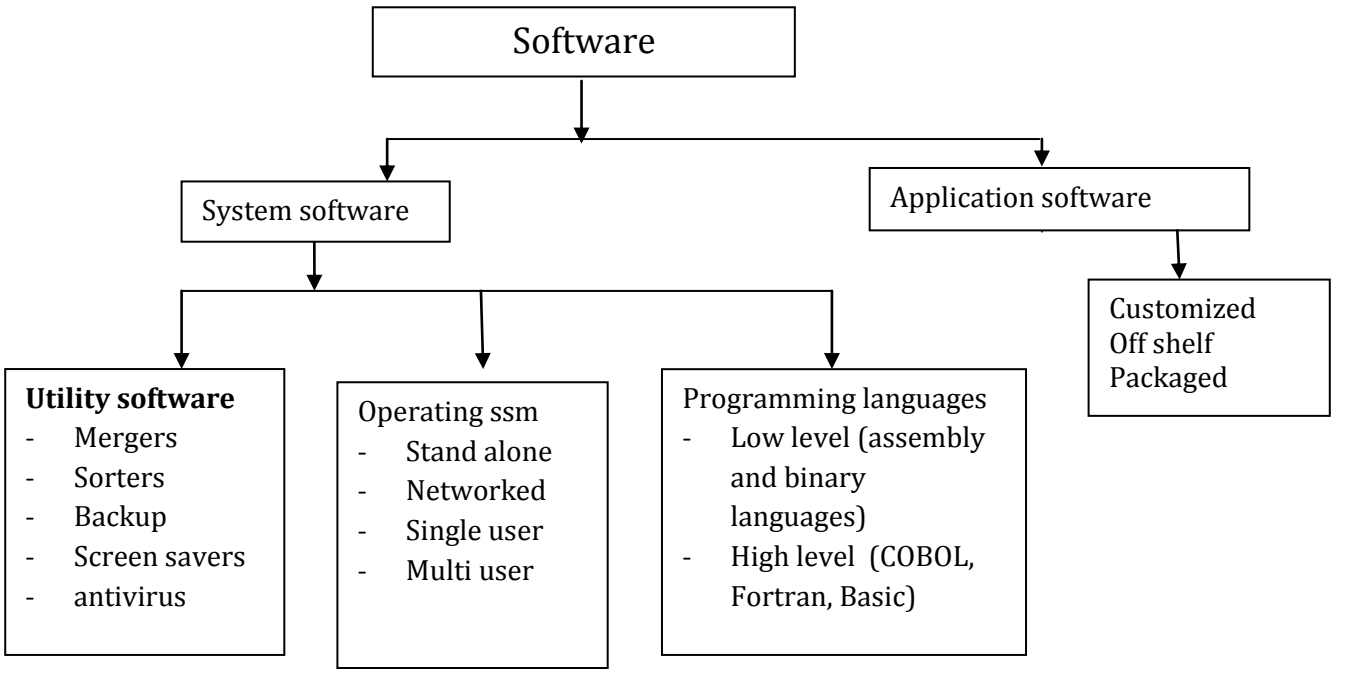
- Seck time
- Rotational / Delay Time
- Data transfer time

COMPUTER SOFTWARE

Computer software is a set of programs or a set of instruction that can change a general purpose computer into a computer that is capable of performing special functions. **Software** can also be defined as a set of rules or instruction / programs that can cause a computer system to solve user's problem.

Software is simply a collection of programs that instruct the computer to do work.

A program is a set of instructions that command a computer to perform a specific task



Software is divided into two categories these include

1. **System Software:**
2. **Application software**

SYSTEM SOFTWARE.

These are programs that manage the computer's operations itself. System software programs are usually provided by the Manufacturer of the computer and they include.

THE OPERATING SYSTEM (OS)

An operating System is a platform on which application software can run or operate. It can also be defined as **a program (software) that manages all the computer systems that is to say Hardware, Software, and Human ware**. Operating systems are Programs developed to manage the basic hardware systems or resources and provide a more hospitable interface to users and their programs

NOTE

An Interface is a Place (platform) where the hardware, Human ware, and other programs (software) interact with one another.

FUNCTIONS OF AN OPERATING SYSTEM (OS)

The operating system is basically a resource manager and its Main function is to manage the four basic categories of resources namely:

a) **Memory Management**

The operating system knows which part of the memory is in use and that one which is free. Storage space is therefore provided for data and information in the memory by the Operating system. Programs must be loaded in the memory before they are run (executed) hence the operating system has the function of choosing where they should be stored in the memory. Urgently needed programs are loaded in the primary memory at the booting stage while those that will be needed later are loaded in the secondary memory.

b) **Processor Management**

A multi-user or multi-tasking computer system can be accessed by many users or many programs at the same time but the CPU (processor) can only run one program at a time or one user at a time. Therefore, the number of tasks or programs entering into the CPU for processing must be controlled or monitored; this is done by the operating system. The operating system uses the CU to control these processes. Note: A Multi- user system is a system that allows many users at the same time while a Multi-tasking allows many programs to run at the same time.

c) **Input / Output Management**

Programs required in the use of Input / Output devices and in a Multi-tasking system a conflict may arise on who is to use which device, at what time and for how long. The operating system solves this by monitoring the state of each Input an Output devices and sends a signal if any faults are detected and to indicate which device can be used at that time.

d) **File Management**

The operating system monitors data and information, where it's located in the memory. It's status, use late date of recording and storage, etc. these are facilities called the file system. ***File systems*** deals with the logical organization of the information and provide a way of sorting and sharing it through the operating system. The operating system can also provide protection of files by use of passwords secrete codes to limit access of users to the files.

Note: **A file** is a collection of related information.

A folder is a collection of files.

CLASSIFICATION OF OPERATING SYSTEMS.

There are two types of operating system.

- **Single User system:** This is a kind of operating system which can act as an interface for only one user. These are kinds of machines that STAND ALONE i.e. they are not connected to any of the computers next to them. An example of a single-user system is a Microsoft Disk Operating System (MS-DOS)

Note: An interface is a point at which groups of independent systems interact. This is a point of interaction or communication between a computer and other devices such as Human operator.

- **Multi User Systems:** This is a computer system which acts as an interface for more than one user. Operating system can either be ***character based*** on [Command Line Interface (CLI)] or Graphic based [Graphical User Interface (GUI)]

GUI	**CLI**
Windows 95/98	*DOS*
Windows 2000	*UNIX*

Windows 2003	*LINUX*
Windows XP	*Macintosh*
Windows NT	*Apple*

UTILITY SOFTWARE

Utilitys/w is a program that helps to maintain and improve the efficiency of a computer system. It is also a program that utilizes a system such as the internet to provide a specific service. Utility software or software utilities are the software programs that function like full application software but at a smaller scale for a particular purpose. Utility programs are integrated / combined in most major operating systems. In view of the above, we can therefore define UTILITY PROGRAM as any application or program that allows the user to do cleaning or management on the computer system. Examples of Utility programs / software

a) **Disk defragmenter (joins pieces)**
This is a small but essential program that allows a user gather up all the pieces of files that have been stored in a scattered array on the hard drive and joins them together in one efficient piece.

b) **Disk clean up (debugger)**
This is a small but critical program that allows a user to quickly determine which file / files that: are corrupted, no longer in use and not correctly saved on a hard disk so that they can be eliminated to create a more efficiently operating hard drive.

c) **Backup program.**
This is a program which makes a copy of the whole computer system. This is done in security of the hard drive crash.

d) **Restore program**
This is a program that restores data files or may be able to return data files or a computer to its original state.

e) **Drive space**
This is used to compress and decompress disc drives and hard disks. This increases the storage capacity from 50% to 100% more free space. ***Note***: this Utility should be used with care, since it could damage or destroy the contents of the compressed drives.

f) **Scan disk**
This is used to check files and folders for physical errors.

g) **Inbox repair**
This is used to repair damaged files.

PROGRAMMING LANGUAGES

A Programming language is a combination of symbols, word, and codes arranged in an organization or logical order known as ***SYNTAX*** to help the user to communicate with the processor (CPU). It can also be defined as a logical flow of instructions arranged in order to

from a program in a specific language. There are basically two categories of programming languages and these include.

a) **Low Level Language**
These are called Low Level Language because they are more / best understood by the processor / machine than the user. I.e. Low Level Language is machine friendly. Low Level Language are divided into two i.e. **machine language** and **Assembler language**

b) **High Level Language**
These are languages which are closely associated with the user than the machine hence they are known as user friendly languages. Examples include BASIC, FORTRAN, COBOL, HTML, C+, and C++

LANGUAGE TRANSLATORS / LANGUAGE PROCESSORS

Language translators / processors are used to change or decode or translate a high level language into a low level language that can be understood by de processor. These language processor include

a) **Compliers**
This is a computers program that translates / changes a program written in high level language into machine codes. It can also be defined as a computer program that translates a series of instructions written in one computer language known as ***a source language*** into an output computer language known as the object or target language. NB. The complier program changes the whole program at once into the target language.

b) **Assemblers**
Assemblers are programs that change Assembly programs / instruction into binary codes that understood by the processor. Assembler normally begins from where compliers stop.

c) **Interpreters**
This translates line by line of a program from high level language to low level language.

d) **Linkers**
These are programs which combine complied programs and determine where the programs will be located in the memory.

2. **APPLICATION SOFTWARE:**
These are programs designed to complete the users' every day activities
These are programs that are written to meet the end user's problems.

Examples of application programs and their function

Ms word	Word processing
Ms excel	Spreadsheets
Ms access	Database mgt
Ms power point	For slide shows and presentations
Ms publisher	Publications
VLC, vitualDj, Media player, Automix,	Playing music
Photo shop	Editing photos

They are basically divided into two types i.e.

a. General Purpose packages (Off-shelf Programs):
These are pre-written programs bought by the user and are immediately used (after buying) to solve problems. They are programs that solve a wide range of problems. They are very important for Non- specialists, homes or businesses. E.g. ***Word processor, Spreadsheets, Databases, Graphical Packages such us power point and desktop publisher.***

b. **Special Purpose Application Program (customized Packages).**
These are customized programs written by the user or a software house under contract to perform a specific job or function. They are desired for a particular group of users such as *ATM, Hoteliers, and Estate Agents.*
They are more expensive than the general purpose or off-shelf packages

Advantages of off-shelf packages over customized packages

- Off-shelf programs have a relatively low price since they are sold in large quantities
- They are appropriate for a wide range of applications.
- They are usually provided together with a documentation explaining how to use them.
- They are easy to use and suitable for non-specialists.

Disadvantages of off-shelf packages over Customized packages

- They only give a general solution to a task at hand
- It is easy to forget the commands to use with the package if it is not frequently used.
- In case of spreadsheets and database programs, the user must in some way develop new rules or additions to the program in order to do he/she wants to do exactly.

INTRODUCTION TO WORD PROCESSING

(MICROSOFT OFFICE WORD)

Traditionally, type writers were used to do office work such as typing documents, reports, minutes, etc.

Today most offices use computers to do computer work. In this they use what is called electronic word processors.

An electronic word processor (word processor)

This is application software that enables the user to create, edit, format, save and print a document.

Word processing refers to the process of create, edit, format, save and print a document.

