# 21ST CENTURY ADVANCED COMPUTER STUDIES FOR UNIVERSITIES AND COLLEGES OF EDUCATION

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## INTRODUCTION

The rapid evolution of technology, particularly in the realm of computing, has irrevocably transformed the way we live, work, and learn. This book is designed to equip students in universities and colleges of education with the foundational knowledge and practical skills necessary to navigate the digital age.

Through a comprehensive exploration of computer systems, software, hardware, networking, and applications, this text offers a contemporary perspective on computer science. It delves into the historical development of computing devices, tracing their evolution from early mechanical calculators to modern-day supercomputers. Readers will gain insights into the fundamental concepts of data and information, the intricacies of input and output devices, and the essential role of system and application software.

A significant portion of the book is dedicated to programming, with an emphasis on the BASIC programming language. By understanding the principles of programming, students will be empowered to create and customize software solutions. Furthermore, the text explores the diverse applications of computers in various fields, including education, business, government, science, engineering, and entertainment.

In today's interconnected world, networking and internet technologies are indispensable. This book provides a comprehensive overview of network concepts, protocols, and the global network known as the internet. It highlights the importance of cybersecurity and the risks posed by computer viruses.

By the end of this book, readers will possess a solid understanding of computer systems, programming, and networking, enabling them to effectively utilize technology in their academic and professional pursuits.

Authors.

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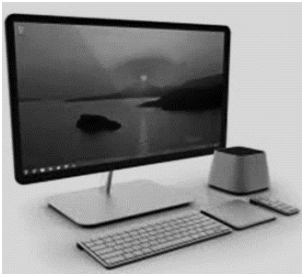
# Chapter One

# AN OVERVIEW OF THE COMPUTER SYSTEM



**Specific Objectives**

By the end of this chapter, should be able to:

- Define computer
- Explain the two constituencies of computer
- Classify computers by type, size and purpose
- List examples of hardware and software
- State the characteristics of a computer
- Recognize a computer set and distinguish its parts

## INTRODUCTION

**Quick Tip**

Data transfer began as early as Noah's time

As the twenty-first century ushers in the Information Age, we will experience new ways of living and working. The only way we can take advantage of and manage the vast amount of available information is through the understanding of how computer works and through the ability to use computers. Most people believe that knowing how to use a computer is a basic skill necessary to succeed in the world and to function effectively in society.

As a student, this overview chapter will help you join the information age by learning the definition and characteristics of computers. Even if you do not have a personal computer, you have been using computer for some times. When you use an ATM (Automatic Teller Machine), when you use a Bank

Debit Card, or when you make calls with phone; you are using a computer. You have also been exposed to many computer advertisements.

**Definition of Computer**

A computer is an electronic device that operates under the control of a set of instructions that is stored in its memory unit. A computer accepts data from an input device and processes it into useful information which it displays on its output device. Actually, a computer is a collection of hardware and software component that helps you to accomplish many different tasks. It is a programmable machine that receives data, perform prescribed mathematical and logical operations at high speed and transmits the result of operation as digital stream of signal that could transform into text, graphics or multimedia information that are displayed (softcopy), printed (hardcopy) or passed as instruction to external devices via the input and output interfaces. The internal architectural design of computers differs from one system mode to another and from one manufacturer to another. However, the basic components and their functions are the same for all computer systems.

**Two main constituents of a computer**

- Computer Hardware
- Computer Software

**Quick Tip**

Software is an Organized information in the form of operating systems, utilities, programs, and applications


Modern personal computer comprises the following items and other add-on components called peripheral devices.

**Quick Tip**

Software consists of carefully-organized instructions and code written by programmers in any of various special

**Quick Tip**

Hardware is best described as any physical component of a computer system that contains a circuit board, ICs, or other electronics.

**Computer Hardware**

The physical parts of a computer that can be touched, seen and handled is referred to computer hardware. Hardware consists of the computer itself and any equipment connected to it. It is the external part of computer which you feel and touch. In a computer system, there are different kinds of hardware; they include: CPU, Main boards, Monitors, Network adapters, Sound cards, Mice Keyboards, Printers, hard disk etc. What is a system unit? The system unit is the entire computer as a whole. This includes the case and all the system unit, powerful electronic circuitry that makes up the computer is housed inside the case. The motherboard or main board, the is a collection of all kinds of slots, and modules. The monitor or visual display unit is a TV like device with help of control knobs and built in tilt/swivel base, displays information on a screen. Monitor is separated by two parts of the system unit and serves as well as an output device (which we will discuss later under output devices).

Keyboard is a device for coding and encoding data, it is used for typing data, information and instructions that are to be transmitted to the computer 'memory. It is a typewriter -like device that allows the user to type information into the computer memory.

**Computer Peripherals**

A computer peripheral or peripheral device is an external object that provides input or output for the computer.

Some common input devices include keyboard, mouse; Joystick, pen tablet, Midi keyboard, scanner, digital camera, video camera and microphone.

Some common output devices include; projector, screen, printer, plotter and speakers.There are devices that functions as both input and output devices they include:

1. External hard drives
2. Media card readers
3. Digital camcorders
4. Digital mixers
5. Midi equipment
6. Floppy diskette
7. Flash drive
8. Handsets can be interfaced to the computer.

While these are some of the more common peripherals, there are many other kinds as well, just remember that any external device that provides input the computer or receive output from the computer is considered a peripheral.

**Computer Software**

Software is a developed computer instruction that operates a computer; manipulates the data and executes particular function or tasks. Computer software can be seen but cannot be touched; it can only be used for a purpose, this means that they have virtual qualities.

**System Software**

A system unit

This is a set of programs that controls the operations of a computer and peripherals attached to the computer. It controls the program that runs on a computer. Its function includes controlling and coordinating the hardware and application software, allocating storage facilities controlling the input and output devices and managing time sharing for linked or networked computers.

**Application Software**

These are already made computer programs written to carry-out a specific task. Application software can also be defined as a set of instructions (programs) written by computer experts called programmers to solve a specific tasks for the user. The term application refers to both the application software and it implementation.

**Characteristics of a Computer**


*Here are some computer peripherals connected to a computer system*

There are eight (8) important characteristics features of a computer grouped under the following:

(1) Speed, (2) Accuracy (3) Automatic (4) Endurance (5) Versatility (6) Storage (7) Reduction of cost (8) intelligent quotient.

1) Celerity (high speed): It denotes the speed of a computer. The present day computer has the speed of nano and Pico second.
2) Authenticity (Accuracy): This means they are reliable and robust, it ever makes mistakes. Most probably the error occurs due to the user rather than the computer e.g.: only accurate robots are used to perform the operations for the patients since human hands are not flexible for making operations.

3) Spontaneous (automatic): This means it execute the process without any intervention of user once it is assigned to a work. Once the data or instructions are fetched from the secondary devices such as optical disks, hard disk etc. immediately they get stored into RAM (primary memory) and then sequentially they get executed.
4) Pertinacity (Endurance): This denotes that computers never get tired as humans do. If there are surplus amount of executions to be made then each and every execution will be executed at the same time period. E.g. computers which are used for controlling the satellites.
5) Adaptability (Versatile): In our day to day life, computer has been a part, with their extended flexibility; they are used all over the world. They can be used as personal computer for homes, for business oriented tasks, weather forecasting, space exploration, teaching, railways, banking, medicine etc. Modern computers, can perform different of tasks simultaneously.
6) Store houses (memory): Secondary storage devices are the key devices of data storage. They store the data for which the user wants to retrieve for future use. The devices for storage are; Floppy, Optical disks, Zip drives, Thumb drive etc.
7) Cheaper (Reduction of cost): Computers are short term investment that helps to achieve a long term benefits. Though the investment is high, they reduce the cost of each and every transaction. They reduce manpower and leads to an elegant and efficient way for computing various tasks.
8) Needs a user interface: The only drawback of computer is it cannot make the decision of its own. It needs a guidance to enhance the process. After all computer is a machine.

**Summary**

**In this chapter, we learn the following:**

1. Computer is a programmable machine that receives input, stores and manipulates data and provides output in a useful format.
2. The computer system constitutes two parts: computer hardware and computer software.
3. Computer hardware can be divided into system unit and peripherals.

4. Computer hardware components of computers includes: input, output, processing, storage, power management devices and computer casing.
5. Characteristics of computer which includes: Speed, Accuracy, Automatic, Endurance, Versatility, Storage, Reduction of cost, intelligent quotient.

**A computer is an electronic device used for**

| | | |
|---|---|---|
| C | - | Calculate |
| O | - | Operating |
| M | - | Mathematical Operations |
| P | - | Print |
| U | - | User friendly operation |
| T | - | Telecommunication |
| E | - | Exploring world and its people |
| R | - | Record and data base maintenance. |

**Classification of Computers**

The computer has passed through many stages of evolution from the days of the mainframe computers to the era of microcomputers. Computers have been classified based on different criteria. In this unit, we shall classify computers based on three popular methods.

**Categories of Computers**

Although there are no industry standards, computers are generally classified in the following ways:

**Classification Based On Signal Type**

There are basically three types of electronic computers. These are the Digital, Analog and Hybrid computers.

**Digital Computer**

Represent its variable in the form of digits. It counts the data it deals with, whether representing numbers, letters or other symbols, are converted into binary form on input to the computer. The data undergoes a processing after

which the binary digits are converted back to alpha numeric form for output for human use. Because of the fact that business applications like inventory control, invoicing and payroll deal with discrete values (separate, disunited, discontinuous); they are beset processed with digital computers. As a result of this, digital computers are mostly used in commercial and business places today.

**Analog Computer**

It measures rather than counts. This type of computer sets up a model of a system. Common type represents it variables in terms of electrical voltage and sets up circuit analog to the equation connecting the variables. The answer can be either by using a voltmeter to read the value of the variable required, or by feeding the voltage into a plotting device. They hold data in the form of physical variables rather than numerical quantities. In theory, analog computers give an exact answer because the answer has not been approximated to the nearest digit. Whereas, when we try to obtain the answers using a digital voltmeter, we often find that the accuracy is less than that which could have been obtained from an analog computer. It is almost never used in business systems. It is used by the scientist and engineer to solve systems of partial differential equations. It is also used in controlling and monitoring of systems in such areas as hydrodynamics and rocketry; in production.

There are two useful properties of this computer once it is programmed:

1. It is simple to change the value of a constant or coefficient and study the effect of such changes.
2. It is possible to link certain variables to a time pulse to study changes with time as a variable, and chart the result on an X-Y plotter.

**Hybrid Computer**

In some cases, the user may wish to obtain the output from an analog computer as processed by a digital computer or vice versa. To achieve this, he set up a hybrid machine where the two are connected and the analog computer may be regarded as a peripheral of the digital computer. In such a situation, a hybrid system attempts to gain the advantage of both the digital

and the analog elements in the same machine. This kind of machine is usually a special-purpose device which is built for a specific task. It needs a conversion element which accepts analog inputs, and output digital value. Such converters are called digitizer. There is need for a converter from analog to digital also. It has the advantage of giving real-time response on a continuous basis. Complex calculations can be dealt with by the digital elements, thereby requiring a large memory, and giving accurate results after programming. They are mainly used in aerospace and process control applications.

**Classification by Purpose**

Depending on their flexibility in operation, computers are classified as either special purpose or general purpose.

**Special Purpose Computers**

A special purpose computer is one that is designed to solve a restricted class of problems.

Such computers may even be designed and built to handle only one job. In such machines, the steps or operations that the computer follows may be built into the hardware. Most of the computers used for military purposes fall into this class. Other example of special purpose computers include:

- Computers designed specifically to solve navigational problems.
- Computers designed for tracking airplane or missiles.
- Computers used for process control applications in industries such as oil refinery, chemical manufacture, steel processing and power generation.
- Computers used as robots in factories like vehicles assembly plants and glass industries.

**General Attributes of Special Purpose Computers**

Special purpose computer are usually very efficient for the tasks for which they are specially designed.

They are very much less complex than the General-Purpose Computers. The simplicity of the circuiting stems from the fact that provision

is made only for limited facilities. They are very much cheaper than the General-Purpose type since they involve less components and are less complex.

**General-Purpose Computers**

General-Purpose computers are computers designed to handle wide range of problems.

Theoretically, a general-purpose computer can be adequate by means of some easily alterable instructions to handle any problems that can be solved by computation. In practice however, there are limitations imposed by memory size, speed and the type of input/output devices. Examples of areas where the general purpose are employed include the following:

Payroll, Banking, Billing, Sales analysis, Cost accounting, Manufacturing scheduling, Inventory control.

**General Attributes of General-Purpose Computers**

·General-Purpose computers are more flexible than special purpose computers.

They can handle a wide spectrum of problems.

They are less efficient than the special-purpose computers due to such problems as;

- Inadequate storage;
- Low operating speed;
- Coordination of the various tasks and subsection may take time.
- General Purpose Computers are more complex than the special purpose ones.

**Classification of Computers According to Capacity**

In the past, the capacity of computers was measured in terms of physical size.

Today, however, the physical size is not a good measure of capacity because the modern technology has made it possible to achieve compactness. A better measure of capacity today is the volume of work that computer can handle. The volume of work that a given computer handles is closely tied to

the cost and to the memory size of computer. Therefore, most authorities today accept the price of rental price as the standard for ranking computers.

Here, both memory size and cost shall be used to rank (classify) computer into three main categories as follows:
(a)Microcomputers
(b)Medium/Mini/Small Computers
(c)Large Computer/Main Frames.

**Micro Computers**
Microcomputers, also known as single board computers, are the cheapest class of computers. In the microcomputer, we do not have a Central Processing Unit (CPU) as we have in the larger computers rather we have a microprocessor chip as the main data processing unit. They are the cheapest smallest and can operate under normal office condition. Examples are IBM, APPLE, COMPAQ, Hewlett Packard (HP), Dell Toshiba, e.t.c.

**Different Types of Personal Computers (Micro Computers)**
Normally, personal computers are placed on table desk hence they are referred to as desktop personal computers. Still other types are available under the categories of personal computers. They are:

Laptop Computers are small size types that are battery-operated. The screen is used to cover the system while the keyboard is installed flatly on the system unit. They could be carried about like a box when closed after operation and can be operated in vehicles while on a journey.

**Notebook Computer**
This is like laptop computers but smaller in size. Though small, it comprises all the components of a full system.

**Palmtop Computer**
Palmtop computer is far smaller in size. All the components are complete as any of the above but made smaller so that it can be held on the palm.

**Uses of Personal Computers**

- Personal computers can perform the following functions:
- Can be used to produce documents like memos, reports, letters, Etc.
- Can be used to calculate budget and accounting tasks
- It can analyze numeric function
- It can create illustrations
- Can be used for electronic mails
- Can help in making schedule and plan projects.
- It can assist in schedules and plan projects.
- It can assist in searching for specific information from lists or from reports.

**Advantages of Personal Computers**

- Computer is versatile; it can be used in any establishment.
- Has faster speed for processing data.
- Can deal with several data at a time
- Can attend to several users at the same time, thereby able to process several jobs at a time.
- Capable of storing several data.
- Operating of Computer is less fatigue
- Network possible, that is linking of two or more computers together.

**Disadvantages of Personal Computers**

- Computer is costly to maintain.
- It is very fragile and complex to handle
- It requires special skill to operate
- With the invention and innovation every day, computer suffers from being obsolete.
- It can lead to unemployment when used mostly in less Developed Countries.
- Some computers cannot function properly without the aid of cooling system e.g. air-condition or fan in some locations.

**Mini Computers**

The Mini Computers have memory capacity in the range 128K bytes to 256 Kbytes and are also not expensive but reliable and smaller in size compare

to mainframe. It was first introduced in 1965; when DEC (Digital Equipment Corporation) built the PDP – 8. Other Mini Computer includes WANG VS.

**Mainframe**

The Main Frame Computers often called number crunches have memory capacity of the order of 4 Kbytes and they are very expensive. They can execute up to 100MIPS (Meanwhile Instructions Per Second). They have large systems and are used by many people for a variety of purpose.

**Conclusion**

Computers are classified based on three major criteria namely size, type of signal being processed and purpose. The classification adopted at any point in time depends on the issues involved. For instance, if our goal is to process different kinds of signals or to accept one type of signal and convert to another form of signal, we should look in the realm of analog or digital or even the hybrid computers. This of course, calls for a converter such as Analog to Digital Converter or Digital to Analog Converter as the case may be. We have been able to understand the following:

i. Computers could be classified based on three major criteria: size, type of signal being processed and purpose.
ii. Based on size computers are classified as mainframe, minicomputer and microcomputer.
iii. Based on the type of signal being processed, computers are classified as analog, digital and hybrid.
iv. Based on purpose, computers are classified as general purpose or special purpose computers.
v. Microcomputers now come in different forms due to the continued reduction in size due to advances in electronic technology. Microcomputers could be desktop, laptop or palmtop.

# *Chapter Two*
# DATA AND INFORMATION

**Specific Objectives**

At the end of this chapter, students should be able to

1. Explain data and Information
2. State sources and uses of data and information
3. State the difference between data and information
4. Give examples of data and information.

**INTRODUCTION**

Data is an unprocessed fact, when examined and it is used to find out things or to make decisions.

Data is a collection of symbols, facts and figures derived from the operations of an organization:

**Data and Information**

The frequency of the use of the words data and information are very high in our daily lives. Depending on the context, the meanings and use of these words differ. Both data and information are types of knowledge or something

***Quick Tip***

Because of the significance of computers in today's world, it is important to be computer literate. Being computer literate means you have knowledge and understanding of computers and their uses.

***Quick Tip***

Bits are transferred internally within the circuitry of the computer along electrical channels. Each channel, called a bus, allows various devices inside and attached to the system unit to communicate with each other.

used to attain knowledge. Though used interchangeably, there are many differences between the meanings of these two words.

Data refers to the lowest abstract or a raw input which when processed or arranged makes meaningful output. It is the group or chunks which represent quantitative and qualitative attributes pertaining to variables. Information is usually the processed outcome of data. More specifically speaking, it is derived from data. Information is a concept and can be used in many domains.

Information can be a mental stimulus, perception, representation, knowledge, or even an instruction. The examples of data can be facts, analysis, or statistics. In computer terms, symbols, characters, images, or numbers are data. These are the inputs for the system to give a meaningful interpretation. In other words, data in a meaningful form is information.

Information can be explained as any kind of understanding or knowledge that can be exchanged with people. It can be about facts, things, concepts, or anything relevant to the topic concerned.

The word information was derived from Latin. The verb from which it is derived is *informare*, which means 'to instruct'. It also means giving form to an idea or fact. Data is the plural of the Latin word datum. It can mean 'to give'. In the realms of mathematics and geometry, the terms data and given are very often used interchangeably. This is how the term was derived for use in computer realm.

If data is at the lowest level in the series, information is placed at the next step. Data can be in the form of numbers, characters, symbols, or even

pictures. A collection of these data which conveys some meaningful idea is information. It may provide answers to questions like who, which, when, why, what, and how. The raw input is data and it has no significance when it exists in that form. When data is collated or organized into something meaningful, it gains significance. This meaningful organization is information.

| Examples of items used to obtain data includes: |
|---|
| Counter scale |
| Weighing balance |
| Measuring cylinder |
| Tapes/meter rule |
| Chart. |

Alphabets is a good example of Data

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H |
| I | J | L | M | N | 0 | P | Q |
| R | S | T | U | W | X | Y | Z. |

Blood pressure of a patient is known as Data. By checking the blood pressure of the patient, we can say that the patient is having high blood pressure. This is information. Note that we are able to conclude or get a meaningful conclusion from the blood pressure readings, so we call this information.

Information is a processed data or fact that is needed for the progress of every organization. It provides management at various levels, the result of making viable decision for 'achievement of the organizational goals and objectives.

Data and information are types of knowledge; which is the whole package of what we learned from the experience of living. It may or may not be factual.

Differences between Data and Information

Both data and information are used to obtain knowledge. They can be used interchangeably. There are many differences between these two words.

**Quick Tip**

125 BC
The Antikythera mechanism: A clockwork, analog computer designed and built in Corinth.

Data is often obtained as a result of recordings or observations. For example, the temperature of the days is data. When this data is to be collected, a system or person monitors the daily temperatures and records it.

**Summary**

1. Data is the lowest level of knowledge and information is the second level
2. Data by itself alone is not significant. Information is significant by itself.
3. Observations and recordings are done to obtain data, while analysis is done to obtain information.

**Data**

- ✓ Facts, statistics used for reference or analysis.
- ✓ Numbers, characters, symbols, images etc., which can be processed by a computer.
- ✓ Data must be interpreted, by a human or machine, to derive meaning "Data is a representation of information"
- ✓ Latin 'datum' meaning "that which is given"
- ✓ Data plural, datum singular (M150 adopts the general use of data a! singular. Not everyone agrees.)

**Information**

Knowledge derived from study, experience (by the senses), or instruction.
Communication of intelligence.
"Information is any kind of knowledge that is exchangeable amongst people, about things, facts, concepts, etc., in some context."
"Information is interpreted data"

## RELATIONSHIP BETWEEN DATA AND INFORMATION

What is the relationship between data, information and knowledge?
A basic understanding of Data, information and knowledge helps in understanding of knowledge management system. Here we will try to explain all these with some simple examples

**Data**: Data in its own way known as a collection of discrete objects, facts or events out of context. Data has no reference to space or time. In some advance way we can say collection of some objects or results of some process are known as data.

**Information**: The processed data is known as information. From a collection of data, we can derive meaningful information (conclusion). We can't call it information if we are not getting any result (conclusion) out of our data.

**Knowledge**: After Data and information Knowledge is in the next stage of evolution. When we apply our experience, jurisdiction or judgment to the information we get knowledge. Knowledge is the result of learning.
Knowledge is the internalization of information, data, and experience. Knowledge is divided into two types, tacit knowledge and explicit knowledge.

### Uses of data

- It can be use by managers, Principals, administration to perform effective operations in a school or organization.
- It can be used as raw fact to generate reports, graphical and also statistical information.
- It provides references to information.
- It enables the user to make informed decision.

### Examples of Data

**Numeric data:** It is related to figures, value or numbers. E.g. 50, 34, 110.00
**Alphabetic data:** This is letters of alphabets and labels, sentences, phrases etc. E.g. ABCD, Enugu, UBA.
**Alpha-numeric data:** This includes the combination of numbers and special characters and labels. E.g. 10kg., 25%, 12Km and 3o'clock.
**Audio data:** this includes sounds, cry, whistling but they are all dependent on the context. E.g. sound of a gong.

**Visual data:** this includes images, diagrams, video, graphics, photos and pictures

**Audio-visual data:** This is the combination of audio and visual data.

**SOURCES OF INFORMATION**

1. Radio: The process of sending and receiving messages through the air (audio).
2. Television: It is the process of receiving moving pictures and sounds (audio-visual).
3. Newspaper: A set of large printed works containing information.
4. Computer: It is an electronic device which can accept, store and retrieve information.

**QUALITIES OF A GOOD INFORMATION**

1. **Accurate**: It must be correct and clean.
2. **Relevant**: It must contain the essential meaning of the ideas of all the data currently available.
3. **Complete**: Information must include all relevant data.
4. **Availability**: It must be available at any time it is needed.

**WAYS OF PASSING INFORMATION**

1. **Recording:** The information passed down in the recorded form is passed down to the concerned
2. **Writing:** The writing of the ancient time were in Greek, Hebrew or Arabic. Messages were written with hand and scroll and kept at strategic places or common meeting places.
3. **Town-crier:** The town-crier went round the town shouting the information repeatedly.
4. **Gong beating:** Decrees were passed by sounding the gong.
5. **Discussion**: Information was passed orally through discussion involving the informant and the person or group of people concerned.
6. **Bush burning:** The smoke was used to trace the spot of the danger. This alerted the people in the environment of the impending danger.

**REVIEW QUESTIONS**

1 a. State the difference between data and information
b. Define Data
2. a. information can be define as_____
b. List 2 characteristics of Information
3. a. Computer can be defined as_____
b. States two broad classes of a computer set
4. a. State three characterizes of a Computer
b. List two functional parts of a Computer
5. a. List examples of hardware and software
b. State types of software?

**Differences between Data and Information**

Both data and information are used to obtain knowledge. They can be used interchangeably. There are many differences between these two words

**Summary:**

1) Data is the lowest level of knowledge and information is the second level.
2) Data by itself alone is not significant. Information is significant by itself.
3) Observations and recordings are done to obtain data, while analysis is done to obtain information.

**Data**

- Facts, statistics used for reference or analysis.
- Numbers, characters, symbols, images etc., which can be processed by a computer.
- Data must be interpreted, by a human or machine, to derive meaning "Data is a representation of information"
- Latin 'datum' meaning "that which is given"
- Data plural, datum singular (M150 adopts the general use of data a! singular. Not everyone agrees.)

**Information**

- Knowledge derived from study, experience (by the senses), or instruction.
- Communication of intelligence.

- "Information is any kind of knowledge that is exchangeable amongst people, about things, facts, concepts, etc., in some context."
- "Information is interpreted data"

**Relationship Between Data and Information**

What is the relationship between data, information and knowledge? We will try to discuss this in the context of knowledge management program. A basic understanding of Data, information and knowledge helps in understanding of knowledge management system. Here we will try to explain all these with some simple examples

**Data**: Data in its own way known as a collection of discrete objects, facts or events out of context. Data has no reference to space or time. In some advance way we can say collection of some objects or results of some process are known as data. It is also known as unprocessed information. Inside the spread sheet of excel in each cell we store data, on its own it does not give any information. When we store the sells figure of the company in a spread sheet we call it as data. We may do some categorization on the data to get meaning full output from it.

**Information**: The processed data is known as information. From a collection of data, we can derive meaningful information (conclusion). We can't call it information if we are not getting any result (conclusion) out of our data. The cells figure stored in a spread sheet on its own can't give any conclusion but on observation or by statistical tools we can see that north region the cells are better than southern region. This is the information we get out of the cells data.

**Knowledge**: After Data and information Knowledge is in the next stage of evolution. When we apply our experience, jurisdiction or judgment to the information we get knowledge. Knowledge is the result of learning.

Knowledge is the internalization of information, data, and experience. In our sells data we can conclude that more marketing efforts or promotions are required in south than in north to improve the cells in southern region. Knowledge is divided into two types, tacit knowledge and explicit knowledge.

Organization learning depends on knowledge creation process which is explained in SECI (Socialization, Externalization, combination, lateralization).
**Data**: The term data is referred to facts about a person, object or place e.g. name, age, complexion, school, class, height etc.
**Information**: Is referred to as processed data or a meaningful statement e.g. Net pay of workers, examination results of students, list of successful candidates in an examination or interview etc.

**Methods of Data Processing**
The following are the three major methods that have been widely used for data processing over the years:
a. Manual method
b. Mechanical method and
c. Computer method.


**Manual Method**
The manual method of data processing involves the use of chalk, wall, pen pencil and the like. These devices, machine or tools facilitate human efforts in recording, classifying, manipulating, sorting and presenting data or information. The manual data processing operations entail considerable manual efforts. Thus, manual method is cumbersome, tiresome, boring, frustrating and time consuming. Furthermore, the processing of data by the manual method is likely to be affected by human errors. When there are errors, then the reliability, accuracy, neatness, tidiness, and validity of the data would be in doubt. The manual method does not allow for the processing of large volume of data on a regular and timely basis.

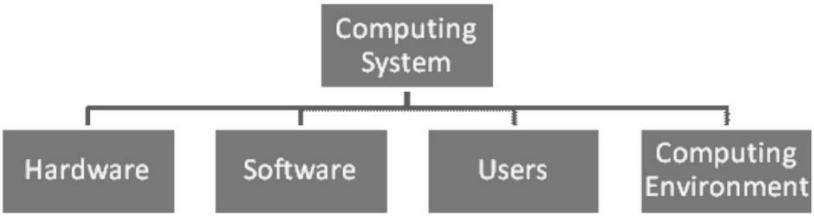
**Mechanical Method**
The mechanical method of data processing involves the use of machines such as typewriter, roneo machines, adding machines and the like. These machines facilitate human efforts in recording, classifying, manipulating,

sorting and presenting data or information. The mechanical operations are basically routine in nature. There is virtually no creative thinking. The mechanical operations are noisy, hazardous, error prone and untidy. The mechanical method does not allow for the processing of large volume of data continuously and timely.

**Computer Method**

The computer method of carrying out data processing has the following major features:

a. Data can be steadily and continuously processed
b. The operations are practically not noisy
c. There is a store where data and instructions can be stored temporarily and permanently.
d. Errors can be easily and neatly corrected.
e. Output reports are usually very neat, decent and can be produced in various forms such as adding graphs, diagrams, pictures etc.
f. Accuracy and reliability are highly enhanced.




**Schematic diagram of the computing system**

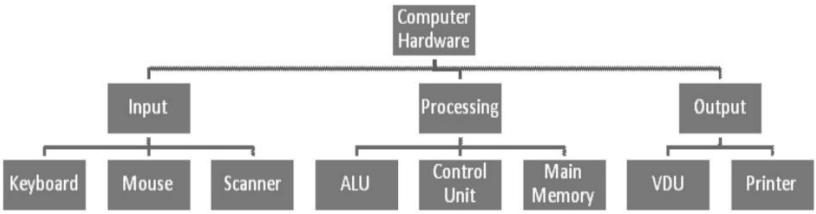
**The Computing System**

The computing system is made up of the computer system, the user and the environment in which the computer is operated.