Examples of word processors

- Microsoft office word
- Notepad
- Word pad
- Lotus word perfect.
- Open office

Advantages of using electronic word processor

i. Documents can be stored for future use.
ii. It is easy to print multiple copies.
iii. It is easier and more efficient due to automated features like auto correct and auto complete.
iv. It provides predefined features for generating headers, footers, endnotes, footnotes and references.
v. They offer superior document formatting features like bolding, underlining, italics, use of different colors.
vi. It has the ability to import and export table, graphs and text from other programs and sources.

Creating a document on a blank window

- ✓ Click on start to open a blank window
- ✓ Go to all programs
- ✓ Select Microsoft office
- ✓ Open Microsoft office word

Or

- Once a window is displayed, start typing at the insertion point.
- The insertion point is a point where the cursor keeps on blinking.
- On typing if the current line if finished, the text / words automatically go to a new line, this is called text wrap/ word wrap.

Saving the document

ii. click on file menu/ office button
iii. select save as
iv. create a file name
v. Select the location where to save your document.
vi. Click on save/ok

Or

i. Press control + s or F12
ii. Type file name
iii. Press enter.

Protecting a document with a password.

A password is a combination of characters and numbers that prevent un authorized users from opening a document without the true users permission.

To insert a pass word in a document follow.

i. Click on office button/file menu.
ii. Go to save as
iii. Select tools
iv. Go to general option
v. Type the password
vi. Re type the pass word.
vii. Click ok

Deleting text.

- ✓ **T**o delete characters from the right to left, press the cursor at the right of the word, press the back space key on the key board.
- ✓ **T**o delete characters to the right of the cursor, position the insertion pointer at the left of the word, press the delete key on the key board.

  Or
- ✓ High light the text to be deleted and then press the back space or delete key.

To restore the deleted text, click on undo command.

Proof reading a document

Proof reading refers to reading through the document to check whether it has typing or grammatical errors. Microsoft office has spell checking features such as spelling and grammar checkers. The wrongly spelt words and poor grammar are usually underlined with a bleu/green or red line.

Spelling and Grammar checkers.

These are inbuilt features that help the user to check wrongly spelt words and poor grammar.

The spelling and grammar checkers only recognize spellings of words whose correct spelling is in its dictionary.

Autocorrect.

This automatically detects the wrongly spelt words or capitalized words and replaces them with the correct ones.

Use of thesauruses
This is an editing tool that helps the user to find words or phrases with the same meaning (synonyms) and opposites (antonyms) to the selected words.

Formatting word documents
Formatting can be defined as the act of making a document more attractive and pleasing to the user.
The user can format paragraphs, text, pages or the entire document.
The user can for mat documents using the following features

i. **Bolding;** this makes the selected text appear more dark that the rest of the text. The user can do this by selecting the text and then clicking on B in the home tools or can use control +B
ii. **Underlining;** this refers to pressing a line at the bottom/base of the word (s). Underlines can be of different types and forms. To underline a word, press ctrl + U or select the word and click on U in the home tools.
iii. **Italics;** this refers to putting the selected words in a slanting format. Use control + I
iv. **Changing font colors;** in most cases the default color is black, but the user can adjust the text color to the colors of his or her choice.
v. **Font type and size;** this enables the user to change the font types and size of the words. Microsoft has a number of font types and sizes that you can use to enhance the appearance of your documents.
vi. **Superscript;** this makes selected text appear slightly above others eg. CM^2
vii. **Subscript;** this makes the selected text appear slightly below others. Eg. H_2O

Paragraph formatting.

A paragraph is a block of text dealing with a single theme and starting on a new linethe following can be done to format a paragraph

1. **alignment;**

This is the arrangement of text relative to the left margin.

Examples of alignment.
Left alignment; this is a default alignment that lines up the text along the left margin but the text is un evenly aligned along the right margin.
Right alignment;this lines up the text evenly along the right margin but uneven along the left margin.
Centre alignment;these lines up the text at the centre between the left and right margins.
Justify alignment; this arranges the text evenly along the right and left margins.

2. **Drop cap**

A drop cap is a letter that appears larger than the rest consuming more lines in a document.

To insert a drop cap

i. High light the letter to drop,
ii. Click on insert
iii. Select drop cap
iv. Go to drop cap options

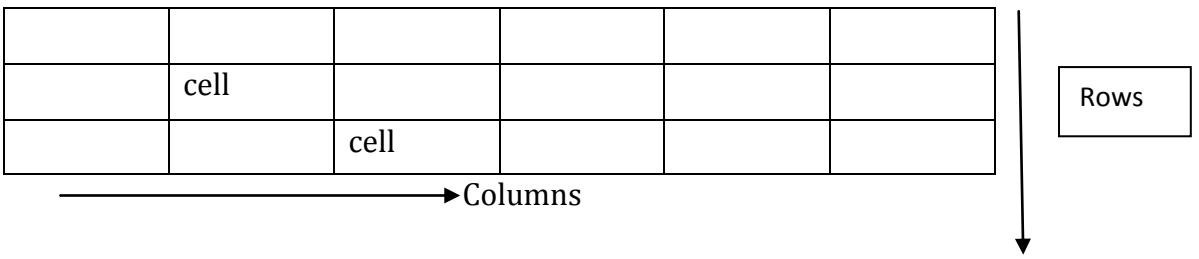
v. Select the number of lines to drop.
vi. Click ok

3. **Line spacing**
   This is a vertical space/ distance between lines of text. The default line spacing is single space (1.5) but the user can adjust the line spacing to the spacing of his or her choice.

   Character spacing is the horizontal space between letters.
4. **Bullets and numbers**
   Bullets and numbers are used to create ordered lists in a document.
5. **Headers**
   These are lines of text that appear at the top margin of a page or selected pages.
6. **Footers**
   These are lines of text that appear at the bottom of the page or selected pages
7. **Page numbers.**
   These are used to organize large documents for easy references.
8. **Footnotes and endnotes.**
   These are used in large documents to explain, comment on, or provide a reference on a text in a document. Footnotes appear at the bottom of the page while end notes appear at the end of the document.

Creating and manipulating tables

A table is made up of rows and columns of cell



THE INTERNET AND WORLD WIDE WEB (WWW)

THE INTERNET

Internet refers to the global interconnection of computers for the purpose of communication and resource sharing.

Internet is the connection of computers to communicate together and share resources globally.

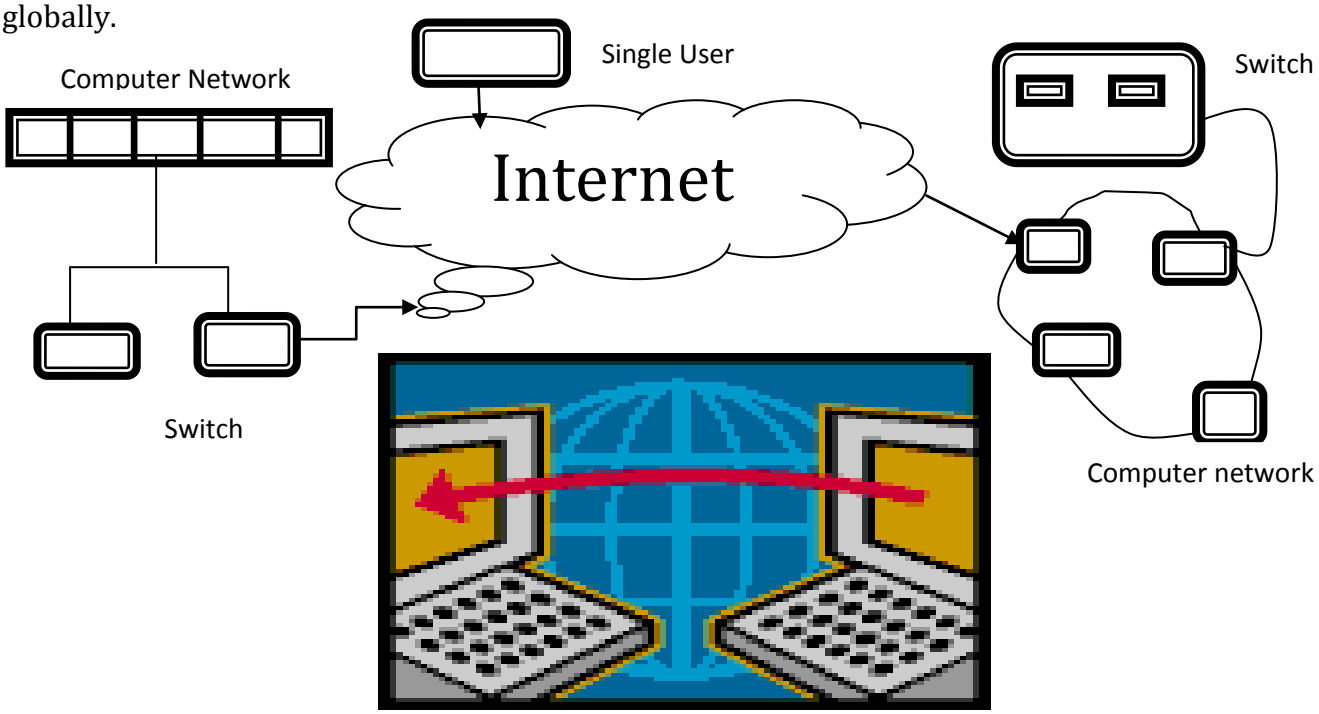


fig 1

WORLD WIDE WEB (WWW)

This is a system of interlinked hypertext documents that can be accessed through the internet.

With a web browser, one can view web pages that contain text, images, pictures, animation, videos and other multimedia and can navigate through them using hyperlinks.

Basic requirements for the WWW

The following are the basic requirements needed for communication over the WWW

High memory/ processor

- Client and host computers
- Modems
- Communication software
- Telephone line
- Satellite facility

The internet service provider (ISP)

This is an organization/company that maintains the LAN attached to the WWW.

Examples of ISPs in Uganda

- Mtn Uganda
- Airtel
- UTL
- Africel
- Smart telecom
- K2 telecom etc

Services offered by ISPs

i. They connect and disconnect customers to and from the service
ii. They offer customer care advise
iii. They give customer technicaladvice on software and hardware problems.
iv. They give discounts to the internet users in terms of zones, royalty programs etc

Advantages of using internet

- It offers personal connectivity for friends through face book, twitter, emails, and telephone calls.
- It's a tool for entertainment through on line games, videos, animations, refreshing video clips and online animal zoos.
- It offers travel services such as e-booking and reservations for holiday makers and tourists.
- It is a tool for financial management that offers answers to financial management challenges e.g. Where, how and when to invest.
- It offers education and research facilities for students and researchers for knowledge enrichment.
- It offers multimedia services eg. Videos and audio music
- It offers online banking services for online banking institutions e.g. ATMs, Big cash, cyber cash, Millicent, western union, and credit card facilities.
- It provides news updates on climate, weather, politics and finance, sports, through online news papers, radios, TVs and magazines.
- It offers online employment for online job seekers through online employment firms and agents.
- It offers online medicine as diseases are diagnosed and medicine prescribed online.
- It offers courtship and marriage for people seeking lovers on line.
- It is a tool for transacting business through e-commerce and e-business. Goods are sold and bought online.