**The Hardware**

The computer hardware comprises the input unit, the processing unit and the output unit. The input unit comprises those media through which data is fed into the computer. Examples include the keyboard, mouse, joystick, trackball,

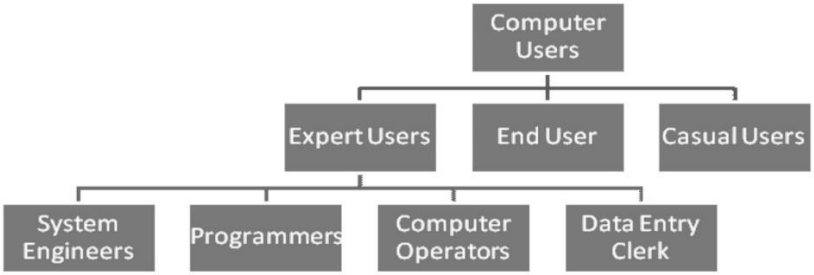
scanner etc. The processing unit is made up of the Arithmetic and Logic Unit (ALU), the control unit and the main memory. The main memory also known as the primary memory is made up of the Read Only Memory (ROM) and the Random Access Memory (RAM). The output unit is made up of those media through which data, instructions for processing the data (program), and the result of the processing operation are displayed for the user to see. Examples of output unit are the monitor (Visual Display Unit) and the printer.



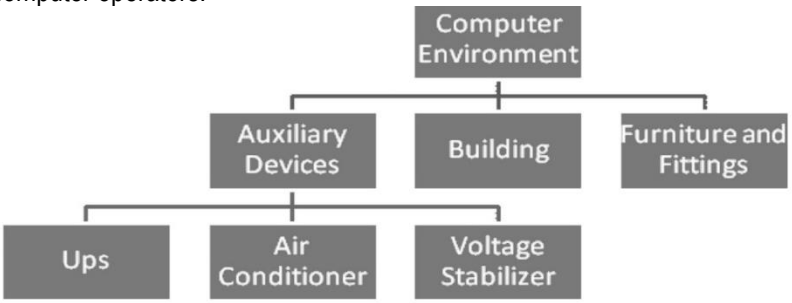

**Software**

Computer software are the series of instructions that enable the computer to perform a task or group of tasks. A program is made up of group of instructions to perform a task.

Series of programs linked together make up software. Computer programs could be categorized into system software, utility software, and application programs.



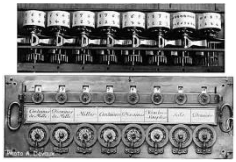
**Schematic diagram of the computer users Computer Users**
Computer users are the different categories of personnel that operates the computer. We have expert users and casual users. The expert users could be further categorized into computer engineers, computer programmers and computer operators.




**Schematic diagram of the Computing environment**
**The Computing Environment**
The computing environment ranges from the building housing the other elements of the computing system namely the computer and the users, the furniture, auxiliary devices such as the voltage stabilizer, the Uninterruptible Power Supply System (UPS), the fans, the air conditioners etc.

**Conclusion**
The computer is a machine used for a variety of purposes. Its use transcends all areas of human endeavour owing to the advantages of computer method of data processing over the manual and mechanical methods of data processing. We have learnt the following:

i. Computer is any electronic device that can accept data, process it and produce an output.
ii. The computer method of data processing is superior to the manual and mechanical methods of data processing.
iii. The computing system is made up of the computer system, the users and the computing environment.



# Chapter Three

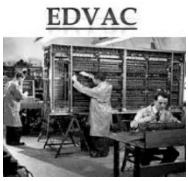
# HISTORICAL DEVELOPMENT OF COMPUTING DEVICES

**Specific Objectives:**

At the end of this chapter, students should be able to

- State the features abacus, slide rule, Napier's bone, Pascals calculator, Jacquard's loom, Charles Babbage's analytical engine, Burroughs' machine and other 19th century computing devices.
- List the components of the 19th century computing device.
- State the uses of these 19th century computing device.

**INTRODUCTION**




The history of computing hardware is the record of the ongoing effort to make computer hardware faster, cheaper, and capable of storing more data.

Computing hardware evolved from machines that needed sepaate manual action to perform each arithmetic operation, to punched

card machines, and then to stored-program computers. The history of stored-program computer relates first to computer architecture, that is, the organization of the units to perform input and output, to store data and to operate as an integrate mechanism.

Secondly, this is a history of the electronic components and mechanical devices that comprise these units. Finally, we describe the continuing integration of 21st -century supercomputers,

networks, personal devices and integrate, computers/communicators into many aspects of today's society. Increase in speed and memory capacity, and decreases in cost and size in relation to compute power, are major features of the history. As all computers rely on digital storage, and tend to be limited by the size and speed of memory, the history of computer data storage is tied to the development of computers.

Fig. 3.1 Yazu Arithmometer

**Overview**

Vanneyar Bush

Before the development of the general-purpose computer, most calculations were done by humans. Mechanical tools to help humans with digital calculations were then called "calculating machines", by proprietary names or even as they are now, calculators. It was those humans who used the machines who were then called computers; there are pictures of enormous rooms filled with desks at which computers (often young women) used then machines to jointly perform calculations, as for instance, aerodynamic ones required for in aircraft design.

A machine designed and built by Vannevar Bush before World War II, automatically manipulated by a mechanical mechanism

Calculators have continued to develop, but computers add the critical element of conditional response and larger memory, allowing automation of both numerical calculation and in general, automation of many symbol manipulation tasks. Computer technology has undergone profound changes every decade since the 1940s.

. Early counting devices

Computing hardware has become a platform for uses other than mere computation, such as process automation, electronic communications, equipment control, entertainment,

education, etc. Each field in turn has imposed its own requirements on the hardware, which has evolved in response to those requirements, such as the role of the touch screen to create a more intuitive and natural user interface. Aside from written numerals, the first aids to computation were purely mechanical devices which required the operator to set up the initial values of an elementary arithmetic operation, and then manipulate the device to obtain the result. A sophisticated (and comparatively recent) example is the slide rule in which numbers are represented as lengths on a logarithmic scale and computation is performed by setting a cursor and aligning sliding scales, thus adding those lengths. Numbers could be represented in a continuous "analog" form, for instance a voltage or some other physical property was set to be proportional to the number. Analog computers, like those designed and built by Vannevar Bush before World War II were of this type. Or, numbers could be represented in the form of digits, automatically manipulated by a mechanical mechanism. Although this last approach required more complex mechanisms in many cases, it made for greater precision of results.

Both analog and digital mechanical techniques continued to be developed, producing many practical computing machines. Electrical methods rapidly improved the speed and precision of calculating machines, at first by providing motive power for mechanical calculating devices, and later directly as the medium for representation of numbers. Numbers could be represented by voltages or currents and manipulated by linear electronic amplifiers. Or, numbers could be represented as discrete binary or decimal digits, and electrically controlled switches and combinational circuits could perform mathematical operations.

The invention of electronic amplifiers made calculating machines much faster than their mechanical or electromechanical predecessors. Vacuum tube (thermionic valve) amplifiers gave way to solid state transistors, and then rapidly to integrated circuits which continue to improve, placing millions of electrical switches (typically transistors) on a single

elaborately manufactured piece of semi-conductor the size of a fingernail. By defeating the tyranny of numbers, integrated circuits made high-speed and low-cost digital computers a widespread commodity.

**Earliest true hardware**

Devices have been used to aid computation for thousands of years, mostly using one-to-one correspondence with our fingers. The earliest counting device was probably a form of tally stick. Later record keeping aids throughout the Fertile Crescent included calculi (clay spheres, cones, etc.) which represented counts of items, probably livestock or grains, sealed in containers. The use of counting rods is one example.

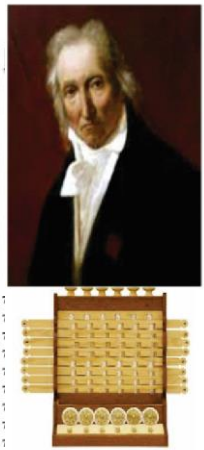
The abacus was early used for arithmetic tasks. What we now call the Roman abacus was used in Babylonia as early as 2400 BC. Since then, many other forms of reckoning boards or tables have been invented. In a medieval European counting house, a checkered cloth would be placed on a table, and markers moved around on it according to certain rules, as an aid to calculating sums of money. Several analog computers were constructed in ancient and medieval times to perform astronomical calculations.

Suanpan (the number represented on this abacus is 6,302,715,408) Scottish mathematician and physicist John Napier noted multiplication and division of numbers could be performed by addition and subtraction, respectively, of logarithms of those numbers. While producing the first logarithmic tables Napier needed to perform many multiplications, and it was at this point that he designed Napier's bones, an abacus-like device used for multiplication and division. Since real numbers can be represented as distances or intervals on a line, the slide rule was invented in the 1620s to allow multiplication and division operations to be carried out significantly faster than was previously possible. Slide rules were used by generations of

engineers and other mathematically involved professional workers, until the invention of the pocket calculator.

Wilhelm Schickard, a German polymath, designed a calculating clock in 1623, unfortunately a fire destroyed it during its construction in 1624 and Schickard abandoned the project. Two sketches of it were discovered in 1957; too late to have any impact on the development of mechanical calculators.

In 1642, while still a teenager, Blaise Pascal started some pioneering work on calculating machines and after three years of effort and 50 prototypes he invented the mechanical calculator. He built twenty of these machines (called the Pascaline) in the following ten years.



Wilhelm Schickard, a German polymath, designed a calculating clock in 1623.

Gottfried Wilhelm von Leibniz invented the Stepped Reckoner and his famous cylinders around 1672 while adding direct multiplication and division to the Pascaline. Leibniz once said "It is unworthy of excellent men to lose hours like slaves in the labour of calculation which could safely be relegated to anyone else if machines were used." Yazu Arithmometer. Patented in Japan in 1903. Note the lever for turning the gears of the calculator. Around 1820, Charles Xavier Thomas created the first successful, mass-produced mechanical calculator, the Thomas Arithmometer that could add, subtract, multiply, and divide. It was mainly based on Leibniz' work. Mechanical calculators, like the base-ten addiator, the comptometer, the Monroe, the Curta and the Addo-X remained in use until the 1970s. Leibniz also described the binary numeral system, a central ingredient of all modern computers. However, up to the 1940s, many subsequent designs (including Charles Babbage's machines of the 1822 and even ENIAC of 1945) were based on the decimal system; ENIAC's ring counters emulated the operation of the digit wheels of a mechanical adding machine.

**Punched card technology**

Punched card system of a music machine, also referred to as Book music

In 1801, Joseph-Marie-Jacquard developed a loom in which the pattern-being woven was controlled by punched cards. The series of cards could be changed without changing the mechanical design of the loom:

This was a landmark achievement in programmability. His machine was an improvement over similar weaving looms. Punch cards were preceded by punch bands, as in the machine proposed by Basile Bouchon. These bands would inspire information recording for automatic pianos and more recently NC machine-tools.

**Analytical engine**

In 1833, Charles Babbage moved on from developing his difference engine (for navigational calculations) to a general-purpose design, the Analytical Engine, which drew directly on Jacquard's punched cards for its program storage. In 1837, Babbage described his analytical engine. It was a general-purpose programmable computer, employing punch cards for input and a steam engine for power, using the positions of gears and shafts to represent numbers.

**IBM 407 Accounting Machine (tabulator)**

A reconstruction of the Difference Engine II, an earlier, more limited design, has been operational since 1991 at the London Science Museum. With a few trivial changes, it works exactly as Babbage designed it and shows that Babbage's design ideas were correct, merely too far ahead of his time. The museum used computer-controlled machine tools to construct the necessary parts, using tolerances a good machinist of the period would have been able to achieve. Babbage's failure to complete the analytical engine can be chiefly attributed to difficulties not only of politics and financing, but also to his desire to develop an increasingly sophisticated computer and to move ahead faster than anyone else could follow.

A machine based on Babbage's difference engine was built in 1843 by Per Georg Scheutz and his son Edward. An improved Scheutzian calculation engine was sold to the British government and a later model was sold to the American government and these were used successfully in the production of logarithmic tables.

Following Babbage, although unaware of his' earlier work, was Percy Ludgate, an accountant from Dublin, Ireland. He independently designed a programmable mechanical computer, which he described in a work that was published in 1909.

In the late 1880s, the American Herman Hollerith invented data storage on a medium that could then be read by a machine. Prior uses of machine readable media had been for control (automatons such as piano rolls or looms), not data. "After some initial trials with paper tape, he settled on punched cards ... " Hollerith came to use punched cards after observing how railroad conductors encoded personal characteristics of each passenger with punches on their tickets. To process these punched cards he inventedthe tabulator, and the key punch machine. These three inventions were the foundation of the modern information processing industry. His machines used mechanical relays (and solenoids) to increment mechanical counters. Hollerith's method was used in the 1890 United States Census and the completed results were "... finished months ahead of schedule and far under budget". Hollerith's company eventually became the core of IBM. IBM developed punch card technology into a powerful tool for business data-processing and produced an extensive line of unit record equipment.

**Quick Tip**

In Japan, Ry ?ichi Yazu patented a mechanical calculator called the Yazu Arithmometer in 1903. It consisted of a single cylinder and 22 gears, it is called (Japanese abacus).

Punched card with the extended alphabet. Leslie Comrie's articles on punched card methods and W. J. Eckert's publication of Punched Card Methods in Scientific Computation in 1940, described punch card techniques sufficiently advanced to solve some differential equations or perform multiplication and division using floating point representations, all on punched cards and unit record machines.

Computer programming in the punch card era was centered in the "computer center". Punched cards are

still used and manufactured to this day, and their distinctive dimensions (and 80-column capacity) can still be recognized in forms, records, and programs around the world. They are the size of American paper currency in Hollerith's time, a choice he made because there was already equipment available to handle bills.

**Features, components and uses of early computer device.**

Early manual computing devices and the uses of computer to perform arithmetic operations have various origins.

For instance, the ancient Babylonians wrote on clay tablets with a sharp stick i.e. the Babylonians cuneiform writing while the ancient Egyptians developed written records or papyrus using a sharp - pointed reed as a pen and organic/dyes for ink i.e. Egyptians hieroglyphics.

However, the earliest form of manual calculating device was the ABACUS used by the Chinese in about 3000 B.C. The use of pebbles or rods laid out on a lined or grooved board were early forms of the ABACUS and were, utilized for thousands of years in many civilizations.

The Japanese counterpart of the abacus is the SOROBAN: Even in contemporary times, the abacus used as a calculator is still being used by skilled abacus operators. These devices allow users to make computations using a system of sliding beads arranged on a rack. Early merchants used Abacus to keep trading transactions. But as the use of pencil and paper spread, particularly in Europe, the abacus lost its importance.

**Quick Tips**

**1848**

British Mathematician George Boole developed binary alqebra (Boolean algebra) which has been widely used in binary computer design and operation.

### Components of Abacus

1) Pebbles or rods laid out on a line or grooved board. 2) Sliding beads arranged on a rack.

It took nearly 12 centuries however, for the next significant advance in computing device to emerge.

### Uses of Abacus

Abacus was used in the ancient days for calculations (counting)but in these modern days:

1. It helps all round development for normal pupil aged 6 to 16.
2. It helps to develop concentration, listening and creativity in the child.
3. To eradicate the phobia of mathematics for school going children.
4. Improving mental calculations.
5. To master + - x :- with efficiency.
6. To enhance imaging skills.
7. To bring revolution in child's education.

**Quick Tips**

**January 1985 USA**

PostScript was introduced by Adobe Systems. It is a powerful page description language used in the Apple Laser-writer printer. Adopted by IBM for their use in March 1987.

### Functions of Abacus

An abacus instrument allows performing basic operations like Addition, Subtraction, Multiplication and Division. It can also carry out operations such as counting up to decimal places, calculates sums having negative numbers etc.

### Slide Rule

It is also known-colloquially as a slip stick is a mechanical analog computer. The slide rule is used primarily for multiplication and division. It is also for

functions such as roots, logarithms and trigonometry but is not normally used for addition or subtraction. Slide rule comes in a device range of styles and generally appear in linear or circular form with a standardized set of marking (scales) essentially to performing mathematical computations. Slide rules manufactured for specialized fields such as aviation or finance typically features additional scales that aid in calculations commons to that field.

Williams Oughtred and others developed the Slide rule in the 17TH century.

**Components of slides Rule**

1) It is a slip stick
2) It is mechanical analog.

**Advantages of slide rule in computing**

1. It made calculation very easy while it resigned.
2. It is relatively easy to construct, compared to other machines of its time.

**Disadvantages of the slide rule for computing**

1. Computational accuracy depends on the size of the slide rule and how readable the scales are printed.
2. Economic advantage of the slide rule to the inventor
3. The slide rule became very popular around 1600s up to mid 1900s and it made the inventor very popular, as he became a reference point in mathematical and arithmetic calculations. Scientists, engineers and sailors became used to the device for all their computations.
4. The simplicity in construction made the slide rule to abound with no serious financial benefits to William Oughtred.

**Napier Bone 1617**

John Napier invented the Napier's bones in 1617. it is simply a mechanical arrangement of bones in which

**Quick Tip**

**1878** Ramon Verea, living in New York City, invented a calculator with an internal multiplication table

numbers are printed. It is capable of direct multiplication when combinations of it are made. The method of multiplication is the location on the top row and the left hand column of the numbers to be multiplied. The use in logarithms made Napier's bone very popular. It was used for tedious and complex calculations in mathematics until contemporary times when pocket calculators came into use.

**Components of Napier's bones**

1) Arrangement of bones

2) Numbers printed on top of the bones.

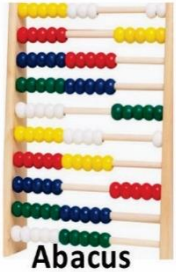
If you look at these strips, you will see that they are really the times tables. Each square gives 2x, 3x, and so on, but the tens and units are divided by a slanting line. You also need a frame to fit them in. The side with the numbers and the bottom are raised slightly, so you can slot the number strips next to them.

**Quick Tip**

**1709**

Giovanni Poleni was the first to build a calculator that used a pinwheel design. It was made of wood and was built in the shape of a calculating clock.

**How to use Napier's bones**



Abacus

Napier's bones are good for multiplying a long number by a single digit number. Let's multiply 425928 by 7. First take the strips for 4, 2, 5, 9, 2 and 8, and fit them into the frame. They must fit snugly.

Since we are multiplying by 7, you need to look at the squares next to the 7 on the side. It is coloured yellow on this diagram, but of course you don't get this help with the real bones.

Now you can work out the answer very quickly. You read off the digits, but any numbers within slanting lines must be added. So the answer is 2 8+1

4+3 5+6 3+1 4+5 6 or 2 9 7 11 4 9 6. Most of these digits are fine, but the 11 needs to have 10 carried to the left. This makes 2 9 7+1 1 4 9 6 or 2981496, which is the right answer.If you do the same sum on paper, you will see what is going on. When you start the calculation, you multiply the end digit, 8, by 7, which is 56. You put the 6 at the end, and carry the 7. Now you multiply the next digit, 2, by 7. This is 14, but you need to add the 5 carried from the previous calculation. So you add the 4 and 5, and carry the 1. You can see the same addition happening with the Napier's bones. They provide a mechanism for the carrying, and do the simple multiplication for you. Here are the rest of the calculations for you to compare. Remember that an extra 1 had to be carried at one point.

| | | | | | |
|---|---|---|---|---|---|
| 425928 | 425928 | 425928 | 425928 | 425928 | 425928 |
| X 7 | x 7 | x 7 | x 7 | x 7 | |
| 6 | 96496 | 1496 | 81496 | 2981496 | |
| 5 | 15615 | | 3615 | 14615 | 14615 |

**Pascal's Calculator 1642**

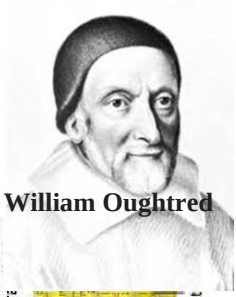
Blaise Pascal of France, a philosopher and mathematician invented the first adding machine in 1642. Numbers were entered on dials that are on the front of the machine. This can be equated to that of the keyboard in the modern computer. The answers appear in little widows at the top of the machine. This can be equated to the screen/ monitor/ visual display unit (V D U) in modern computers. The popular programming language known as PASCAL was named after him.

**Components of Pascal's calculator**

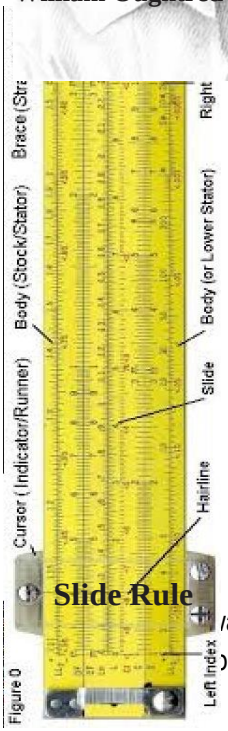
1) The number are dialed
2) It has keyboard
3) It has screen where the numbers appear when divide

## Quick Tip

**1869**
The first practical logic machine was built by William



**William Oughtred**




**Slide Rule**

### Leibnitz's multiplier

Gottfried von leibnitz in 1614 a German invented the leibnitzs calculating machine in 1694. His machine is similar to the input - processing - out put cycle of modern computer. He incorporated some ideas similar to those used in the clock work mechanism and the odometer both of which were developed in ancient Greek and Rome.

Components of labnitz's multiplier

1) It has input - processing out put
2) It has clockwork mechanism.

### Mechanical device personalities

Joseph Jacquard. In 1801; Jacquard of France invented electro-mechanical punch card machine i.e. the punched - board 100m. The 'use of this machine for the automatic processing of data recorded by holes punched in paper cards was another major development in machine computation. At its inception, it was developed to automatically control textile - weaving equipment. Later it became useful in statistics and data processing.

In 1833, Babbage, ceased working on the difference engine because he had a better idea. His idea was to build an (analytical engine). The analytical engine was a real parallel decimal computer that would operate on words of 50

/as able to store 1000 of such numbers. The machine

)er of built –operations such as conditional control, which

allowed the instructions for the machine to be executed in a specific order rather than in numerical order. The instructions for the machine were stored on punched cards. The analytical engine made the difference with the numerical order and the conditional control order of program execution. In numerical order of program execution, instructions used to execute a given task are arranged serially with the first instruction coming first, the second instruction coming second and so on. The numerical order of arrangements of these instructions must be followed for instance, to multiply two numbers together; the following step has to be followed strictly.

Some of his ideas were recorded and analyzed by lady Augusta Ada Byron, countess of Lovelace, and the daughter of Lord Byron, the famous English poet. The programming language Ada was named after her name because she is considered the first world computer programmer.

Dr. Herman Hollerith February 29 1860 - November 17, 1929) was an American statistician who developed a mechanical tabulator based on punch cards to rapidly tabulator statistics from millions of pieces of data. He was the founder of the companies that later merged and became IBM in 1880. He was commissioned by the U.S census Bureau to develop new ways of processing census data within shortest time. It happened that the U.S census report of 1880 was delayed till 1887 because of crude processes involved worse still, the 1890 census was at hand, and there was fear that it might not be completed before the 1900. He took the work as a challenge and he developed a punched paper card for the recovery of data, a hard - operated card punch, a sorting box, and a tabulator. With these devices, in less than three days, the 1890 census was completed and reported. Burroughs Adding Machine Company, 6071 second Av, Detroit, Michigan U. S.A.

In 1886 the American Arithmometer company was founded in St. Louis to manufacture the mechanical add - listing machine invented by

Williams Seward Burroughs. In 1905 the name was changed to Burrough add Machine Company.

The early Burrough models were large machine characterized by having glass panels on the sides so that the mechanism could be seen. This became fashionable in other company's machines of the times. There was constant development in the mechanical calculators throughout the 1960's, when Burroughs converted to electronic desk calculators. They had an agreement to sell in Europe electronic calculators made by sharp in Japan, but also decided to make their own electronic desk calculators at their factory France. The company was heavily involved in accounting machines, had early involvement in computing equipment, and the calculators appear to have been dropped from its product line in the mid to late 1970s. It only produced desktop machines, and no hand no held calculators.

In 1980 Burroughs corporations and Sperry Corporation merged to form Unisys corporations.

**Summary**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 0 0 | 0 2 | 0 4 | 0 6 | 0 8 | 1 0 | 1 2 | 1 4 | 1 6 | 1 8 |
| 0 0 | 0 3 | 0 6 | 0 9 | 1 2 | 1 5 | 1 8 | 2 1 | 2 4 | 2 7 |
| 0 0 | 0 4 | 0 8 | 1 2 | 1 6 | 2 0 | 2 4 | 2 8 | 3 2 | 3 6 |
| 0 0 | 0 5 | 1 0 | 1 5 | 2 0 | 2 5 | 3 0 | 3 5 | 4 0 | 4 5 |
| 0 0 | 0 6 | 1 2 | 1 8 | 2 4 | 3 0 | 3 6 | 4 2 | 4 8 | 5 4 |
| 0 0 | 0 7 | 1 4 | 2 1 | 2 8 | 3 5 | 4 2 | 4 9 | 5 6 | 6 3 |
| 0 0 | 0 8 | 1 6 | 2 4 | 3 2 | 4 0 | 4 8 | 5 6 | 6 4 | 7 2 |
| 0 0 | 0 9 | 1 8 | 2 7 | 3 6 | 4 5 | 5 4 | 6 3 | 7 2 | 8 1 |

**Blaise Pascal**

Blaise Pascal a philosopher and mathematician invented the first adding machine in 1642

Gottfried von Leibniz

**leibnitzs calculating machine in 1694.**

Jacquard of France invented electro-mechanical punch card machine.

The prototype calculators of the seventeenth century demonstrated the feasibility of performing lengthy calculations by mechanical methods. Ultimately this demonstration has result in the construction of the modern computer in the form that is common today. We can from these points; however, note a number of elements - both conceptual and concrete - that are missing from the devices considered previously.

a. There is no concept of program." So that in order to repeat a calculation the same steps must again be performed by hand and separately instantiated for differing input data.

b. Computation is, for the most part, memory less; except in some special cases, partial results must be written down and, re- entered to when they are to use in completing a calculation.

c. Each step of a calculation requires some manual intervention, thus the computation does notproceed independently of human control.

d. The technology used is mechanical not electronic. The history of calculating machines post _ Leibniz can admittedly with hindsight be seen as a series of ideas and technological advances

**Economic benefits of the Hollerith's machine.**

Hollerith made a great fortune from the sales of his machine.

The machine earned him contract with foreign governments and as a result, his machine wereused in 1891 census in USA, Canada, Norway, and

Austria. Railway companies also employed Holleriths machines in calculating fares.Hollerith formed the Tabulating machine company in 1896, He later changed its name to Computer Tabulating Recording Company in 1924, the name was changed to International Business Machines Corporation or IBM. Investors and workers of the company also gained economically from its fortune.

**Advantages of Burroughs' Machine to the Inventor**

1. Burroughs' company founded the American Arithmometer Company that was in charge of production of his machine.
2. Inventors and workers of the company also had economic benefits as a result of these great inventions.
3. Burroughs' Adding and Registering Company was established in international market place (England) and as a result, more sales were recorded.
4. Burroughs made a fortune from the sales of his machine.

**Disadvantages of Burroughs' machine**

1. The operator had to lift a carriage on the rear of the machine to see what was printed. This gave it a name, 'blind' printer.
2. Burroughs was the only one who could operate his machinescorrectly initially but this was later corrected.

**A Brief History of Computer Technology**

A complete history of computing would include a multitude of diverse devices such as the ancient Chinese abacus, the Jacquard loom (1805) and Charles Babbage's "analytical engine" (1834). It would also include discussion of mechanical, analog and digital computing architectures. As late as the 1960s, mechanical devices, such as the Marchant calculator, still found widespread application in science and engineering. During the early

days of electronic computing devices, there was much discussion about the relative merits of analog vs. digital computers. In fact, as late as the 1960s, analog computers were routinely used to solve systems of finite difference equations arising in oil reservoir modeling. In the end, digital computing devices proved to have the power, economics and scalability necessary to deal with large scale computations. Digital computers now dominate the computing world in all areas ranging from the hand calculator to the supercomputer and are pervasive throughout society. Therefore, this brief sketch of the development of scientific computing is limited to the area of digital, electronic computers.

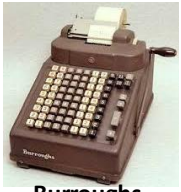
The evolution of digital computing is often divided into generations. Each generation is characterized by dramatic improvements over the previous generation in the technology used to build computers, the internal organization of computer systems, and programming languages. Although not usually associated with computer generations, there has been a steady improvement in algorithms, including algorithms used in computational science. The following history has been organized using these widely recognized generations as mileposts.