Disadvantages of using internet.

- It leads to privacy violation as personal details are exposed to the publicseg. Usernames and address.
- Online information may be intercepted by hackers and crackers.
- Viruses may attack and destroy online information.
- They are high initial and maintenance costs for setting internet, buying hardware and software.
- It leads to moral degeneration. It dangerous to young people as they use internet to access pornography.
- Internet has isolated man from man. All the businesses and activities are done online eg meetings, conferences.

- It leads to addiction.

INTERNET TERMINOLOGIES

i. **Web server;** this is a high speed and storage computer whose primary purpose is to provide requested information to computers on the WWW.

Characteristics of server computer.

- It has very high memory and storage capacities
- It has a very strong processor
- It has improved network interface card.
- It has a high capacity RAM

ii. **Web browser;** this is a master control network program which makes it possible for computers to share data and resources globally. Examples of web browser include. ***Mozilla fire fox, web surfer, internet explorer, opera, Google chrome, Netscape navigator.***

iii. **Hyper Text Markup Language (HTML);**this is a programming language used to design web pages and websites. It is a standard tagging language. It helps in the creating and formatting of lines of text and other special headings of text, images and other objects so that a browser can easily display them.

iv. **Hyper link;** this is a text or graphic designed to provide links in a website or document. One a hyper link is clicked on it leads to a related document, file or page.

v. **Website;** ***a*** website is a collection of related web pages. A website is a group of java, html, MYSQL that are linked together by hyperlinks over the internet.

vi. **Uniform resource locator (URL);** this is an address used to locate a particular website on the WWW.

Examples of URL include

- http://www.facebook.com
- http://www.twitter.com
- http://www.google.com

vii. **Search engines;** this is a program which allows the user to look for specificinformation or documents of interest on the WWW.

Examples of search engines include

- Google
- Yahoo
- Dog pile
- Lycos
- Gmail
- Messenger/msn
- Netiquette
-

viii. **Intranet;** this is an internet that serves a single organization. It enables the organization employees to share files and resources within their organization eg. Printers, modems, faxes.

ix. **Extranet**; this is an internet that serves more than one organization. It can for example serve a school, a nearby church or a health centre.

x. **Protocol**; this is a set of rules and procedures that control communication over the internet.

Examples of protocols

Internet protocol (IP)

This is a set of rules that provide a connection of information delivery between the computer systems. It is not a guarantee that IP delivers the data.

Transfer control protocol (TCP)

It is a set of rules that provide oriented connections. It provides a guarantee that the sent data has been delivered and in case of an error, it is responsible for retransmitting the data.

Other protocols that work hand in hand with the TCP/IP protocols

HTTP(hypertext transfer protocol)

It is used for sending and receiving of WebPages to and from the web server.

FTP(file transfer protocol)

This is used for transferring any kind of files to and from the web server.

SMTP(simple mail transfer protocol)

This is used for transmitting mail messages.

SLIP(serial line internet protocol) and PPP(point to point protocol)

These are used to control net work traffic over a dial up connection. They control communication over the telephone lines.

xi. **Electronic mail (email).**

This is a message sent and received over the World Wide Web. In order for one to send or receive an email, he/she must have an email account/address

Examples of email address;

Is an account that a person owns in order to send and receive the messageover the Internet or WWW. Eg

ambickeller@gmail.com

yourname@gmail.com

kashgss2016@gmail.com

Elements of an email address.

Considering the email address below

ambickeller@gmail.com

Ambickeller	@	gmail	.com
Username	Connecting sign	Domain name	Extension

Features of an Email Address

User Name: this is the name of the person to whom the E-mail belongs

Domain Name/Address: This is a site on to which the user is connecting. Examples include the following:

i. Yahoo
ii. G-mail
iii. Hot-Mail
iv. Y-mail

Connecting Sign: This connects the user name to the domain. It is usually read as “at”

Pass word: This is a secret personal pin code used to restrict an authorized access to your E-mail account.

Dot: This connects extension and the rest at the E-mail account.

Extension: This is a short form of accompany or group that user is connected to.
Examples of extensions

i. Com-Company
ii. Co- Company
iii. Ug- Uganda
iv. Uk- United Kingdom
v. Ac – Academic institution
vi. Org-Organization

How to create an email account/address

- Get connected to the internet.
- Enter http://yahoo.com or http://gmail.com
- Select create account
- Fill in your details like name, age, sex, DoB, Address, password etc. fill all the mandatory fields.
- Click on "**I agree**" to confirm that what you have entered is collect.
- Click on submit.
- Your account will be created.

Basic features of an email:

Inbox; this lists all the messages received.
Sent box;this list all the messages that you sent.
Outbox;this lists all the messages you sent but failed to be sent.
Compose; this activates a screen onto which you type a message to be sent.
Attachment;this allows the user to attach other files and folders to the message to be sent.
To; this is where you type the email of the recipient**.**
Subject; this is where you write the main aim of the message.
Carbon copy CC; this enables copies of the message to be sent to third parties acknowledging other recipients.
Blind carbon copy BCC; this enables copies of the message to be sent to third parties without acknowledging other recipients.

FACTORS THAT AFFECT THE SPEED OF THE INTERNET

There are many factors that affect the speed of data transmission across the internet. They include the following.

1. **Computer woe**these include viruses, worms, spy ware and other destructive programs. These multiply over the internet Network while other a touch themselves to data packets thereby increasing their size which makes them heavy for transmission.

2. **Spam** junk mail from commercial companies advertising goods is sent in bulk over the internet system Network. This increases the internet traffic jam since data transmission is slowed down.

3. **The type of media used by the web** pages being loaded i.e. txt is fastest followed by small images, followed by large images and finally multimedia systems.

4. **The speed of the computer.** It affects the speed of the internet, computers with high CPU processor power work hand in hand with the web browsers to process web pages while those with slow CPU s take long.

5. **The speed of the connection between my computer and the ISP,** if a modem is used, the data transmission rate varies from 56kbps to 512kbps from cable Modem.

6. **The type of Network card and its driver** somewhere on your computer determine speed at which files which will be downloaded or upgraded on the internet.

7. **The speed of your ISP,** determine the speed at which you will receive files from the internet.

8. **The speed of the server (web servers)** that deliver web pages being loaded.

9. **The speed of the outside network** also affects data transmissions of the internet.

10. **The location of your remote computer,** affects the speed of the internet in a way that signals weaken during transmission and this may slow down the whole process.

NETTIQUETE

Is the set of rules and customs that is considered polite when connecting on Internet.
They involve the following practices:

- It helping those seeking for answers on online.
- Signing out your account after use.
- Never to such or post pornographic material.
- Identifying yourself truly on internet
- Down loading only necessary files in order to avoid clogging the internet
- Posting polite statements on online.
- Respecting for one's sites you reached on.
- Never search for friends that you don't know on internet.

Netiquette for E-mail communication

1. Give the title subject of an email you are sending
2. Give the recipient of the message
3. Write your message in sentence case not all in capital letters
4. Identify yourself truly to the recipient.
5. Use proper sentence structures
6. Make sure your Email includes courteous ending/motivating

Netiquette for online group Discussion

1. Identify yourself with a true name on handle.
2. Give objective comments
3. Avoid bad language and have respect for other members
4. Keep the discussion on the topic available don't divert the discussant in the discussion.

NB: A Handle Is A Nickname Used On The Internet

COMPUTER MALWARE, VIRUSES AND WORMS

Definition: Malware is the term used to describe the collection of all software programs designed to interfere in the normal operation of the computer system.
It is a combination of words ***MaliciousSoftware***. **Malware** is software designed to infiltrate or damage a computer system without the owner's informed consent. They include

computer viruses, worms, Trojan horses, spyware, dishonest adware, and other malicious and unwanted software.

VIRUSES:

COMPUTER VIRUSES, ERRORS AND DATA SECURITY

i) VIRUSES:

A computer virus is a deviant program that attaches its self to the computer system and destroys or corrupts data.

Viruses are developed through love for **Adventure, Malice and sabotage.**

Ways through which viruses are spread:

Mainly:

→Through infected diskettes from infected computer systems and sales demonstration applications.
→Through networks
→Software updates
→E- Mails, E – Bulletins, Free computer games on the net, etc.

Virus Symptoms

→Annoying messages e.g. Your Pc is stormed, not secure or infected.
→Adding garbage to files
→Computer switching its self off and on.
→Unnecessary variations in computer processing speeds.
→Deletion of saved file or obliteration of the functioning of the computer system or software.
→Boot failure.
→Unprecedented screen colour changes.
→Hard disk crash
→Reformatting of the hard disk which is typical of

- World concept virus
- Wazzu
- Hurri
- Boot Malmo

Types of Viruses

Virus classifications can be based on the following;
-Environment
-Operating system
-Different Algorithms of work
-Destructive Capabilities, etc.
Hence the following virus types:

- File viruses
- Boot viruses
- Micro Viruses
- Network viruses

(a) Boot Sector viruses (BSU)

These are viruses which attack and reside in programs containing instructions for booting or powering-up the computer system e.g. Anti-CMOS virus, Anti-EXE
New York Boot (NYB), Stoned, Empire, Monkey, Ripper etc

(b) File viruses

These are viruses which attach themselves to files which begin/load a program (i.e. executable files). In DOS, files with extensions like .EXE or .COM.

(c) Multipartite virus

Combine traits of both file and boot viruses e.g. Junkie virus and Parity boot viruses.

Polymorphic virus can mutate or change form, whereas Stealth virus can temporally remove self from memory

(d) Macro viruses.

These are procedural or syntax viruses. They are found inside common data files such as those created by E-mails, Spread sheets, word. E.g. Concept virus in word documents, Laroux in excel.

(e) Logic bomb

Virus set to cause menace at a set date or time.

(f) Trojan horse

Viruses which place illegal and destructive instructions in the middle if the legitimate program or file. Once the program is run, the Trojan horse is also activated to begin havoc. E.g. Format C Virus.

Protecting the Computer System Against viruses

- ✓ Buy software from Authentic/legal vendors
- ✓ Avoid running unchecked/scanned files
- ✓ Avoid running files with attachment from unknown sources on the network.
- ✓ "Back-up your file plus folder regularly"
- ✓ Use Netware with strong validation checks and in-built firewalls (e.g. Linux). i.e. Hardware and soft ware which can limit unauthorized data through Networks to reach your work station.
- ✓ Disable Auto micros functions for Macro viruses.
- ✓ Use anti-virus programs. Utility programs used to scan files and programs in order to detect, destroy or quarantine virus-infected files e.g.
  - ➢ Mcafee
  - ➢ AVG
  - ➢ Pc Cillin
  - ➢ Inoculate IT
  - ➢ Webscan
  - ➢ DR. Solomon's Anti virus Toolkit,
  - ➢ etc

COMPUTER ERRORS AND ACCIDENTS

Computer related errors and accidents include;

-Human errors. Errors caused by human users.
-Procedure errors
-Software errors
-Electro mechanical problems i.e. printers keyboards, mouse foil to work.
-Dirty data problems e.g. typographic errors.
-Natural hazard.
-Civil strife plus acts of terrorism.

CRIMES AGAINST COMPUTERS

-Theft of Hardware

-Theft of software.
-Theft of time and services.
-Theft of information.
-Crime of malice plus destruction.