**First Generation Electronic Computers (1937 – 1953)**

Three machines have been promoted at various times as the first electronic computers. These machines used electronic switches, in form of vacuum tubes, instead of electromechanical relays. In principle the electronic switches were more reliable, since they would have no moving parts that would wear out, but technology was still new at that time and the tubes were comparable to relays in reliability. Electronic components had one major benefit, however: they could "open" and "close" about 1,000 times faster than mechanical switches.

CHARLES BABBAGE

**Dr. Herman Hollerith**



**Burroughs Adding Machine**

**1115 BC**
The South Pointing Chariot was invented in ancient China. It was the first known geared mechanism to use a differential gear.

The earliest attempt to build an electronic computer was by J. V. Atanasoff, a professor of physics and mathematics at Iowa State, in 1937. Atanasoff set out to build a machine that would help his graduate students solve systems of partial differential equations. By 1941, he and graduate student Clifford Berry had succeeded in building a machine that could solve 29 simultaneous equations with 29 unknowns. However, the machine was not programmable, and was more of an electronic calculator.

A second early electronic machine was Colossus, designed by Alan Turning for the British military in 1943. This machine played an important role in breaking codes used by the German army in World War II. Turning's main contribution to the field of computer science was the idea of the Turing Machine, a mathematical formalism widely used in the study of computable functions. The existence of Colossus was kept secret until long after the war ended, and the credit due to Turning and his colleagues for designing one of the first working electronic computers was slow in coming. The first general purpose programmable electronic computer was the Electronic Numerical Integrator and Computer (ENIAC), built by J. Presper Eckert and John V. Mauchly at the University of Pennysylvania. Work began in 1943, funded by the Army Ordinance Department, which needed a way to compute ballistics during World War II. The machine wasn't completed until 1945, but then it was used extensively for calculations during the design

of the hydrogen bomb. By the time it was decommissioned in 1955 it had been used for research on the design of wind tunnels, random number generators, and weather prediction. Eckert, Mauchly, and John Von Neumann, a consultant to the ENIAC project, began work on a new machine before ENIAC was finished. The main contribution of EDVAC, their new project, was the notion of a stored program. There is some controversy over who deserves the credit for this idea, but no one knows how important the idea was to the future of general purpose computers. ENIAC was controlled by a set of external switches and dials; to change the program required physically altering the settings on these controls. These controls also limited the speed of the internal electronic operations. Through the use of a memory that was large enough to hold both instructions and data, and using the program stored in memory to control the order of arithmetic operations, EDVAC was able to run orders of magnitude faster than ENIAC. By storing instructions in the same medium as data, designers could concentrate on improving the internal structure of the machine without worrying about matching it to the speed of an external control.

**Quick Tip**

**1668**

Sir Samuel Morland (1625-1695), of England, produced a non- decimal adding machine, suitable for

Regardless of who deserves the credit for the stored program idea, the EDVAC project is significant as an example of the power of interdisciplinary projects that characterize modern computational science. By recognizing that functions, in the form of a sequence of instructions for a computer, can be encoded as numbers, the EDVAC group knew the instructions could be stored in the computer's memory a long with numerical data. The notion of using numbers to represent functions was a key step used by Goedel in his incompleteness theorem in 1937, work which Von Neumann, as a logician, was quite familiar with. Von Neumann's background in logic,

combined with Eckert and Mauchly's electrical engineering skills, formed a very powerful interdisciplinary team.

Software technology during this period was very primitive. The first programs were written out in machine code, i.e. programmers directly wrote down the numbers that corresponded to the instructions they wanted to store in memory. By the 1950s programmers were using a symbolic notation, known as assembly language, then handtranslating the symbolic notation into machine code. Later programs known as assemblers performed the translation task.

As primitive as they were, these first electronic machines were quite useful in applied science and engineering. Atanasoff estimated that it would take eight hours to solve a set of equations with eight unknowns using a Marchant calculator, and 381 hours to solve 29 equations for 29 unknowns. The Atanasoff-Berry computer was able to complete the task in under an hour. The first problem run on the ENIAC, a numerical simulation used in the design of the hydrogen bomb, required 20 seconds, as opposed to forty hours using mechanical calculators. Eckert and Mauchly later developed what was arguably the first commercially successful computer, the UNIVAC; in 1952, 45 minutes after the polls closed and with 7% of the vote counted, UNIVAC predicted Eisenhower would defeat Stevenson with 438 electoral votes (he ended up with 442).

**Second Generation (1954 – 1962)**

The second generation saw several important developments at all levels of computer system design, from the technology used to build the basic circuits to the programming languages used to write scientific applications. Electronic switches in this era were based on discrete diode and transistor technology with a switching time of approximately 0.3 microseconds. The first machines to be built with this technology include TRADIC at Bell Laboratories in 1954 and TX-0 at MIT's Lincoln Laboratory. Memory

technology was based on magnetic cores which could be accessed in random order, as opposed to mercury delay lines, in which data was stored as an acoustic wave that passed sequentially through the medium and could be accessed only when the data moved by the I/O interface.

Important innovations in computer architecture included index registers for controlling loops and floating point units for calculations based on real numbers. Prior to this accessing successive elements in an array was quite tedious and often involved writing self-modifying code (programs which modified themselves as they ran; at the time viewed as a powerful application of the principle that programs and data were fundamentally the same, this practice is now frowned upon as extremely hard to debug and is impossible in most high level languages). Floating point operations were performed by libraries of software routines in early computers, but were done in hardware in second generation machines.

During this second generation many high level programming languages were introduced, including FORTRAN (1956), ALGOL (1958), and COBOL (1959). Important commercial machines of this era include the IBM 704 and 7094. The latter introduced I/O processors for better throughput between I/O devices and main memory. The second generation also saw the first two supercomputers designed specifically for numeric processing in scientific applications. The term "supercomputer" is generally reserved for a machine that is an order of magnitude more powerful than other machines of its era. Two machines of the 1950s deserve this title. The Livermore Atomic Research Computer (LARC) and the IBM 7030 (aka Stretch) were early examples of machines that overlapped memory operations with processor operations and had primitive forms of parallel processing.

**Third Generation (1963 – 1972)**

The third generation brought huge gains in computational power. Innovations in this era include the use of integrated circuits, or ICs

(semiconductor devices with several transistors built into one physical component), semiconductor memories starting to be used instead of magnetic cores, microprogramming as a technique for efficiently designing complex processors, the coming of age of pipelining and other forms of parallel processing, and the introduction of operating systems and time-sharing.

The first ICs were based on small-scale integration (SSI) circuits, which had around 10 devices per circuit (or "chip"), and evolved to the use of medium-scale integrated (MSI) circuits, which had up to 100 devices per chip. Multilayered printed circuits were developed and core memory was replaced by faster, solid state memories. Computer designers began to take advantage of parallelism by using multiple functional units, overlapping CPU and I/O operations, and pipelining (internal parallelism) in both the instruction stream and the data stream. In 1964, Seymour Cray developed the CDC 6600, which was the first architecture to use functional parallelism. By using 10 separate functional units that could operate simultaneously and 32 independent memory banks, the CDC 6600 was able to attain a computation rate of 1 million floating point operations per second (1 Mflops). Five years later CDC released the 7600, also developed by Seymour Cray. The CDC 7600, with its pipelined functional units, is considered to be the first vector processor and was capable of executing at 10 Mflops. The IBM 360/91, released during the same period, was roughly twice as fast as the CDC 660. It employed instruction look ahead, separate floating point and integer functional units and pipelined instruction stream. The IBM 360-195 was comparable to the CDC 7600, deriving much of its performance from a very fast cache memory. The SOLOMON computer, developed by Westinghouse Corporation, and the ILLIAC IV, jointly developed by Burroughs, the Department of Defense and the University of Illinois, was representative of the first parallel computers. The Texas Instrument Advanced Scientific Computer (T I-ASC) and the STAR-100 of CDC were

pipelined vector processors that demonstrated the viability of that design and set the standards for subsequent vector processors.

Early in this, third generation Cambridge and the University of London cooperated in the development of CPL (Combined Programming Language, 1963). CPL was, according to its authors, an attempt to capture only the important features of the complicated and sophisticated ALGOL. However, the ALGOL, CPL was large with many features that were hard to learn. In an attempt at further simplification, Martin Richards of Cambridge developed a subset of CPL called BCPL (Basic Computer Programming Language,1967).

**Fourth Generation (1972 – 1984)**

The next generation of computer systems saw the use of large scale integration (LSI – 1000 devices per chip) and very large scale integration (VLSI – 100,000 devices per chip) in the construction of computing elements. At this scale entire processors will fit onto a single chip, and for simple systems the entire computer (processor, main memory, and I/O controllers) can fit on one chip. Gate delays dropped to about Ins per gate. Semiconductor memories replaced core memories as the main memory in most systems; until this time the use of semiconductor memory in most systems was limited to registers and cache. During this period, high speed vector processors, such as the CRAY 1, CRAY X-MP and CYBER 205 dominated the high-performance computing scene.

Computers with large main memory, such as the CRAY 2, began to emerge. A variety of parallel architectures began to appear; however, during this period the parallel computing efforts were of a mostly experimental nature and most computational science was carried out on vector processors. Microcomputers and workstations were introduced and saw wide use as alternatives to time-shared mainframe computers.

Developments in software include very high level languages such as FP (functional programming) and Prolog (programming in logic). These

languages tend to use a declarative programming style as opposed to the imperative style of Pascal, C. FORTRAN, et al. In a declarative style, a programmer gives a mathematical specification of what should be computed, leaving many details of how it should be computed to the compiler and/or runtime system. These languages are not yet in wide use, but are very promising as notations for programs that will run on massively parallel computers (systems with over 1,000 processors). Compilers for established languages started to use sophisticated optimization techniques to improve code, and compilers for vector processors were able to vectorize simple loops (turn loops into single instructions that would initiate an operation over an entire vector). Two important events marked the early part of the third generation: the development of the C programming language and the UNIX operating system, both at Bell Labs. In 1972, Dennis Ritchie, seeking to meet the design goals of CPL and generalize Thompson's B, developed the C language. Thompson and Ritchie then used C to write a version of UNIX for the DEC PDP-11. This C-based UNIX was soon ported to many different computers, relieving users from having to learn a new operating system each time they change computer hardware. UNIX or a derivative of UNIX is now a de facto standard on virtually every computer system.

An important event in the development of computational science was the publication of the Lax report. In 1982, the US Department of Defense (DOD) and National Science Foundation (NSF) sponsored a panel on Large Scale Computing in Science and Engineering, chaired by Peter D. Lax. The Lax Report stated that aggressive and focused foreign initiatives in high performance computing, especially in Japan, were in sharp contrast to the absence of coordinated national attention in the United States. The report noted that university researchers had inadequate access to high performance computers.

One of the first and most visible of the responses to the Lax report was the establishment of the NSF supercomputing centers. Phase I on this NSF program was designed to encourage the use of high performance computing at American universities by making cycles and training on three (and later six) existing supercomputers immediately available. Following this Phase I stage, in 1984 – 1985 NSF provided funding for the establishment of five Phase II supercomputing centers. The Phase II centers, located in San Diego (San Diego supercomputing Centre); Illinois (National Center for Supercomputing Applications); Pittsburgh (Pittsburgh Supercomputing Center); Cornell (Cornell Theory Center); and Princeton (John Von Neumann Center), have been extremely successful at providing computing time on supercomputers to the academic community. In addition they have provided many valuable training programs and have developed several software packages that are available free of charge. These Phase II centers continue to augment the substantial high performance computing efforts at the National Laboratories, especially the Department of Energy (DOE) and NASA sites.

**Fifth Generation (1984 – 1990)**

The development of the next generation of computer systems is characterized mainly by the acceptance of parallel processing. Until this time, parallelism was limited to pipelining and vector processing, or at most to a few processors sharing jobs. The fifth generation saw the introduction of machines with hundreds of processors that could all be working on different parts of a single program. The scale of integration in semiconductors continued at an incredible pace, by 1990 it was possible to build chips with a million components – and semiconductor memories became standard on all computers.

Other new developments were the widespread use of computer networks and the increasing use of single-user workstations. Prior to 1985, large scale parallel processing was viewed as a research goal, but two systems introduced around this time are typical of the first commercial products to be based on parallel processing. The Sequent Balance 8000

connected up to 20 processors to a single shared memory module (but each processor had its own local cache). The machine was designed to compete with the DEC VAX-780 as a general-purpose Unix system, with each processor working on a different user's job. However, Sequent provided a library of subroutines that would allow programmers to write programs that would use more than one processor, and the machine was widely used to explore parallel algorithms and programming techniques. The Intel iPSC -1, nicknamed "the hypercube", took a different approach. Instead of using one memory module, Intel connected each processor to its own memory and used a network interface to connect processors. This distributed memory architecture meant memory was no longer a bottleneck and large systems (using more processors) could be built. The largest iPSC-1 had 128 processors. Toward the end of this period, a third type of parallel processor was introduced to the market. In this style of machine, known as a data-parallel or SIMD, there are several thousand very simple processors. All processors work under the direction of a single control unit; i.e. if the control unit says "add a to b" then all processors find their local copy of a and add it to their local copy of b. Machines in this class include the Connection Machine from Thinking Machines, Inc., and the MP-1 from MasPar, Inc.

Computer users can be divided into five categories: home user, small office/home office users, mobile users, large business users, and power users. A home user spends time on the computer for personal and business communications, budgeting and personal financial management, entertainment, and Web access.

100 BC Chinese mathematicians first used negative numbers.

Vacuum

In June 1951, the UNIVAC I (Universal Automatic Computer) was delivered to the U.S. Census Bureau

Scientific computing in this period was still dominated by vector processing. Most manufacturers of vector processors introduced parallel models, but there were very few (two to eight) processors in these parallel machines. In the area of computer networking, both wide area network (WAN) and local area network (LAN)

technology developed at a rapid pace, stimulating a transition from the traditional mainframe computing environment towards a distributed computing environment in which each user has their own workstation for relatively simple tasks (editing and compiling programs, reading mail) but sharing large, expensive resources such as file servers and supercomputers. RISC technology (a style of internal organization of the CPU) and plummeting costs for RAM brought tremendous gains in computational power of relatively low-cost workstations and servers. This period also saw a marked increase in both the quality and quantity of scientific visualization.

**Sixth Generation (1990 to date)**

Transitions between generations in computer technology are hard to define, especially as they are taking place. Some changes, such as the switch from vacuum tubes to transistors, are immediately apparent as fundamental changes, but others are clear only in retrospect. Many of the developments in computer systems since 1990 reflect gradual improvements over established systems, and thus it is hard to claim they represent a transition to a new "generation", but other developments will prove to be significant changes.