COMPUTER CRIMINALS.

Professional criminals

Where organized criminals use ICTs for illegal purpose e.g. Database used for tracking stolen goods or gambling debts.
Computer used to forge cheque books, passports, driving permits etc.

Hackers

Are people who gain unauthorized access to computers or telecommunications systems for the challenge or even the principle of it.

Crackers

Gain unauthorized access to ICTs for criminal/malicious purposes like selfish financial gains, shut down hardware, pirate software, or destroy data.

Employees

Corporate employees using company computers for personal gains. Other selfish and criminal acts by employees include;

-Unlawful copying of copyrighted software
-Unauthorized access to confidential files
-Importation of virus or worm
-Frauds centered on use of credit cards, telecommunications, and employee's personnel files etc.

Outside users

E.g. Suppliers and clients, due to their ability to access firm computers through net works.

Safeguarding Your Computer

-Identification plus access.
-Encryption. I.e. altering data to avoid usage.
-Protection of software e.g. through control of access - audit control and user controls.
-Disasters recovery plans.
-Use of strong firewalls.
-Install anti-virus utilities and virus time checks.

A**computer virus**is a computer program that can copy itself and infect a computer without permission or knowledge of the user.
The original may modify the copies or the copies may modify themselves, as occurs in a metamorphic virus. The term comes from the term virus in biology. A computer virus reproduces by making (possibly modified) copies of itself in the computer's memory, storage, or over a network. This is similar to the way a biological virus works.
A virus can only spread from one computer to another when its host is taken to the uninfected computer, for instance by a user sending it over a network or carrying it on a removable medium such as a floppy disk, CD, USB drive or by the Internet. Additionally,

viruses can spread to other computers by infecting files on a network file system or a file system that is accessed by another computer.

Some viruses are programmed to damage the computer by damaging programs, deleting files, or reformatting the hard disk. Others are not designed to do any damage, but simply replicate themselves and perhaps make their presence known by presenting text, video, or audio messages. Even these benign viruses can create problems for the computer user. They typically take up computer memory used by legitimate programs. As a result, they often cause erratic behavior and can result in system crashes. In addition, many viruses are bug-ridden, and these bugs may lead to system crashes and data loss. There are many viruses operating in the general Internet today, and new ones are created and discovered every day.
Examples of Viruses:

- Acid
- Acme (Uses email to destroy all files on the computer)
- A and A (Highly attacks Windows 95, 98 and MS.DOS)

WORMS

Viruses are sometimes confused with computer worms and Trojan.
A **computer worm** is a self-replicating computer program. It uses a ***network*** to send copies of itself to other nodes (computer terminals on the network) and it may do so without any user intervention. Unlike a virus, it does not need to attach itself to an existing program. Worms always harm the network (if only by consuming bandwidth), whereas viruses always infect or corrupt files on a targeted computer. Many worms have been created which are only designed to spread, and don't attempt to alter the systems they pass through. However, as the *Morris worm*and ***Mydoom***showed, the network traffic and other unintended effects can often cause major disruption.
On the other hand, a **Trojan horse** is a program that installs malicious software while under the guise of doing something else. A Trojan horse differs from a virus in that a Trojan horse does not insert its code into other computer files and appears harmless until executed. The term is derived from the classical myth of the Trojan Horse. Trojan horses may appear to be useful or interesting programs (or at the very least harmless) to an unsuspecting user, but are actually harmful when executed.

HOW VIRUSES SPREAD

1. ***Use of already infected storage devices*** like floppy diskettes, flash disks and other portable devices.

2. *Down loads from internet Bulletin Boards*: Downloading software programs from internet advertising boards. Such programs include free screensavers, smilesetc

3. ***Pirated software***: Software that is not original from the manufacturer but sold by vendors.

4. ***Downloading email attachments (binary files) form unknown senders***. Normally this could be Spam or hacker programs that have been encoded with virus codes in them.

5. ***Freeware and game programs*** are an excellent environment for virus developer to send viruses to many people because games are liked by many.

6. ***Interconnecting an infected PC on a network*** will also spread the virus or the worm to the rest of the network.
7. ***Software updates***when one is updating the software some applications has got viruses which are got from the designed program.

HOW TO STOP THE THREAT OF VIRUSES AND OTHER MALWARE PROGRAMS

1. Use of Anti-virus software such as Norton Anti-virus, Dr. Solomon Toolkit, AVG anti-virus etc

2. Avoid external storage devices before they are scanned for malware.

3. Avoid downloads from bulletin boards and opening of email binary files/attachments form unknown sources.

4. Always buy genuine software form original manufacturers other than vendors who have pirated versions.

DATA COMMUNICATION & NETWORKING

Data communicationrefers to the electronic transfer of data & information that has been digitally encoded from the source to the destination.

It is the high speed exchange of data and information from the source (sender) to the destination (Receiver)

It is the high speed exchange of data and information between computers and any other electronic devices through cables and wireless technology.

Elements of data communication

i. **Sender;** this is the device that initiates an instruction to transmit data and instructions eg. A source computer.
ii. **Receiver;** this is a device that accepts data signals from the source device.
iii. **Message;** this is the data/content/information to be relayed/transmitted over a transmission medium. It is usually in a digital/discrete form.
iv. **Transmission medium;** this is a communication channel/path over which data signals are sent. Eg. Physical wire or wireless media like blue tooth, infra red, micro waves etc.
v. **Protocol;** this is a set of rules and procedures for exchanging data and information among computers and devices over a network.
vi. **Communication device/signal converter;** this is a device that converts the data/ instructions from the sending device into a signal that can be carried by the transmission medium to the receiver.

DATA COMMUNICATION TOOLS.

Data communication tools include

i. Phones
ii. Emails
iii. Social networks
iv. Instant messaging and Skype.

Phones; Wireless phones are a most common form of communication in most countries in the world today. Text messaging is rampant and with the advent of smart phones which have PC enabled functions. People are now using phones to send large format videos, pictures and multimedia. This is achieved by phone having blue tooth, hands free, speakers and internet access.

Emails; Email is a function of the internet and many users can access it through myriad devices like phones, computers, and Personal Digital Assistances (PDAs). Emails are used to send messages and other multimedia from the sender to the receiver.

Social networks; Social networks enable interaction between different users who communicate directly over the internet. Social networks include;face book, twitter, badoo, whatsapp, palm chart, Viber, Imo, etc.

Social networks allow users to up load and download photos, pictures, and can be used for digital record keeping. Some social networks are free to use. E.g. http://0.facebook.com

Instant messaging and Skype; Instant messaging and Skype are often done over the internet. Skype offers online calling, messaging, and video calling across the world.

DATA TRANSMISSION MEDIA

This is a communications channel/paths over which data signals are sent from the source to the destination.

TYPES OF TRANSIMISSION MEDIA

i. Physical transmission media/guided
ii. Wireless/un guided media

Physical data transmission media provides restricted path/ physical path along which data signals are propagated.

Examples of physical data transmission media include;

- Twisted pair wire
- Coaxial cables
- Optical fiber cables.

Wireless data transmission media.

This is a type of transmission media that is used to transmit data from one point to another without using any physical connections.

It is a kind of transmission media that is unguided because in most cases the signals are scattered in the air and the user may have no control over them.

This kind of transmission is facilitated by use of antennas and receiver aerials.

An antenna can be defined as an electrical conductor or a system of conductors used for either radiating or collecting electromagnetic energy.

Categories of wireless transmission media.

i. **Satellite (broadcasting transmission);** This is a micro wave relay station. It is used to link two or more ground based microwave transmitter/receiver earth/ground stations**.** Satellites are of two types ie. Passive and active satellites.
ii. **Blue tooth;** this is a wireless technology standard for exchanging data over short distances. It uses a short wave length in the transmission of data. Blue tooth is most used with phones to exchange data files over short distances.
iii. **Wi-Fi (wireless fidelity);** This is a wireless technology that allows an electronic device to exchange data using radio waves over a computer network. A device that uses Wi-Fieg a PC, video game consul, smart phone, or a digital audio player can connect to a network through a wireless network access point.
iv. **Infra Red;** This is an electromagnetic radiation with a long wave length than that of visible light. Infra red light is used in industries for scientific and medical applications.
v. **Micro wave;** These are radio waves with a wave length ranging from one meter and with a frequency of between 300mhz (0.3ghz) to 300ghz.

COMPUTER NETWORKS

A **computer network** or **data network** is a telecommunications network that allows computers to exchange data.

In computer networks, networked computing devices pass data to each other along data connections. The connections (network links) between nodes are established using either cable media or wireless media. The best-known computer network is the Internet.

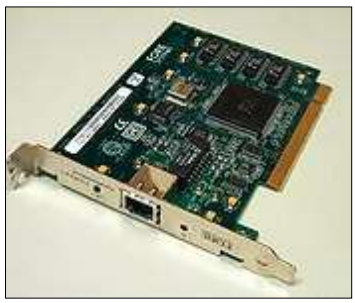
Network computer devices that originate, route and terminate the data are called network nodes. Nodes can include hosts such as personal computers, phones, servers as well as networking hardware. Two such devices are said to be networked together when one device

is able to exchange information with the other device, whether or not they have a direct connection to each other.

Computer networks support applications such as access to the World Wide Web, shared use of application and storage servers, printers, and fax machines, and use of email and instant messaging applications. Computer networks differ in the physical media used to transmit their signals, the communications protocols to organize network traffic, the network's size, topology and organizational intent

BASIC REQUIREMENTS FOR SETTING UP COMPUTER NETWORKS

Networks comprise additional basic system building blocks, such as network interface controller (NICs), repeaters, hubs, bridges, switches, routers, modems, and firewalls.



Network interfaces; A network interface controller (NIC) is computer hardware that provides a computer with the ability to access the transmission media, and has the ability to process low-level network information. For example the NIC may have a connector for accepting a cable, or an aerial for wireless transmission and reception, and the associated circuitry.

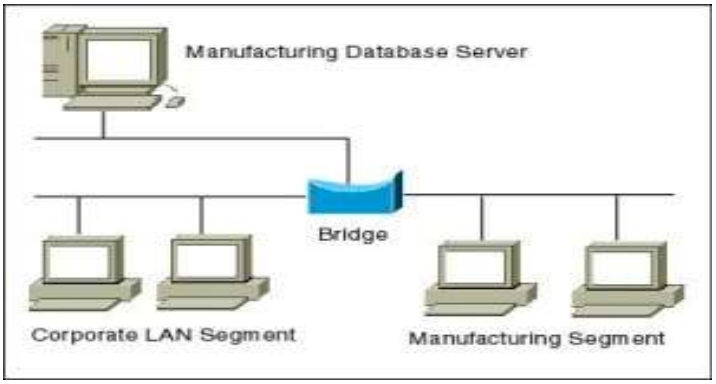
The NIC responds to traffic addressed to a network address for either the NIC or the computer as a whole.

Repeaters and hubs; A repeater is an electronic device that receives a network signal, cleans it of unnecessary noise, and regenerates it. The signal is retransmitted at a higher power level, or to the other side of an obstruction, so that the signal can cover longer distances without degradation. In most twisted pair Ethernet configurations, repeaters are required for cable that runs longer than 100 meters. With fiber optics, repeaters can be tens or even hundreds of kilometers apart.