In this section, we offer some assessments about recent developments and current trends that we think will have a significant impact on computational science. This generation is beginning with many gains in parallel computing, both in the hardware area and in improved understanding of how to develop algorithms to exploit diverse, massively parallel architectures. Parallel systems now compete with vector processors in terms of total computing power and most especially parallel systems to dominate the future. Combinations of parallel/vector architectures are well established, and one corporation (Fujitsu) has announced plans to build a system with over 200 of its high and vector processors. Manufacturers have set themselves the goal of achieving teraflops (1012 arithmetic operations per second) performance by the

middle of the decade, and it is clear this will be obtained only by a system with a thousand processors or more. Workstation technology has continued to improve, with processor designs now using a combination of RISC, pipelining, and parallel processing. As a result it is now possible to procure a desktop workstation that has the same overall computing power (100 megaflops) as fourth generation supercomputers. This development has sparked an interest in heterogeneous computing: a program started on one workstation can find idle workstations elsewhere in the local network to run parallel subtasks. One of the most dramatic changes in the sixth generation is the explosive growth of wide area networking. Network bandwidth has expanded tremendously in the last few years and will continue to improve for the next several years. T1 transmission rates are now standard for regional networks, and the national "backbone" that interconnects regional networks uses T3. networking technology is becoming more widespread than its original strong base in universities and government laboratories as it is rapidly finding application in K-12 education, community networks and private industry. A little over a decade after the warning voiced in the Lax report, the future of a strong computational science infrastructure is bright.

**Conclusion**

The development of computer span through many generations with each generations chronicling the landmark achievements of the period.

# Chapter Four

# COMPUTING DEVICES II
# (20TH CENTURY TO DATE)

**Specific Objectives**

At the end of this chapter, students should be able to

1. Describe the ENIAC, EDVAC, UNIVAC, personal computer, laptop and notebook computers and palmtop computers.
2. State the different uses of these computers.

## INTRODUCTION

**Z1computer**

With the onset of the Second World War, governments sought to develop computers to exploit their potential strategic importance. This increased funding for computer development projects hastened technical progress. By 1941 German Engineer Konrad Zuse had developed a computer Z3, the to design air planes and missiles. The Aillied forces however made greater strides in developing powerful computers. In 1943, the British completed a secret code - breaking computer called Colossus to decode German Message. The colossus's impact on the development of the computer industry was rather limited for two important reasons:

Firstly, colossus was not a general - purpose computer, it was only designed to decode secret messages.

**Z3 computer**

Secondly, the existence of the machine was kept secret until decades after the war.

American efforts produced a broader achievement.

Harward Aiken (1900-1973), a Harvard engineer working with IBM succeeded in producing an all-electronic calculator by 1944. The purpose of the computer was to create ballistic charts for the U.S Navy. It was about half as long as a football field and contained about 500 miles of wiring.

The Harvard - IBM Automatic sequence-controlled calculator (ASCC) or mark I for short: was an electronic relay computer.

It used electromagnetic signals to move mechanical parts.

The machine was slow (taking 3-5 second per calculation) and inflexible (in the sequence of calculations could not change) but it could perform basic arithmetic as well as more complex equations.

ENIAC (Electronic Numerical integrator and computer). 1946: Another computer development spurred by the war was the (ENIAC), produced by a partnership between the U.S government and the University of Pennsylvania. Consisting of 18, 000 vacuum tubes 70,000 resistors and 5 million soldiered joints, the computer was such as a massive piece of machinery that it consumed 160 kilowatts of electrical power; enough energy to dim the lights is an entire section of Philadelphia ENIAC was developed by John .W. Mauchly (1907 - 1980), ENIAC, unlike the colossus and mark I, was a general - purpose computer that computed at speed 1 , 000 times faster than Mark I I EDVAC (Electronic Discrete Variable Automatic computer). In the mid-1940s John von Neumann (1903 - 1957) joined the university of Pennsylvania' team, initiating concepts in computer design that remained central to computer engineering for the next 40 years.

Von Neumann designed the EDVAC in 1945 with memory to hold both a stored program as well as the "conditional control transfer that allowed the computer to be stopped at any point and then resumes, which allowed for greater versatility in computer programming. The key element to the Von Neumann architecture was the Central Processing Unit which allowed all computer functions to be coordinated through single source.



IBM Automatic sequence controlled calculator (ASCC) or mark I for short: was an electronic relay computer developed by Harward Aiken

**UNIVAC (universal Automatic Computer)**

In 1951 the UNIVAC, built by Remington Rand under the supervision of Eckert & Mauchly became one of the first commercially available computer to take advantage of these advances. Both U.S. One of UNIVAC'S impressive early achievements was predicting the winner of the 1952 presidential Election, DWIGHT D. Eisen however defeated Stevenson with 438 electoral votes (he ended up with 442)

Features of UNIVAC

A key feature of the UNIVAC system was a newly invented type of metal magnetic tape, and a high-speed tape unit, for non-volatile storage.

**ABC Computer**

Dr John V. Atanasoff 1940. He was a professor of mathematics of Iowa state university. He worked towards producing some types of digital computer device using electronics. His dream was realized in 1940 when with his assistant, Clifford Berry who

built the Atanasoff - Berry- computer popularly known as the ABC. This work was instrumental to the design and production of the ENIAC by Mauchly and Eckert.


ENIAC (Electronic Numerical integrator and computer).

Desktop is one of the microcomputers which is divided into two groups

1. Personal computer
2. Work stations.

Work stations are powerful Single - user computer. They have the capacity to store and process large quantities of data, but they are only used by one person at a time.

However, workstation are typically linked together to form computer network group computers by telecommunication linked to and peripherals connected together to enable group users to share and exchange information called a local area network (LAN). This means that several people, like staffers in an office can communicate each other and share electronic files and dates. A workstation is similar to a Desktop personal computer but is more powerful and often comes with a higher quality monitor. In terms of computing power, workstations has in between personal computing and mini - computers. Workstation commonly support applications that require relatively high - quality graphics capabilities and lots of memory, such as desktop publishing, software development and engineer applications.

Personal computers (PC) also called microcomputers are the most popular type of computer in use today. The pc is a smaller sized, relatively inexpensive computer designed for an individual user. Computers may be

called "DESKTOP" computers which stay on the desk. It has separate monitor, keyboards, mouse, and other peripherals attached to it. Another classification of computer is the Note book computer. A notebook computer can fit unto a case and weight forever than two pounds yet it can complete with the microcomputers.

LAPTOP is the large and heavier version of Note book. Organizations and individuals use laptops for a wide range of tasks, including word proves accounting, desktop. All these have to be grouped under generations of computers.

**Generations of computer**

An improvement on calculating device and mechanical machine There are various generation of computer that have been recorded. Five generation of computers have been produced between1930 to date.

**The generation and some of their functions are**

**UNIVAC 1951**
built by Remington Rand
under the supervision of
Eckert & Mauchly

1. First Generation Computers: It was the first attempt made by man in building what is called computer. It was manufactured between 1930 and 1958. It has the following features:

(I) It was developed with electronic value "Vacuum tubes".

(ii) It was slow in operation.

(iii) It was too large in size.

(iv) It generated a lot of heat.

They include Automatic Computer Engine (ACE), Electric Numerical Integrator and Calculator (ENIAC, EDVAC, UNIVAC)

**Second generation: transistors**

Atanasoff -Berry-computer popularly known as the ABC

The bipolar transistor was invented in 1947. From 1955 onwards transistors replaced vacuum tubes in computer designs, giving rise to the "second generation" of computers.

Second Generation Computers: Scientists led by William Scholey at Bell Laboratories invented a device called a transistor. This brought a wonderful and significant changes in computer system by replacing vacuum tubes with the transistors. It was an improvement from the first-generation computer.

It was manufactured between 1959 and 1963.

**It has the following features.**

(i) It was developed with a component called transistor.

(ii) It makes use of High-Level Language.

(iii) It possesses high speed in operation.

(iv) It consumes less electricity.

They include IBM 7090 series, IBM 7094, ATLAS.

**Third Generation Computers**

It was an improvement on the second-generation computer. It makes use of a component called integrated invent which consists of series of inter-connected transistors, resistors and capacitors, all attached on a single chip. It was manufactured between 1964 and 1969. It has the following features.

i. It was developed with integrated circuit.
ii. It gave rise to more development in hardware technology.
iii. They are smaller in size, less expensive and higher speed.
iv. Minicomputers were produced.

First computer in the third generation was called system 360.

**Fourth Generation Computers**

An Engineer called Dr. Hoff conceived the idea of converting the integrated circuit to a single central chip called microprocessor. This brought a radical change in the technological system by connecting the entire computer to the one known as microprocessor. It was manufactured between 1970 to date.

**It has the following features:**

(i) It makes use of chip (microprocessors) as memory.

(ii) It led to the standard use of software.

(iii) It is more compact and portable.

(iv) It has a main memory capacity of 4 to 16 million characters.

**Fifth Generation Computers**

It is the advanced form of computer system. This form of computer makes use of higher manipulations and it is the standard form in the society. It is an advanced machine that reason like human being during operation. They develop from 1990s to the present day.

**Artificial Intelligence**

**It has the following features:**

i. It processes data in million cycles per second.
i. Development of internet computers.
ii. Development of artificial intelligence in computer technology.
iii. They are smaller in size, inexpensive and have higher speed.
iv.


**Microprocessor**

**Artificial intelligence**

The first Major Branches of Artificial intelligence is

1. Perceptive system or artificially intelligent system. A system that approximates the way a human see, hears, and feels objects.
2. Vision system captures, store, and manipulate visual images and pictures.
3. Robotics: Mechanical and computer devices that perform tedious tasks with high precision, Expert system, stores knowledge and makes inferences.

**The second Major Branches of Artificial intelligence are**

1. Learning system: Computer changes how it functions or reacts to situations based on feedback.
2. Natural language processing: Computers understand and react to statements and commands made in a "natural" language, such as English.
3. Neural network: Computer system that can act like or simulate the functioning of the human brain.

**Benefits of Artificial Intelligence**

Artificial intelligence has been used in a wide range of fields including medical diagnosis, stock trading,

robot control, scientific discovery and toys.Artificial intelligence is widely used in the field of gaming e.g. the game of chess.

**Special features of personal computer.**

1. Large user base means there are lots of people to ask when there are challenges.
2. There is a possibility of comparatively inexpensive upgrades when hardware becomes obsolete.
3. There is no reliance on a single manufacturer but there are lots of choices of hardware suppliers.
4. Branded Pc's have a wide market. There are many options when it comes to choosing a PC. Examples are HP, Dell, Zinox (coupled in Nigeria).
5. They are less expensive for some the same computing power of non-PC.

# Chapter Five
# INPUT DEVICES

**Specific Objective**
At the end of this chapter, you should be able to
a. Define input device.
b. List input devices
c. State the features and uses of input devices.
d. State how the mouse works

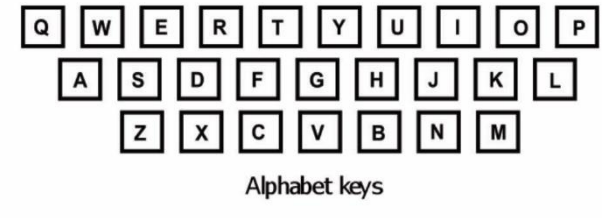
**INTRODUCTION**
Input Device is any device with which you can send signal or data to the processing unit or the device that the computer user uses to communicates the processing unit.
An input device is a piece of hardware that is used for providing information to the computer.
Input device are:

- Keyboard Mouse Joystick
- Pen tablet or light pen
- Scanner
- Microphone
- Card reader
- Midi keyboard
- Digital camera
- Video camera
- Web cam

Keyboard is one of the input devices that is used for coding and decoding data in the central processing unit. A keyboard is an input device. It is a device for sending data and information into the computer. This is done through punching the keys on the keyboard. It is a device for sending data

and information into the computer. A keyboard is a typewriter-like device that allows the user to information into the computer memory. A keyboard may be part and parcel of a computer or a separate component fixed to a computer. A keyboard may be classified into two:

I. Standard or original keyboard and
Ii. Enhanced or ergonomic keyboard.



Alphabet keys

**These numeric keys are used for typing numbers**

**Sections of the Keyboard**

The keys on a computer keyboard are grouped together according to the function they perform. These group of keys are called sections of the keyboard. The sections of the keyboard are:

1. **Functions Keys Section:** This Section contains the function keys. A function key is a key that is used to instruct the computer to do a particular thing or to perform a particular function. Function keys are labelled F1 to F12. They are located above the typewriter area of the keyboard.
2. **Alphanumeric Keys Section:** This section is called the typewriter area of the keyboard. It contains alphabet keys, space bar key, capslock key, enter key, back space key, alternate and control keys, tab key and shift keys.
3. **Alphabet keys:** These are also called letter keys. These are keys that contain letters of the alphabet A to Z. They are used to enter alphabetic characters (a, b, c, d, ...z) into the computer. So the alphabet keys are used for typing words and sentences. To type any letter or alphabet, gently press

the key of that particular letter. The computer then writes that letter on the screen

4. **Numeric Section:** The numeric keypad is located at the extreme right of the keyboard. It contains numbers, numlock and arithmetic signs. It is the section used for typing numbers. In this section, numbers and arithmetic signs are grouped together and this makes it easy for anybody to use this keypad to type numbers and to do arithmetic.

5. **Cursor or Arrow Control Keys:** Cursor Control keys are:
   (a) The Arrow keys
   (b) Page Up key
   (c) Page Down key
   (d) Home key
   (e) End key

   They are called cursor control keys because they are used to control the movement of the cursor on the screen.

   (**a) Arrow keys:** A key that has an arrow is called an arrow key. An arrow key moves the cursor one character at a time on the screen. The four arrow keys are:
   (i) Up arrow key
   (ii) Down arrow key
   (iii) Right arrow key
   (Iv) Left arrow key

   **(B) Page Up Key:** When this is pressed once, the cursor moves one screen page up. If you are reading a text and you want to go back to the immediate last page, you simply press the Page Up Key. The cursor then moves one screen of monitor page up at a time.

   **(C) Page Down Key:** This key is used for moving the cursor one screen page down at a time. For example, if you are reading a text and you do not want to read some lines before going to the next page, simply press the Page Down Key. The cursor instantly moves one screen page down and you see the next screen page.

**(d) Home Key and End Key:** When the home Key is pressed, the cursor moves to the left of the first letter on the line. Pressing the end key makes the cursor to move to the right of the last character on the line.

**6. The space bar:** This is the longest key on the keyboard. When it is pressed, it moves the cursor to the right. This key is used to create space between one word or character and another.