A repeater with multiple ports is known as a hub. Repeaters work on the physical layer of the OSI model. Repeaters require a small amount of time to regenerate the signal..

Hubs have been mostly absorbed by modern switches; but repeaters are used for long distance links, notably undersea cabling.

Bridges; A network bridge connects and filters traffic between two network segments at the data link layer (layer 2) of the OSI model to form a single network. This breaks the network's collision domain but maintains a unified broadcast domain. Network segmentation breaks down a large, congested network into an aggregation of smaller, more efficient networks.



Bridges come in three basic types:

- Local bridges: Directly connect LANs
- Remote bridges: Can be used to create a wide area network (WAN) link between LANs. Remote bridges, where the connecting link is slower than the end networks, largely have been replaced with routers.
- Wireless bridges: Can be used to join LANs or connect remote devices to LANs.

Switches; A network switch is a device that forwards and filters OSI layer 2data grams between ports based on the MAC addresses in the packets. A switch is distinct from a hub in that it only forwards the frames to the physical ports involved in the communication rather than all ports connected. It can be thought of as a multi-port bridge. It learns to associate physical ports to MAC addresses by examining the source addresses of received frames. If an unknown destination is targeted, the switch broadcasts to all ports but the source. Switches normally have numerous ports, facilitating a star topology for devices, and cascading additional switches.

Multi-layer switches are capable of routing based on layer 3 addressing or additional logical levels. The term *switch* is often used loosely to include devices such as routers and bridges, as well as devices that may distribute traffic based on load or based on application content (e.g., a Web URL identifier).

Routers;A router is an internetworking device that forwards packets between networks by processing the routing information included in the packet or datagram (Internet protocol information from layer The routing information is often processed

in conjunction with the routing table (or forwarding table). A router uses its routing table to determine where to forward packets. (A destination in a routing table can include a "null" interface, also known as the "black hole" interface because data can go into it, however, no further processing is done for said data.)

Modems; Modems (Modulator Demodulator) are used to connect network nodes via wire not originally designed for digital network traffic, or for wireless. To do this one or more frequencies are modulated by the digital signal to produce an analog signal that can be tailored to give the required properties for transmission. Modems are commonly used for telephone lines, using a Digital Subscriber Line technology.

Firewalls; A firewall is a network device for controlling network security and access rules. Firewalls are typically configured to reject access requests from unrecognized sources while allowing actions from recognized ones. The vital role firewalls play in network security grows in parallel with the constant increase in cyber attacks.

Advantages of Computer Networks

File Sharing; The major advantage of a computer network is that is allows file sharing and remote file access. A person sitting at one workstation that is connected to a network can easily see files present on another workstation, provided he is authorized to do so. This saves him/her the hassle of carrying a storage device every time data needs to be transported from one system to another. Further, a central database means that anyone on that network can access a file and/or update it. If files are stored on a server and all of its clients share that storage capacity, then it becomes easier to make a file available to multiple users.

Resource Sharing; Resource sharing is another important benefit of a computer network. For example, if there are twelve employees in an organization, each having their own computer, they will require twelve modems and twelve printers if they want to use the resources at the same time. A computer network, on the other hand, provides a cheaper alternative by the provision of resource sharing. All the computers can be interconnected using a network, and just one modem and printer can efficiently provide the services to all twelve users.

Inexpensive Set-Up; Shared resources mean reduction in hardware costs. Shared files mean reduction in memory requirement, which indirectly means reduction in file storage expenses. A particular software can be installed only once on the server and made available across all connected computers at once. This saves the expense of buying and installing the

same software as many times for as many users.

Flexible Handling; A user can log on to a computer anywhere on the network and access his files. This offers flexibility to the user as to where he should be during the course of his routine. A network also allows the network administrator to choose which user on the network has what specific permissions to handle a file. For example, the network administrator can allot different permissions to User A and User B for File XYZ. According to these permissions, User A can read and modify File XYZ, but User B cannot modify the file. The permission set for User B is read-only. This offers immense flexibility against unwarranted access to important data.

Increased Storage Capacity; Since there is more than one computer on a network which can easily share files, the issue of storage capacity gets resolved to a great extent. A standalone computer might fall short of storage memory, but when many computers are on a network, the memory of different computers can be used in such a case. One can also design a storage server on the network in order to have a huge storage capacity.

Disadvantages of Computer Networks

Security Concerns; One of the major drawbacks of computer networks is the security issues that are involved. If a computer is a standalone computer, physical access becomes necessary for any kind of data theft. However, if a computer is on a network, a hacker can get unauthorized access by using different tools. In case of big organizations, various network security software need to be used to prevent theft of any confidential and classified data.

Virus and Malware; If even one computer on a network gets affected by a virus, there is a possible threat for the other systems getting affected too. Viruses can spread on a network easily, because of the inter-connectivity of workstations. Moreover, multiple systems with common resources are the perfect breeding ground for viruses that multiply. Similarly, if malware gets accidentally installed on the central server, all clients in the network that are connected to that server will get affected automatically.

Lack of Robustness; If the main file server of a computer network breaks down, the entire system becomes useless. If there is a central linking server or a bridging device in the network, and it fails, the entire network will come to a standstill. In case of big networks, the file server should be a powerful computer, which often makes setting up and maintaining the system doubly expensive.

Needs An Efficient Handler; The technical skills and know-how required to operate and administer a computer network is considerably high. Any user with just the basic skills cannot do this job. Also, the responsibility that comes with such a job is high, since allotting username-passwords and permissions to users in the network are also the network administrator's duties. Similarly, network connection and configuration is also a tedious task, and cannot be done by an average user who does not have advanced knowledge of computers and/or networking.

Lack of Independence; Since most networks have a centralized server and dependent

clients, the client users lack any freedom whatsoever. Centralized decision making can sometimes hinder how a client user wants to use his own computer.
Computer networks have had a profound effect on the way we communicate with each other today, and have made our life easier. From the World Wide Web to your local office LAN, computers have become indispensable in daily life, and networks have become a norm in most businesses. If networks are designed and configured keeping in mind its pros and cons, they are the best piece of facility you could ever have.

Types Of Computer Networks

A **local area network** (**LAN**) is a computer network that interconnects computers within a limited area such as a home, school, computer laboratory, or office building, using network media. The defining characteristics of LANs, in contrast to wide area networks (WANs), include their smaller geographic area, and non-inclusion of leased telecommunication lines

A **metropolitan area network** (**MAN**) is a computer network larger than a local area network, covering an area of a few city blocks to the area of an entire city, possibly also including the surrounding areas. A MAN is optimized for a larger geographical area than a LAN, ranging from several blocks of buildings to entire cities. MANs can also depend on communications channels of moderate-to-high data rates. A MAN might be owned and operated by a single organization, but it usually will be used by many individuals and organizations. MANs might also be owned and operated as public utilities. They will often provide means for internetworking of local networks

A **wide area network** (**WAN**) is a network that covers a broad area (i.e., any telecommunications network that links across metropolitan, regional, national or international boundaries) using leased telecommunication lines. Business and government entities utilize WANs to relay data among employees, clients, buyers, and suppliers from various geographical locations. In essence, this mode of telecommunication allows a business to effectively carry out its daily function regardless of location.

A **campus network**, **campus area network**, **corporate area network** or **CAN** is a computer network made up of an interconnection of local area networks (LANs) within a limited geographical area. The networking equipments (switches, routers) and transmission media (optical fiber, copper plant, Cat5 cabling etc.) are almost entirely owned by the campus tenant / owner: an enterprise, university, government etc.

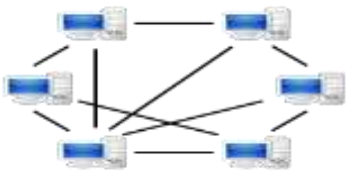
A **personal area network** (**PAN**) is a computer network used for data transmission among devices such as computers, telephones and personal digital assistants. PANs can be used for communication among the personal devices themselves (intrapersonal communication), or for connecting to a higher level network and the Internet (an uplink). A **personal digital assistant** (**PDA**), also known as a **palmtop computer**, or **personal data assistant**, is a mobile device that functions as a personal information manager. PDAs are largely considered obsolete with the widespread adoption of smart phones.

TYPES OF NETWORK MODELS

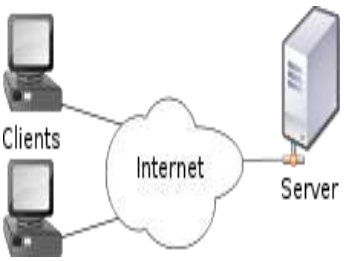
Peer-to-peer (P2P)

Is a LAN configuration where no particular computer is assigned the responsibility of administering other computers on the network. Computers on the network communicate direct with one another without a server. Peers are equally privileged, equipotent participants in the application. They are said to form a peer-to-peer network of nodes.

Peers make a portion of their resources, such as processing power, disk storage or network bandwidth, directly available to other network participants, without the need for central coordination by servers or stable hosts. Peers are both suppliers and consumers of resources, in contrast to the traditional client–server model in which the consumption and supply of resources is divided. Emerging collaborative P2P systems are going beyond the era of peers doing similar things while sharing resources, and are looking for diverse peers that can bring in unique resources and capabilities to a virtual community thereby empowering it to engage in greater tasks beyond those that can be accomplished by individual peers, yet that are beneficial to all the peers



Peer-to-peer (P2P)



Client–server model

The **client–server model** of computing is a distributed application structure that partitions tasks or workloads between the providers of a resource or service, called servers, and service requesters, called clients.[1] Often clients and servers communicate over a computer network on separate hardware, but both client and server may reside in the same system. A server host runs one or more server programs which share their resources with clients. A client does not share any of its resources, but requests a server's content or service function. Clients therefore initiate communication sessions with servers which await incoming requests.

Examples of computer applications that use the client–server model are Email, network printing, and the World Wide Web.

Network structure/topology (not examinable at A' Level)

Network topology is the layout or organizational hierarchy of interconnected nodes of a computer network. Different network topologies can affect throughput, but reliability is often more critical. With many technologies, such as bus networks, a single failure can cause

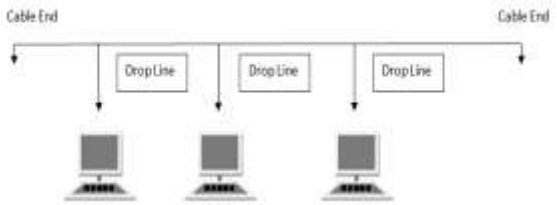
the network to fail entirely. In general the more interconnections there are, the more robust the network is; but the more expensive it is to install.

TYPES OF NETWORK TOPOLOGY

Network Topology is the schematic description of a network arrangement, connecting various nodes (sender and receiver) through lines of connection.

BUS Topology

Bus topology is a network type in where every computer and network device is connected to single cable.



Features of Bus Topology

1. It transmits data only in one direction.
2. Every device is connected to a single cable

Advantages of Bus Topology

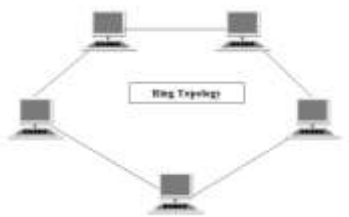
1. It is cost effective.
2. Cable required is least compared to other network topology.
3. Used in small networks.
4. It is easy to understand.
5. Easy to expand joining two cables together.

Disadvantages of Bus Topology

1. Cables fails then whole network fails.
2. If network traffic is heavy or nodes are more the performance of the network decreases.
3. Cable has a limited length.
4. It is slower than the ring topology.

RING Topology

It is called ring topology because it forms a ring as each computer is connected to another computer, with the last one connected to the first. Exactly two neighbors for each device.



Features of Ring Topology

1. A number of repeaters are used and the transmission is unidirectional.
2. Date is transferred in a sequential manner that is bit by bit.

Advantages of Ring Topology

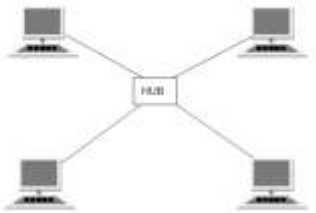
1. Transmitting network is not affected by high traffic or by adding more nodes, as only the nodes having tokens can transmit data.
2. Cheap to install and expand

Disadvantages of Ring Topology

1. Troubleshooting is difficult in ring topology.
2. Adding or deleting the computers disturbs the network activity.
3. Failure of one computer disturbs the whole network.

STAR Topology

In this type of topology all the computers are connected to a single hub through a cable. This hub is the central node and all others nodes are connected to the central node.



Features of Star Topology

1. Every node has its own dedicated connection to the hub.
2. Acts as a repeater for data flow.
3. Can be used with twisted pair, Optical Fiber or coaxial cable.

Advantages of Star Topology

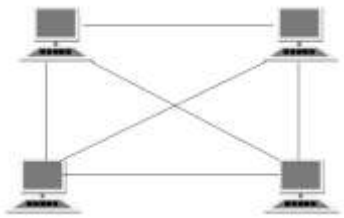
1. Fast performance with few nodes and low network traffic.
2. Hub can be upgraded easily.
3. Easy to troubleshoot.
4. Easy to setup and modify.
5. Only that node is affected which has failed rest of the nodes can work smoothly.

Disadvantages of Star Topology

1. Cost of installation is high.
2. Expensive to use.
3. If the hub is affected then the whole network is stopped because all the nodes depend on the hub.
4. Performance is based on the hub that is it depends on its capacity

MESH Topology

It is a point-to-point connection to other nodes or devices. Traffic is carried only between two devices or nodes to which it is connected. Mesh has n (n-2)/2 physical channels to link the devices.



Types of Mesh Topology

1. **Partial Mesh Topology:**In this topology some of the systems are connected in the same fashion as mesh topology but some devices are only connected to two or three devices.
2. **Full Mesh Topology:**Each and every nodes or devices are connected to each other.

Features of Mesh Topology

1. Fully connected.
2. Robust.
3. Not flexible.

Advantages of Mesh Topology

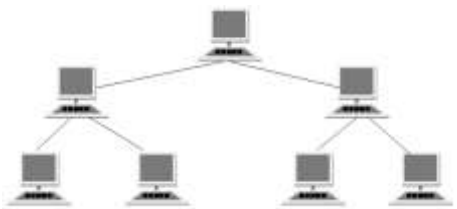
1. Each connection can carry its own data load.
2. It is robust.
3. Fault is diagnosed easily.
4. Provides security and privacy.

Disadvantages of Mesh Topology

1. Installation and configuration is difficult.
2. Cabling cost is more.
3. Bulk wiring is required.

TREE Topology

It has a root node and all other nodes are connected to it forming a hierarchy. It is also called hierarchical topology. It should at least have three levels to the hierarchy.



Features of Tree Topology

1. Ideal if workstations are located in groups.

2. Used in Wide Area Network.

Advantages of Tree Topology

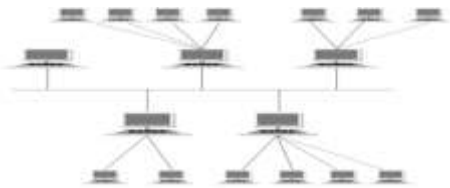
1. Extension of bus and star topologies.
2. Expansion of nodes is possible and easy.
3. Easily managed and maintained.
4. Error detection is easily done.

Disadvantages of Tree Topology

1. Heavily cabled.
2. Costly.
3. If more nodes are added maintenance is difficult.
4. Central hub fails, network fails.

HYBRID Topology

It is two different types of topologies which is a mixture of two or more topologies. For example if in an office in one department ring topology is used and in another star topology is used, connecting these topologies will result in Hybrid Topology (ring topology and star topology).



Features of Hybrid Topology

1. It is a combination of two or topologies
2. Inherits the advantages and disadvantages of the topologies included

Advantages of Hybrid Topology

1. Reliable as Error detecting and trouble shooting is easy.
2. Effective.
3. Scalable as size can be increased easily.
4. Flexible.

Disadvantages of Hybrid Topology

1. Complex in design.
2. Costly.

Note: the physical layout of the nodes in a network may not necessarily reflect the network topology. As an example, with FDDI, the network topology is a ring (actually two counter-rotating rings), but the physical topology is often a star, because all neighboring connections can be routed via a central physical location

INTRODUCTION TO DATABASE
(MICROSOFT ACCESS)

A database is a collection of structured and related data items organized so as to provide a consistent and controlled access to items.

A database management software on the other hand is a software that facilitates the creation, organization and maintenance of a database.

Examples of database mgt software.

- ***Ms access***
- ***MySQL***
- ***Lotus approach***
- ***Fox pro database***

Functions of a database software.

It allows the user to create or add a record.

Allows the user to update and modify the existing records

It acts as an interface between the database and other application programs

It ensures security for the data

It keeps statistical data in the database.

Database models.

i. **Flat files.**
In a flat file model a database holds only one set of data and this is not different from a manual file e.g.A students assessment report may consist of performance cards for every students in a class.

ii. **Hierarchical mode;**
Data items are arranged in a hierarchical tree form.

iii. **Rational database mode**
This is where related items are stored together in a structure called a ration/table.

iv. **Network mode.**
This is the type of organization that links are used to express relationships between data items forming a network of items.

Features of a database management software.

Most database software contains a collection of features that provide the user with the means of manipulating data in a database.

<u>These features include;</u>

Tables
Queries
Reports
Forms

Tables; this is a database structure that is used to hold related records. Tables are organized in rows and columns with each row representing a record while each column represents a field in each record.
Queries;this is a statement used to extract, change, analyze or request a specific data from one or more tables.
Forms;this is a graphical representation (interface) that enables the user to view and enter data in a table.
Report;this provides the user with the means to specify output and what is to be printed as a report.

Guidelines for designing a good database.

- Carefully study the user requirements in order to determine the input, output and the relationships required.
- Design a draft database on the paper to determine the number of fields or tables required.
- Divide the information into separate fields, records and tables to allow flexibility in manipulating the table.
- Give important fields first priority when constructing a table structure.

Description of field data types.

When designing a database, the type of data to be entered must be clearly defined for the purpose of storage and manipulation.

i. **Text;**this data type includes letters of alphabet, spaces and punctuation marks. This database does not support any calculations. It can be used where the user wants to enter only words involving no numbers.
ii. **Number;** these are fields made up of numeric numbers 0-9 that are manipulated mathematically.
iii. **Memo;** this is data type made up of alphanumeric data (both numbers and letters).
iv. **Date/time;**this is used to identify the field using either date or time. This is because date and time value can be manipulated in a database.
v. **Currency;**this is a data type used especially when dealing with money eg. Fees balances, salary etc.
vi. **Auto Number;**this is an automatically generated number. It is used especially on user id number and index numbers that are automatically generated.
vii. **Yes/no;**this a logical data type entered in afield that requires the user to answer whether the condition is true or false, yes or no. it can be entered in a field that requires one to about sex, female or male.
viii. **OLE object.**(Object linking and embedding); this is use in field where the user wants to insert a drawing, a graphic or a picture.

Terms used in relation to database.

Format; this determines how information will appear when printed. Eg. You can format a number to currency, percentage, of general number.

Decimal places; this is used on field with numbers and currency; the user can format the decimal places to the number of decimal places of his or her choice.

Caption; this is a more descriptive name for a field or table.

Default values; these are values that automatically appear in the data sheet. Eg. Date and time appear on sheets automatically.

Validation rule;this is a logical expression that restricts the values to be entered in a field. E.g. if you want to enter numbers that vary between 0 and 100, type >=0 and <=100.

Validation text; this is a message that appears once a validation rule is violated.

Require; this determines that an entry must be made in a field before you proceed to the next field.

Allow zero length;this allows the user to proceed without making any entry in a field set to zero length.

Index. This facilitates the organization of records for easy search. A primary key is an example of an index.

Primary key; this is an index that uniquely identifies each record sorted in a table. A primary key controls the user from entering a null or double entries in a table.

INTRODUCTION TO SPREADSHEETS (Microsoft office excel)

Introduction

Analysing data is one of the most demanding tasks. This is the reason why the human being has been struggling to come up with better tools for handling these figures. This started with the abacus but today we have electronic calculators and spreadsheets. Fig. 5.1 shows a sample electronic spreadsheet.

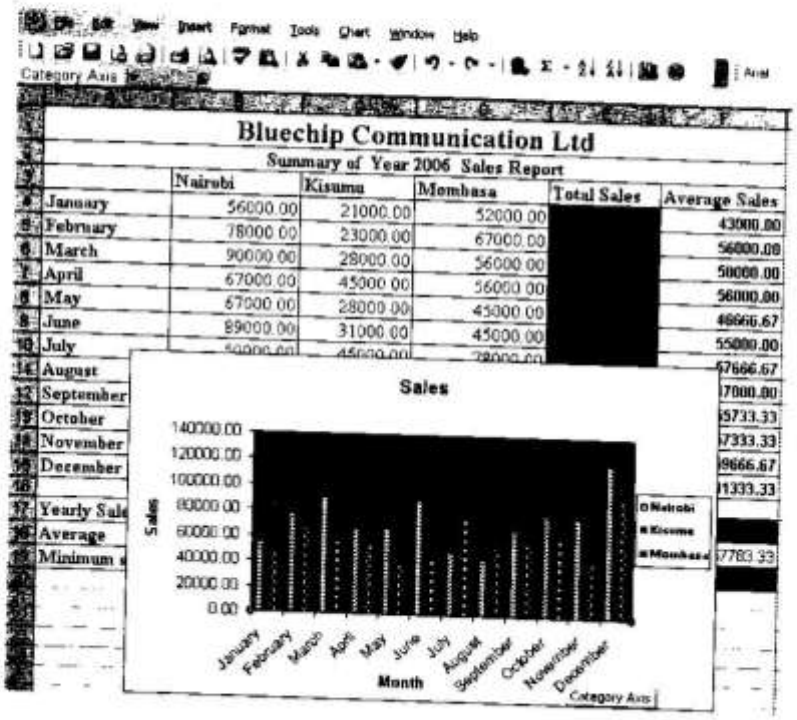


Fig. 5.1: A sample spreadsheet

Electronic spreadsheets

An electronic spreadsheet is an application software used to calculate, organise and analyse numerical data. Examples of spreadsheets include Microsoft Excel, Lotus 1-2-3 and Corel Quattro Pro.