**7. The caps lock key:** This key is used for typing capital letters. If you press the caps lock key once, every letter you type appears in the capital form. When you finish typing the capital letters, you unlock the small letters by pressing again the caps lock key. Then every letter you type appears in small case.

**8. Enter or return key:** When you press this key, it makes the cursor to move to the beginning of a new line. This means that when you want to start typing on a new line, you press the enter or return key. Also pressing this key after giving any instruction to the computer makes the computer to carry out that instruction.

**9. The insert key, delete key and backspace key:** These are called editing keys. They are used for making corrections in what is typed on the computer. The insert key is used to add words or letters to a text. When you press the insert key, the computer creates a space for you to add letters, punctuation marks, arithmetic signs etc. The delete key is used to clean a word or any other character. To delete a word, place the cursor under the word you want to clean and gently press the delete key. The backspace key is used for correcting mistakes on the left of the cursor.

**10. Alternate and Control keys:** These keys are located to the right and left of the space bar. They are special keys for giving commands to the computer. However, the use and meaning of these keys are determined by the software that a person is using at a particular time.

**11. Tab key:** When this key is pressed, it moves the cursor to the next tab stop. It is the key used in creating paragraphs. For example, if your last sentence stops at any point on a particular line (beginning, middle, end, anywhere along the line) and you want the next sentence to start as a paragraph, you press the tab key. This will move the cursor to the next tab stop and that is where the new paragraph starts.

**12. Shift key:** There are two shift keys. One shift key is located to the right and the other one is located to the left of the typewriter area. These positions make it easy for a person to use any of the shift keys. While typing with the right fingers, you press the shift key that is located to the left and you use the one located to the right when working on the left of the typing area. This makes the typing easy. The shift keys are used for changing letters from capital to small letters and from small to capital letters. Also shift keys are used for typing some special characters. This is done by pressing at the same time one shift key and the key of the special character you want to type. Some of these special characters that are typed by pressing the one shift key at the same time that you press the special character are: @ # $ * %.

**MOUSE**

A mouse is a handheld pointing device for computers. It is a small object fitted with one or more buttons and shaped to sit naturally under the hand. It is called mouse primarily because the cord on early models resembled the rodent's tail, and because the motion of the pointer on the screen can be mouse like. The computer mouse is a pointing device which derives its name from its resemblance with the domestic mouse. It has two buttons which can be clicked in order to send commands to the computer. When a mouse is moved across mouse pad or even desk, an electric ball under it causes the cursor to move correspondingly on the screen. Mouse buttons are clicked once or twice to enable the user to quickly select, and send commands to the computer.

A mouse device is a device which converts data from a mouse to a stand form that can be used by any software while a mouse pointer is a symbol which indicates movement of a mouse on the screen.

**Brief History of the mouse**

Mouse was invented by Douglas Engelbart of Stanford Research Institute in 1963 extensive usability testing. It is also called the "Bug", but eventually "bug" was dropped in favour of "mouse". The first mouse was bully, and used two gear wheels perpendicular to each other, the rotation of each wheel was translated into motion along one axis in the plane. Engelbart received patent

US 3541541 on November 17, 1970 for a "X- Y position indicator for a display system."
Later variations on the mouse, invented in the early 1970's by Bill English at Xerox PARC, replaced the external wheels with a single ball which could rotate in any direction. It resembled an inverted trackball, and was the predominant form used with personal computer throughout the 1980s and 1990s.

**Types of Mouse**

- Mechanical mouse
- Optical mouse.
- Optical/mechanical mouse
- Optomechanical mouse
- Laser mouse
- Tactile mouse
- Mini Computer mouse.

**1.The Ball Mouse or Mechanical Mouse:** The ball Mouse uses a ball under it, which rotates along a surface or mouse pad as the mouse is moved back and forth. The rotation of the ball generates signals which are sent into the computer.

**2. The Optical Mouse:** The Optical Mouse does not have a ball. Instead, it uses light to generate the signals for moving the mouse cursor from one object to the other as the mouse is moved back and forth.

**Functions of Mouse**

1. **Clicking:** The mouse controls the movement of the cursor on the screen. The user moves the cursor over on object then presses one of the mouse buttons to make something happen with the mouse. The user can edit, rearrange windows and perform several other operations.
   Clicking is used to pick an object or a location on a screen. If the object is a window, then click brings to the front and may select it to receive characters from the keyboard.

**2. Double Clicking:** The user double-clicks an object by positioning the cursor over it, then quickly pressing and releasing a mouse button twice

in quick succession. The mouse button must be pressed the second time within a short interval of the first or the action will count as two clicks rather than a double-click.

**3. Dragging and Dropping:** Dragging and Dropping is used in moving objects from one place to the other. The user drags by placing the cursor on the object, pressing the left mouse button and moving the mouse while the button is still pressed down.

**Mouse Accessories**

Several accessories are for the mouse. They include:

**1. Mouse Pad:** This is the most popular mouse access available, which is used in most mouse. It provides a surface for mouse to be used on, as desks are not suitable and hard wood or plastic surface makes mouse feet Covers to wear faster.

**2. Mouse feet covers:** These are made out of Teflon and are placed over the mouse feet. This makes mouse glide to have less resistance over the mousing.

**3. Cord Managers:** This is an accessory for managing cord of a mouse, it comes in different forms, but they help manage the cord on corded mice, so it does not get the way. Some of them are known as "mouse bungees. Cordless and wireless of course, need no such accessory, A mouse driver; is a device which converts data from mouse to a standard that can be used by any software. A mouse pointer: is a symbol which indicates movement of a mouse on the screen.

4**. Gel wrist pad:** A gel wrist pad is a soft pad that goes under the wrist to provide padding.

**Mouse structure**

Inside a ball-style computer mouse. Traditional mice have a rubber ball inside them. Open one up and you can see the heavy ball clearly and the spring that keeps it in position. Here's the inside of an old-style Logitech ball mouse:
Components inside a low-cost ball and wheel mouse

- ✓ Switch detects clicks of left mouse button.
- ✓ Switch for middle button.

- ✓ Switch for right button.
- ✓ Old-style connection to PS/2 socket on computer.
- ✓ Chip turns back-and-forth (analog) mouse movements into numeric (digital) signals computer can understand.
- ✓ X-axis wheel turns when you move mouse left and right.
- ✓ Y-axis wheel turns when you move mouse up and down.
- ✓ Heavy rubber wheel.
- ✓ Spring presses rubber ball firmly against X- and Y-axis wheels so they register movements properly.
- ✓ Electrolytic capacitor
- ✓ Resistors.

**Alternative Mouse:**

Apart from the regular mouse that is operated with hand, other mouse variants exist or other types exists. These are meant for the handicapped ones in our midst, those who have wrist injury resulting from excessive mouse usage or to people who feel uncomfortable with traditional mouse designs. Some of these include: Camera, Natural pointer track foot and palm mouse.

1. **Camera mouse:** Where a camera tracks the head movement of the computer user and moves the onscreen cursor.
2. **Natural pointer track:** A deliberately fixed dot on a person's head which moves the cursor accordingly. It is more precise than the camera mouse above.
3. **Palm mouse:** Here the mouse is held in the palm and operated with I only 2 buttons. The movements across the screen corresponds to a feather touch; pressure increases the speed of movement.
4. **Foot mouse:** Is a type of mouse for those who do not wish to use the hand or the head instead foot clicks are used.

**Other input devices**

**Joystick:** Is a device that enables the user to move a picture, word, line or cursor on a screen by moving an upright rod connected to an input/output

port (joystick port) on the computer, Joystick port is a circuit or connector used to interface a joystick with a computer.

**Light pen or pen tablet:** It goes by another name, graphic data pen or graphic light pen. It is a light sensitive pen-shaped device that enables the user to input graphic data or make direct drawing on the screen. For engineers it is Computer Aided Design (CAD) device.

**Punch card:** They are the called IBM cards or Holrieth Cards. They are sets of cards for putting programs into the computer using a keypunch. A key punch resembles typewriter key and it punches one line of a program (one statement) to one card.

**Pen input device:** Is a computer device that enables one to JI!' write directly on the visual display screen with the stylus. It has #.r software that enables it to recognize and analyze human hand writing as it is written on the computer.

**Graphic tablets:** Is a flat table - shaped input device that allows the user to draw a picture or make designs into a computer by drawing on its surface such that the drawing appears instant on the display screen.

**Track ball:** Is common with laptop and note book computers where there is no desk on which to place and move the mouse. Track ball, when moved with a finger, correspondingly moves the cursor on the display screen.

**Scanner:** Is a device which uses photo electronic cells as an image digitizer to quickly pass on printed materials, drawings maps, graphs and photographs or pictures to word processing or desktop system to make them ready for use. Scanners are also used in banking to input customer's signatures and passport photographs into the computer memory for purpose of verification during transactions.
**Digitizer:** Is a device that can be used to copy or trace image, drawings, pictures, signatures and sketches. Digitiser converts analogue signals to

digital ones, e.g. a digital camera turns an image into a digital picture on the screen. It is a powerful device in the hands of engineers and architects.
Web cam: Is a real time camera whose image can be accessed' using the World Wide Web, instant messaging or a Pc, Video calling application, Generally, a digital delivers images to a web server, either continuously or at regular intervals. A Web cam is also the name of a class of video camera device which connects directly to the PC for the purpose of video calling over the internet.

**Card reader:** A memory card reader is a device used for communication with a smart card or a flash memory card. A business card reader is a scanning device used to scan and electronically save business cards. A magnetic card reader is a device used to scan cards containing magnetic data strips. A term used for a device that can read the information from a memory card. A device that is capable of reading and encoding on plastic cards.

**Microphone:** Is an acoustic -to-electric transducer or sensor that converts sound into an electrical signal. 1876, Emile
Berliner invented the first microphone used as a telephone voice transmitter. Microphones are used in many applications such as telephones. tape recorders, karaoke system, hearing aids, motion picture production, live and recorded audio engineering, FRS radios, megaphones, in radio and television broadcasting and in computers for recording voice speech recognition, Most microphones today use electromagnetic Induction (dynamic microphone), capacitance change (condenser microphone), piezo electric generation, or light modulation to produce an electrical voltage signal from mechanical vibration.

**REVIEW QUESTION**

1. Explain a keyboard and a mouse.
2. State the functions of the input devices.
3. Define Input device and state 2 functions of Input device
4. List and explain 4 examples of Input device.

# Chapter Six

# OUTPUT DEVICES

**Specific Objectives**

At the end of this chapter, you should be able to

1. Define output devices
2. List output devices
3. State the features and uses of monitors
4. Types of monitors
5. Explain printer and types of printer
6. Know how printers work.

**INTRODUCTION**

**Definition of output device:** An electronic or electro mechanical equipment connected to a computer and used to transfer data out of a computer in the form of text, graphics, images etc. it is any piece of computer hardware equipment used to communicate the result of data processing carried out by the data processing which in turn carried out by an information processing machine.

**Types of Output Devices**

1. Printer: are output device which produces printed copies (computer printouts) known as hard copy. The printer outs or hard copy are called permanent output in human readable form. Printers are grouped into two major categories in terms of speed of operation viz: low speed and high speed printers.

LOW SPEED PRINTERS include (i) character printers (ii) impact printer (iii) non-impart (iv) thermical (v) electrostatic (vi) ink-jet (vii) dot-matrix (viii) daisy-wheel printer

**Character printers:**

Prints one character at a time as typewriter do. It prints at a low speed of 15-150 characters per second.

**Impact printers**: Prints characters and images on paper via the impact of a printing device which presses or strikes a printing element e.g. print wheel or cylinder, and an inked ribbon/roller against the face of a paper.
**Non-impact printer:** Makes printouts without striking anything such as a wheel or cylinder. It uses specially treated paper which forms characters by thermal (heat) electrostatic or eletro-chemical processes. Some non-impact printers use plain paper and inkjet or xerographic technologies to form an image.
**Thermal printer:** Uses heat and heat sensitive paper to produce character images.
**Electrostatic printer:** uses electrically charged ink particles and electrically charged printer heads that have an opposite charge to produce output.

**Inkjet printers:** Uses electrically charged ink particles in conjunction with an electrical field to make print-outs. As the charged particles of ink pass through the field, they are arranged into characters which are formed when the ink hits the paper: It has a orlntlno speed 200 characters per second or about 200 lines per minute.


**Dot-matrix printers:** It do not make outputs by conventional characters through the selection of faces but by a dot matrix printing element which

consists of short print wires which are struck by a hammer to form a character as a series or matrix. Daisy wheel printers: Are also a low-speed printer which uses a rotating ball or wheel to print characters. It is a type of character printer.

**HIGH SPEED PRINTERS includes**

(i) line printer (ii) page printer (iii) laser and (iv) Xerography Line printer: prints a whole line at a time. It prints at a speed of 3,000 lines. per minute. Examples are chain and drum-type line printers.

Page Printer: Prints an entire page at a time. It prints at a speed exceeding 60,000 lines per minute.

**Laser printer:** is a type of page printer which can print over 60,000 lines per minutes. It uses laser beam technology with an in-built mini computer that controls the printing process. It uses photographic paper in printing laser printer is best for printing but too expensive. It brings out the best quality of printing .

**Xerographic printer:** Uses Xerox copier technology and mircroprosseor intelligence to print up to 4000 lines per minute. It uses plain papers for printing.

**Plotter:** Is a device which can draw graphs, maps sketches, diagrams, architectural and cartographic designs by the use of graphics pen in a computer system. Graphic plotters produce the best graphics even in multicolours.

**2. Monitor/Computer Visual Display Unit**

A computer monitor, technically termed as a visual display unit, can be plainly described as an electronic device that transmits information from the computer onto a screen, thereby acting as an interface and connecting the viewer with the computer. . Sometimes the name "display" is preferred to the word "monitor" as the latter is perceived to be ambiguous alongside the other senses of "monitor" meaning you can see what you type through it. At present, computer monitors are available in a variety of shapes, designs, and colors. However, based on the technology used to make computer monitors, they can be broadly categorized into three types

**Types of Monitor**

- CRT (Cathode Ray Tube)
- LCD (Liquid Crystal Display)
- LED (Light-Emitting Diodes)

**Classifications of a computer monitor**

Low resolution monitor and high resolution monitor.

low Resolution monitors are monitors that display pictures that are sharp and clear to see, they always dim in visualization.

High resolution monitor produces sharp and clear picture for good visualization. Types of Monitor adapter Cards

MGA - Monochrome Graphic Adapter One Colour
CGA - Colour Graphic AdapterFour Colours
EGA - Enhance Graphic AdapterSixteen Colours
VGA - Video Graphic Adaptor 256 colours
SVGA - Super Video Graphic Adapter 256 colours
XGA - Extended graphic array 65,256 colours.