Components of an electronic spreadsheet

The three main components of standard spreadsheet software are:

- *Worksheet* - A rectangular grid made up of rows and columns.
- *Database* - Enables the user to perform functions such as sort, filter, subtotaling and

consolidation on worksheet data. A spreadsheet file can also be saved with a .dbf extension to make it accessible from other applications using a database engine.

- *Graphs* - Visual representation of data on a chart.

Advantages of electronic spreadsheets

- They have large worksheets compared to manual spreadsheets.
- They automatically adjust the result whenever a value is changed in a cell(s) that is referenced by a formula.
- They have superior editing and formatting features hence producing neat work.
- Easier entry of data due to typing aids such as autocomplete, autocorrect, copy and move.
- It is possible to forecast or predict the outcome of changing values in one or more cells.
- Analytical graphs or charts lets one provide visual representation of data from a worksheet.
- Easy management of large amount of data using data management features such as sorting, filtering, data validation and subtotaling.

Applications of electronic spreadsheets

- *Statistical analysis* such as mean, standard deviation, variance etc.
- *Accounting* such as balance sheet preparation, loan repayment, mortgage and investments analysis.
- *Forecasting* — What if analysis, solver, goal seek and scenario in most spreadsheets evaluate the effect of changing a value to achieve a certain goal for managerial purpose.
- *Mathematical and scientific* solution such as arithmetic, trigonometric, rounding off and multiplication.

CELL REFERENCE.

Types of cell reference

i. **Relative reference;** this is where the cell reference of a formula is automatically updated when the formula is copied to a new cell.

ii. **Absolute cell reference;** this is where the cell reference of the formula remains the same even when the formula is copied to another cell/location. This happens when the formula is preceeded by a US dollar sign eg =a1:a5

iii. **Mixed cell referencing**; this is a combination of an absolute and rekative cell reference.

Apart from the *title bar*, *menu bar*, *standard toolbar* and *status bar*, discussed in chapter 4 (Word Processing), Excel has the following additional features:

Formula bar

Formula bar is an area where a cell entry or a formula is displayed before being entered into the selected cell.

Worksheets

A worksheet is the work area made up of rows and columns where data is entered. In Excel, a spreadsheet file is referred to as a workbook. A workbook consists of one or more related *worksheets*.

Cells

A cell is an intersection between a row and a column. A column is a vertical arrangement of cells labelled A,B, C... while a row is the horizontal arrangement labelled 1, 2, 3, ... For example, *A2* represents a cell in the first column, second row.

Worksheet tabs

Worksheet tabs are located at the bottom of a spreadsheet. They show the number of worksheets in the workbook. Note that one worksheet may have several pages.

Entering data into a worksheet

When entering data item, the entry is displayed in the formula bar before you move to another cell. To place the content to the selected cell, press Enter key or an arrow key or click into another cell. Three main cell entries are:

- *Labels* — alphanumeric characters or text that describe the content of a row or column, e.g. names.
- *Values* — numeric characters 0-9 and dates that can be manipulated mathematically.
- *Formula* and *Functions* — while a formula refers to a mathematical expression, a function is a predefined or in-built formula that allows the user to perform complex calculations.

Saving a workbook

To save a workbook:

1. On the File menu click Save As. Alternatively click the Save button on the standard toolbar.
2. Select the storage location.
3. Type the name of the workbook then click the Save button.

Protecting a workbook

To protect a worksheet or workbook from unauthorised access or modification:

1. On the Tools menu, point to Protection, then select Sheet or Workbook (Fig. 5.3).
2. Click check boxes for protection options.
3. Type a password, then click OK.

3) **Range**: This is a group of adjacent cells. A range is a rectangular group of cells. E.g. A1:B8
4) **Range Address**: This is a reference of adjacent cells which has a format of top-left cell address or e.g.D13:F20.
5) **Worksheet**: This is one sheet in a spreadsheet workbook. It is a grid of columns and rows. It is a component in which data values are entered.
   Ms Excel by default presents three worksheets in every workbook when opened but more sheets can be added.
6) **Workbook**: This is a collection of worksheets grouped together.
7) **Formula**: This is a worksheet entry that calculates data. It consists of numbers, text, operators, cell addresses, range names etc.
8) **Active cell**: This is the cell in which the cursor is situated at a particular moment. It is the selected cell where data is being entered. It is also called the Current cell
9) **Row**: Horizontal arrangement of cells. The rows are numbered 1 to 65536, while columns are lettered (A, B, C.....)
10) **Column**: Vertical arrangement of cells
11) **Worksheet tab**: This consists of name of worksheets in a workbook
12) **Name Box**: A place in the worksheet window where the name of the active cell is displayed.

Types of Data Entered In Ms Excel

1) Labels
2) Values
3) Formulae
4) Functions

Labels

This refers to any text or alphanumeric characters that cannot be numerically calculated. Labels are usually used as row or column headings.

Headings are used to describe the contents of the row or column. Labels cannot be calculated and are always in text form.

Numbers can be used as labels but an apostrophe must be used before that number for example, '2013. Other examples of labels include NAME, ITEM, etc.

Values

These are entries which can be calculated mathematically by spreadsheets. They may include numbers 0 – 9, currency, date, formula, special symbols like +,-, #, @, % etc, which can be used for calculation.

Formula

This is an entry in a worksheet used to calculate data OR It is an expression which creates a relationship between cells and returns a value in a chosen cell. Examples of functions are: SUM, MAX, MIN, AVERAGE etc.

Functions

These are inbuilt predefined formulae that the user can quickly use instead of having to create a new one each time calculations are to be carried out. Most common calculations have their formulae predefined like SUM

Arithmetic Operations in Ms Excel/Spreadsheets

OPERATION	OPERATOR	OPERAND	EXAMPLE
Multiplication	* (Asterisk)	B2,C4	=B2* C4
Division	/ (Forward Slash)	B2,C4	=B2/C4
Sum/Addition	+ (Plus)	B2,C4	=B2+C4
Subtraction	- (Minus)	B2,C4	=B2-C4
Percentage	% (Percent)	C5	=C5*60%
Exponent	^ (Exponent)	C5	=C5^2
Parentheses	( ) (brackets)	B2,C4,D5	=B2* (C4+D5)

NB: Values (arguments) in brackets are calculated first.

VALUE (NUMBER) FORMATS IN SPREADSHEETS

General: General format cells have no specific number format.

Date: This displays date in specified format.

Number: This is used for general display of numbers.

Time: This displays time in specified format.

Currency: This displays general monetary values like dollars, pounds, shillings.

Percentage: This displays data as a percentage.

Accounting: This automatically assigns a currency symbols and decimal points

Fraction: This displays all entered values as fractions.

Text: Formats cells so that every entry is treated as text including values

Custom: The user specifies the values that fall outside the values in Excel e.g. index numbers.

Special: This includes special values like phone numbers, Account numbers & social security.

TYPES OF CELL AND RANGE REFERENCING

Cell reference refers to the position of the cell in a worksheet.

In Ms Excel, the A1instead of the R1C1 cell referencing style is used.

There are 3 types of cell references.

1) Relative cell reference.
2) Absolute Reference (fixed cell reference).
3) Mixed cell reference.

Relative Cell Reference

- This is a cell address that changes when copied to another cell in the worksheet.
- This means that the cells used in the formula keep changing depending on their position. (Relative) in the worksheet. For example, if the formula =A1+A2 is in cell A3, it would become =B1+B2 in cell B3.
- This happens when copying formulae.

Absolute Cell References

This is a cell address that doesn't change even when copied to other cells in the worksheet.

It always refers to the cells in a specific location.

- An absolute reference is shown by a dollar sign ($), which makes it absolute.
- The dollar sign fixes the column letter or row number placed immediately after it e.g. $A$15.
- If a formula is constructed using cell A15 and you want the values in A15 to remain unchanged if copied from one cell to another you include the dollar sign e.g.: = $A$15.

Mixed Cell References

- This cell reference is partly absolute and partly relative.
- The dollar sign fixes the column letter or row number immediately after it only. For example, in the formula, =$A1*A2. The column letter A is absolute (cannot change) but the row number is relative (it can change).

- In the formula =A$1*A2, column letter A is relative (it can change), while row number is absolute (it can't change). Therefore when this formula is copied to D7 it becomes =D$1*D6.

FORMULAE AND FUNCTIONS IN SPREADSHEETS

- A formula is a worksheet entry that calculates data. A formula can contain numbers, text, operators, cell addresses, range names and other formulae.
- A formula can be built using operators and separators like brackets.
- Formulae perform mathematical operations ranging from very simple arithmetic problems to complex scientific, financial and mathematical analysis.

How to build a Formula

- Select a cell where you want to enter the formula by clicking in it.
- Type an equal sign to begin the formula.
- Type the first operand e.g. A5.
- Type the first operator e.g. +
- Type in the next operand e.g. B5
- Press Enter to display the results.

TYPES OF FORMULAE/FUNCTIONS

There are three types of formula in spreadsheet

1. Numeric (Mathematical) Formulae/Functions

These perform calculations in values.

They use operators like +,-, /,* and ^ for calculation.

Most of the calculations in a worksheet are based on these functions. For example Summing, Product, Division etc

2. Text (Statistical) Formulae/Functions

A text formula is used to manipulate text data.

The text is normally enclosed in Quotation marks (" ") to form a strings of characters.

Text formulae can be used to combine text from different cells to one cell.

3. Logical Formulae/Functions

These are statements that evaluate conditions.

They use operators like, =,>, < , >< , also, OR, AND, NOT and BETWEEN.

Examples of logical functions include;

1) **If**: This returns a specified value if a condition is evaluated and found to be true and another value if it is false. Eg: =if(A1>50,"PASS","FAIL")

   PASS will be returned if value in A1 is greater than 50 and FAIL will be returned if the value is less than 50

2) **Countif:** Counts the number of cells within a specified range which meet the given criteria.

3) If the cells A1:E1 contain eggs, beans, beans, eggs, eggs; the formula would look like; =countif(A1:E1,"eggs") this will return 3 as the answer because eggs appear three times.

4) **Sumif:** This adds values in cells specified by the condition or criteria.

For example, if the cells A1:E1 contain values 1, 2, 4, 5, 7 to sum all values greater than 4 the formula would look like this. =sumif(A1:E1,"<5"). 7 will be returned as the answer.

STATISTICAL FORMULAE/FUNCTIONS

Statistical functions include:

1) **Average**: This displays the mean for a group of values. For example =Average(A1:E10)
2) **Count:** This counts the number of cells that contain values within the specified range. For example =Count(E1:A10)
3) **Max**: This returns the largest value within the cell range. =Max(A1:E10)
4) **Min**: This returns the smallest value in the range. =Min(A1:E10)
5) **Mode**: Returns the most frequently occurring value in the range. =Mode(A1:E10)
6) **Rank**: Returns the rank (position/weight) of a number in the list by comparing its size with others. =Rank(A1,$A$1:$E$1,1) this means RANK(number to be ranked, range, order) order is usually 1 or 0,
   1) 1 ranks in ascending order
   2) 0 ranks in descending order.

STANDARD ERROR VALUES IN SPREADSHEET CELLS

When an error is created in a formula, Excel has a way of notifying the user through the messages below.

Error code	Meaning
#DIV/0!	You are trying to divide by 0
#N/A!	A formula or a function inside a formula cannot find the referenced data
#NAME?	Text in the formula is not recognized
#NULL!	A space was used in the formula that references multiple ranges OR A comma separates range references.
#NUM!	A formula has invalid numeric data for the types of operation
#REF!	A reference is invalid
#VALUE!	The wrong type of operand or function argument is used
#######	The column is not wide enough

DATABASE MANAGEMENT SOFTWARE

Database management software is an application program that enables one to collect information of interest on a computer and organize it in different ways.

OR These are programs that enable the manipulation of electronic or computer based databases.

DBMS usually provide a database management system (DBMS) to facilitate the creation, organization and maintenance of databases.

SYSTEM SECURITY AND ICT ETHICAL ISSUES.

Chapter outline	*Introduction* *ICT security issues and effects on society*

Introduction

The dynamic growth of computers and information technology has made it easy for us to carry out day-to-day activities. However, this technology has also made it easy for some to access other organizations and personal privacy. The potential impact of ICT on society touches on:

- *Security* — The protection of information, hardware and software against computer criminals, physical and natural hazards.
- *Privacy* — Protection of private data or information against misuse or unauthorised access.
- *Health* — Guarding end-users against physical and mental risks associated with use of technology.
- *Environment* — Minimise the effects of using ICT on our environment.

ICT security issues and effects on society

Enforcing data security

Enforcing data security refers to the act of safeguarding data and information from loss or unauthorised access. People who get unauthorised access to data and information are called *computer criminals*.

Computer crime and criminals

Computer criminals can be classified into four main groups:

- *Hackers and crackers* — A hacker is a person who gains unauthorised access to an information just for fun while a Cracker gains unauthorized access for malicious reasons.
- *Fraudsters* — These are mostly former employees of the company or outsiders who use their knowledge to cheat or defraud with the intension of acquiring goods, services or cash.
- *Terrorist* — A person or an organization that works towards crippling the information infrastructure by attacking expensive installations like satellite stations, server rooms and buildings in order to wage an economic warfare or to hurt people.
- *Thieves and trespassers* — These are people who physically break into a room with the intention of stealing hardware and software resources such as storage devices.

Causes of data loss

Some causes of data or information loss are:

1. *Attack by malicious* programs like viruses, worms, and Trojan horse.
   - A virus is a malicious program that migrates through removable devices and computer networks causing system failure or data loss.
   - A worm is a special type of virus that does not attach itself to program but self-replicates hence clogging a machine memory.
   - Trojan horses are programs that masquerade as something else. Like worms they are carriers of viruses. Trojan horses may come in form of downloadable games and free screen savers.
2. *Data manipulation* involves altering or deleting data and information for the purpose of sabotage.
3. *Piracy* is illegal copying of copyright protected data and information or software.

Data protection measures

1. *Encryption*. This refers to the coding of data or information so that only a person with decrypting key can read it.
2. Enforcing data and information access control policies on all employees and outsiders.
3. Reinforce the computer room security.
4. Assign user accounts in a networked environment.
5. *Install firewalls*. A firewall acts as a security buffer or wall between a private network and other networks. Access to the private and external networks must first be authenticated by the firewall and the proxy server.
6. Install security and antivirus software, which should be updated regularly to protect the computer against the malicious programs.
7. Put in place *disaster recovery plan*. Natural forces including floods, fire, hurricanes, tornadoes and earthquakes are beyond our control. To avoid losing data and information, an organization should put in place a disaster recovery plan which entails backing up data, creating of emergency facilities and installing fire extinguishers.
8. Avoid downloading programs, games, screen savers and themes you are not sure of.
9. Enable write protection on removable disks.
10. Protect computers against brownout or blackout which may cause physical damage or data loss by using surge protectors and UPS such as one shown in Fig. 9.1.

Fig. 9.1: Uninterruptible Power Supply (UPS)

Data privacy and confidentiality

Private data or information is the collection and use of personal information. This information should not be accessed or disclosed to any other person unless permitted by the owner. Data held by an organization or government that should be disclosed to authorised people only is said to be confidential.

Concerns related to collection and use of private and confidential data are:

1. Spreading information without the owners consent or awareness.
2. Spreading inaccurate information.
3. Eavesdropping and tapping of information from a communication line.
4. Secretly recording and reporting user activities by using recording devices, spyware and cookies.

No secret database.

Some laws governing privacy and confidentiality have been created. This laws can be summarised as:

Right of individual access

1. *No secret databases* — No keeping of personal data exclusively secret in government

Right of consent ations.

2. *Right of individual access* — An individual must be able to find out what information

Right to correct is recorded and how it is used.

3. *Right of consent* — Information obtained for one purpose cannot be used for other

Assurance of reliability and proper use

4. *Right to correct* — An individual must be able to correct or amend records of his/her information.
5. *Assurance of reliability and proper use* — Data must be reliable.

Effects of ICT on health

- Some health concerns on the use of ICT devices such as computers and cellular phones are:
  - *Eye strain and headache* — This can be controlled by taking frequent breaks, using TFT LCD displays or an antiglare screen on CRT monitors.
  - *Noise* *and neck pains* — Use adjustable furniture and right sitting posture as shown in [illegible]2.
  - *Repetitive strain injury* (RSI) — Also known as repetitive motion injury or cumulative trauma disorders results from fast repetitive tasks such as typing. This results in damage of nerves and tendons. Make correct use of the keyboard, and take frequent breaks in between.
  - *Noise* Some noise, such as that of an impact printer, may leave a person with "ringing ears". Use non-impact printers, head mounted earphones and microphones.

Fig. 9.2: Correct sitting position.

Effects of ICT on the environment

Disposal of dead computer parts as shown in Fig. 9.3, power consumption and emissions have resulted in environmental pollution. Environmental Protection Agency (EPA) has created the energy star compliance policy, which coerces electronic components manufacturers worldwide to comply to acceptable levels of environmental pollution and radiation.

Computer manufacturers are also avoiding excessive use of harmful chemicals such chlorofluorocarbons and nickel cadmium and other heavy metals in their productions.

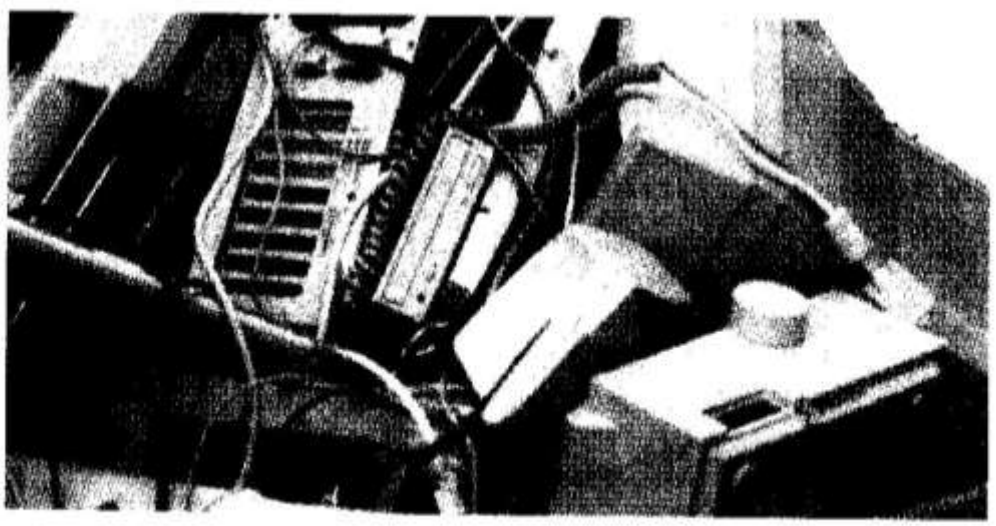


Fig. 9.3: Computer components dump site.

ACRONYMS

ALU - Arithmetic Logic Unit
ASCII - American Standard Code for Information Interchange
BIOS - Basic Input Output System
BPS - Bits Per Second
CAD/M - Computer Aided Design/ Manufacturing
CAL – Computer Aided Learning
CAT 5 - 'Category 5' cable
CD - Compact Disc
CD-R - Compact Disc Recordable
CD-ROM - Compact Disc Read Only Memory
CD-RW - Compact Disc Re-Writable
CPU – Central Processing Unit
CRT - Cathode Ray Tube
DBMS - Data Base Management System
DDR - Double Data Rate
DFD – Data Flow Diagrams
DOS – Disc Operating System
DSL - Digital Subscriber Line
DTP - Desktop publishing
DVD - Digital Versatile Disc
EFT - Electronic Funds Transfer
EULA - End User Licence Agreement
FAQ - Frequently Asked Questions
FIFO - First in First Out
FNF - First Normal Form
FTP – File Transfer Protocol
Gb – Gigabyte
GIF – Graphic Interchange Format
GIGO- Garbage In Garbage Out
GPS – Global Positioning System
GUI – Graphical User Interface
GW – Gateway
HCI – Human Computer Interaction
HTML – Hyper Text Mark-up Language
HTTP – Hyper Text Transfer Protocol
IC – Integrated Circuit
ICT – Information and Communication Technology
IP – Internet Protocol
TCP-Transfer Control Protocol
IRC– Internet Relay Chat
ISDN – Integrated Services Digital Network
ISP – Internet Service Provider
JPEG – Joint Photographic Experts Group
Kb – Kilobyte
KH – KiloHertz
LAN - Local area network
LCD – Liquid Crystal Display
LED – Light Emitting Diode
LIFO - Last in First Out
MAN – Metropolitan Area Network
MICR – Magnetic Ink Character Recognition
MP3 – MPEG Layer 3
NIC – Network Interface Card
NOS- Network Operating System
OCR – Optical Character Recognition
OMR- Optical Mark Reader /Recognition
OOPL- Object Oriented Programming Language
OSI – Open Systems Interconnection
PCI – Peripheral Component Interconnect
PDA- Personal Data Assistant
POS - Point of Sale
PPM – Pages per Minute
RAM - Random Accesses Memory
ROM - Read Only Memory.
SCSI – Small Computer Systems Interface
SQL – Structured Query Language
TCP – Transmission Control Protocol
UPS- Uninterrupted Power Supply
LCD-liquid crystal Display
CRT-Cathode Ray Tube
VDU-Visual Display Unit
PPP-Point to Point Protocol
HDD-Hard Disk
PC-personal Computer

URL-Uniform Resource Locator
CU-Control Unit
CAI-Computer Aided Instruction
ENIAC-Electronic Numeric Integrator Calculator
UNIVAC-UniversalAutomatic Computer
LEO-Lyris Electronic Machine
IBM-International Business Machine
ATM-Automatic Teller Machine
CCT-Close Circuit Television
SLIP-Serial Line Internet Protocol
PPP-Point To Point Protocol

BASIC-Beginners All Symbolic Instruction Code
EBCDIC:-*Extended Binary Coded Decimal Interchange Code (EBCDIC)*
BCD: Binary-Coded Decimal *(BCD)*
ENIARC - Electronic Numerical Atomic Research Co

CMOS- Complementary Menta Oxide Sem-conduct