**CRT (Cathode Ray Tube) Monitors**

These monitors employ the CRT technology used most commonly in manufacturing television screens. In this, a stream of intense high-energy

electrons forms images on a fluorescent screen. A cathode ray tube is a vacuum tube containing an electron gun at one end and a fluorescent screen at another end. From this electron gun, a process called thermionic emission generates a strong beam of electrons. These electrons travel through a narrow path within the tube at high speed using various electromagnetic devices and finally strike the phosphor points on the fluorescent screen, thus creating an image.

**Advantages of the Cathode Ray Tube**

1. It has a high dynamic range (up to around 15,000:1), excellent colour, wide gamut and low black level. The colour range of CRTs is unmatched by any display type except
OLED.
2. It can display natively in almost any resolution and refresh rate.
3. It has no input lag.
4. Sub-millisecond response times.
5. Near zero colour, saturation, contrast or brightness distortion.

**Excellent viewing angle.**

6. It is usually much cheaper than LCD plasma screens.

7. It allows the use of light guns/pens.

**Disadvantages of Cathode Ray Tube**

1. It has a large size and weight (a 20-inch unit weighs about 50 1b (23kg).
2. It consumes a lot of power.
3. It generates a considerable amount of heat when running.
4. It can suffer screen burn-in.
5. It produces noticeable flicker at low refresh rates.
6. It is hazardous to repair/services.

**LCD (Liquid Crystal Display) Monitors**

Liquid crystal display, also known as liquid crystal diode, is one of the most advanced technologies available at present. Typically, an LCD monitor consists of a layer of colour or monochrome pixels arranged schematically between a couple of transparent electrodes and two polarizing filters. The optical effect is achieved by polarizing the light in varied amounts and making it pass through the liquid crystal layer.

There are two types of LCD technology available. These include

1. The active matrix or TFT
2. A passive matrix technology.

Among these, TFT technology is more secure and reliable and generates better picture quality. On the other hand, the passive matrix has a slow response time and is slowly becoming outdated.

In recent times, LCD monitors have become increasingly popular with consumers.

**Advantages of using liquid crystal displays**

The following are some of the advantages of liquid crystal display:

1. It is very compact and light.
2. It consumes less power.
3. It has no geometric distortion.
4. Little or no flicker depending on backlight technology.
5. Not affected by screen burn-in.
6. No high voltage or other hazards present during repair/service
7 . More reliable CTRs.

**Disadvantages of liquids crystal displays**

These include the following:

1. The images transmitted by these monitors do not get geometrically distorted and have little flicker.
2. These monitors are very expensive.
3. Image quality is not constant when viewed from different Angles.
4. Also, an LCD monitor's resolution is always constant.
5. Any alterations can result in a reduced performance.

**LED (Light-Emitting Diodes) Monitors**

LED monitors are the latest types of monitors in the market today. Like LCD, it is again a flat panel display making use of light-emitting diodes for back-lightning instead of Cold Cathode Fluorescent (CCFL) back-lightning used in LCDs. Primarily, the display is of LCD only but the back-lightning is done by LEDs.

LED monitors are said to use much less power than CRT and LCD. Thus, they are also considered environmentally friendly. Other core

**The advantages of LED monitors are:**

They produce images with higher contrast

They have less negative environmental impact when disposed

The lifespan and durability of LED monitors is more than CRT or LCD monitors

Because of the technology, the monitor panels can be made very thin

Do not produce much heat while running

**Disadvantages**

- LED monitors are a little more expensive than the former types. There are multiple ways by which LED backlighting is done.
- White-edge LEDs are fixed around the rim of the monitor. It used a special diffusion panel to spread light evenly behind the screen.
- An array of LEDs are placed behind the screen. Their brightness is not controlled individually.

**Plasma Display:** This is an emissive flat panel device display where light is created by phosphors excited by a plasma discharge between two flat panels of glass. This gaseous mixture is inert and entirely non-harmful.

**Digital Projector:** is an electro-optical machine which converts images, and data from a computer or video source to a bright image which is then focused on a distant wall or screen using a lens system.
The projector serves the following purposes
Visualization of data stored in a computer for presentation
Demonstration of program products for a large number of prospective customers. The projector replaces the interactive whiteboard. Watching moving images from a video tape player or digital video disk player.

*Digital projector*

**Speakers and sound cards**
Enables the computer to output sound through speakers connected to the board. It produces output in the form of bound to the user.

**Review Question**

a. State two features of a monitor and explain the Visual display unit.
b. Define the following: Monitor, Printer, speaker and plotter
c. State the differences between Monitor and Printer
d. Stat the full meaning of the following: MGA, CGA, EGA, VGA/ SVGA & XGA
e. List 2 examples of impact and non-impact printers.

# Chapter Seven

# COMPUTER SYSTEM SOFTWARE

**Specific Objectives**

- At the end of this chapter, you should be able to
- Define software
- List types of software
- List different types of system software


System software consists of programs that control the operations of a computer and its devices. System software serves as the interface between a user, the application software, and the computer's hardware.

## INTRODUCTION

Software is a collection of instructions that enable the user to interact with a computer, its hardware, or perform tasks. Without software, computers would be useless. It is a collective name for all programs which the users a use for handling several and voluminous problems and various fields of human endeavours. Software packages are called program, proprietary software or packaged program. hardware is the physical components while software is the non-physical components of a computer system. Software is cream, the Operational Milk or the nervous system of the hardware components.

## TYPES OF SOFTWARE

There are two Types of Software
System software and Application Software

**SYSTEM SOFTWARE:** This is known as Manufacturer Supplied Software in the sense that it is provided by the manufacturer of the

computer system. They are inbuilt in the computer system. They are programs for the control and performance of the computer system (freeman 1975). Systems software comes with the computer system to help in the use of the hardware. One type of system software applied to microcomputers uses (ROM) Read Only Memory in which case the software is built into the hardware on a memory clip. This means the ROM contains instruction that are hardwired and cannot be easily altered. That is, it is permanent. Such permanent instructions are called firmware. The major difference between firmware and software is that firmware cannot be easily changed while software can easily change.

**Importance of system software**

It insulates the application program from the internet details of the computer being used. System software helps to run the computer hardware

**OPERATING SYSTEM**

This is the brain of a computer. It controls every process and everything that happens in the Central Processing Units (CPU). It is an integrated system of programs which supervises operations of the CPU, controls input/output and storage functions of the computer system. It also provides various supply services. This function of the control program in the operating system is performed by what is called SUPERVISOR. The supervisor goes by other names like the executive, the monitor or the controller.

In some operating system, the supervisor handles the functions of resource management and job management. The supervisor directs the operations of the entire computer system by controlling and coordinating the other components of the operating system.

**Examples of Operating System are:**

MS DOS, II. MS WINDOWS SP, VISTA, WIN ME ETC
III. MACINOTSH, IV. UNIX, V. OS/2 (Operating System 2)

**Ms Dos: -** This was developed and first introduced by Microsoft Corporation in 1981. Ms Dos means Disk operating system. There are many upgrades

and versions of Ms Dos. The latest version (Ms Dos) allows the user to use mouse for the pull-down menus. Ms Dos is the standard for IBM personal computers.
GUI-Graphical user Interface

An operating system is conceptually broken into three sets of components a user interface which:
a.Command user interface (GUI) and or a
b. Command line interpreter or "shell" low level system utilities and
c. A kernel, which is the heart of the operating system.
As the name implies, the shell is an outer wrapper to the kernel which in turn talks directly to the hardware and makes the operating system a comfortable platform for the application programs or packages.

**Hardware <> shall <> kernel <> shell <> applications.**
Microsoft Windows: Originated as a graphical layer on top of the older Ms-Dos environment for the IBM DC. Microsoft Corporation released its first windows in 1990; and others in 1995, 1998, 2000, 2007 and 2010 respectively.

The First Windows was an add-on device i.e. operating environment layer over the Ms-Dos there are versions of windows ranging from window 95, 98 window 7. Window is referred to as graphical user interface because the issue commands by using mouse to select and click the graphic image and symbols (icon) which represents the command you wants the computer to carry out by technology design, other versions of windows are more powerful and sophisticated than window 95, 98 and NT. It has multi user capability. This means that many persons can use the same computer at the time it has in built security checks and work capabilities.

**MACINTOSH:** This was introduced by an Apple Computer Company. The software runs only on Macintosh computer. It resembles Ms Window and uses high quality graphical user interface. Macintosh was originally not designed to run Dos application problems but a recent version called Macintosh system 7.5 which use Motorola's power PC chips can read Dos windows (95, 98,2000 and XP) and Os/2

**UNIX:** It has little or no business application but it is common among scientist, engineers researchers and research organizations. It has high network reliability. It can run on various computers. It has both multi-processing and multi-user capabilities. OS/2 (OPERATING SYSTEM 2) Os/2 means operating system 2. It was first designed and developed by IBM and Microsoft companies but the two companies now produce separately. Os/2 has version like window that is (Windows 95, 98, 2000, Win ME, Win XP and Win 7). The latest version of Os/2 is the Os/2 wrap which is designed for powerful Microcomputer. Os/2 has both network and multi-processing capability.

**DATA BASE MANAGEMENT SYSTEMS (DBMS) - i**s data base manager software package. Database means larges or voluminous collection of related data. DBMS is used to set pup, create or structure, and to manage, organism and maintain a data base for the purpose of retrieval of information in an organization. it controls all the use of databases in a computer system of an organization, some database software are FOX- pro and Microsoft Access by Microsoft Company and Borland's paradox which runs on windows operating system. Others are D base III and D base Iv by Borland, and clipper by Microsoft which run on Ms Dos.

**Translators:** Contextually means language or program translators. They are called language processors.

**EXAMPLES OF TRANSLATOR ARE:** Compilers and Interpreter. They translate high level language like PASCAL, COBOL, BASIC FORTRAN PL/I or RPG into a machine or low level languages.

**ASSEMBLY LANGUAGE:** In between machine language and programming language lies the assembler. Assembly languages have the same structure and set command as machine language but they enable a program to use names instead of numbers. It is the second generation language. It uses memory aids inform of symbols, abbreviation or mnemonics to make it easier for the program. This gave rise to further development in programming language.

**A compiler**: Is a language processor or transfer that converts high level language programs known as Sources code into a machine language

program known as object code. Object code can be saved and executed at any time.

**An Interpreter:** Converts a high-level language program at the rate of one statement at time into machine code and runs it at once. It does not produce an object code. BASIC is a typical example of high-level language using interpreter.

**Linux Operating System:** Linux computer operating system using open-source software. Linux is a UNIX like operating system that is available as an alternative to commercial operating such as window, UNIX, or Macintosh. Because Linux is open-source software, user have access to the source code and are allowed to use modify, or redistribute the code. The name LINUX is pronounced LINNUCKS in English. Utility programs are group of miscellaneous programs which perform various housekeeping and file conversion functions. They clear primary storage, load program records the contents or primary storage (memory dumping and convert a file of data from one storage medium to another e. g tape to disk,card to tape; tape to printer and backup commands and that of duplicating files and examples of utility programs: editors and anti-virus but they vary
from computer system.

**EDITOR -** edits on a program by defining the specific storage locations it requires and links together parts of the program with necessary subroutines.

**Anti-virus:-** Automatically cures virus, it is a program designed to eliminate virus, any computer that has anti virus will not contaminate any virus. By implication, when your PC is infected by virus you must buy anti-virus program to cure the system. Application software/packages are pre-written programs that are supplied by the computer manufacturer or computer vendor to solve a particular business or scientific task. -

**Functions Of An Operating System**

- it controls every process and anything that happens to the Central processing unit (CPU)
- it allots to each user enough time in the system
- It simplifies the job of the computer programmer.
- it serves as a software interface between computer system hardware and the application programs of computer users.

Control programs of operating system performs major functions namely:

a. job management, (b) resource management (c) data management.
    a. Job management is the preparation, scheduling and monitoring of work for continuous processing by the computer. -
    b. b. Resource management is 'controlling the use of computer system resources by the other system software and application software programs.
    c. Data management is controlling the input/output of data as well as its location, Storage etc.
6. Another function of the control program in the operating system is performed by what is called super visor. The supervisor goes by other name viz the executive the monitor or the controller, the supervisor directs the operations of the enterer computer system by controlling and coordinating the other components of the operating system.

# *Chapter Eight*
# APPLICATION SOFTWARE

**Specific Objectives**

At the end of this chapter, you should be able to

- Explain application software
- List the criteria for classification of application software
- State two types of application software
- Mention the major categories of application packages
- List packages for specialized area

**INTRODUCTION**

Application Software consists of programs designed to solve specific problems for the user. It is supplied by the computer manufacturer. application Software are computer programs that make it possible to be used (applied) in other human discipline areas and includes programs that users access to carry out work. This should be contracted with system software which is involved in integrating a computer's various capabilities, but does not directly-apply them in the performance of tasks that benefits-the user. The term application refers to both the application software and its implementation. All application programs produced by a user are called user programs. A single application program is called a job.

A job may be divided into smaller units called tasks. Some companies e.g. NNPC, FRSC, MTN, organization, industries and tertiary institutes, Universities, Polytechnics and colleges of education have their own custom-

or tailor-made application software. Examples are their various payroll programs, account payable, account receivable inventory control; billing and sales analysis program.

**Types of Application Packages.**

1. Word processing
2. Spreadsheet
3. Data base
4. Graphics,
5. Presentation
6. Communication.

Word processing is the most common application software.

a. **Word Processing Package:** An application package which allows the user to process document in ways which are more efficient. It enables the user to enter, store, manipulate and print texts. Examples are: Microsoft Word, Word Perfect and Wordstar. The great advantage of word processing over using a typewriter is that you can make changes without retyping the entire documents.

Word processing package is used to create, edit, save, and print documents e.g. personal and business letters, term papers and students project reports, memos, circular for meetings, handbills, flyers to mention but a few. Word processing package unlike the office typewriter makes it possible for user to see the document on the screen so as to make corrections before it is printed out. The user can choose font i.e. type face or character.

Uses of Word Processing Software

(i) It can be used to produce letters, documents, etc.

(ii) It is used to make the task of editing a document easier.

**b. Graphics Software:**

These categories software can be used to draw pictures and create images. Examples are: Paint, CorelDRAW, Harvard graphics.

**Uses of Graphics Software**

(i) It is used to create images and pictures.

(ii) It is used to create animation and charts.

**(C) Spreadsheet Software:** This software is used to present information in the form of tables, charts, graphs. It is also used to perform financial calculations.
Examples are MS-Excel, Lotus 123.Visicalc etc

**Uses of Spreadsheet Software**
(i) It can be used for budgeting.
(ii) It can be used for making time tables.
**(d) Communication Software**: This is used to send and receive messages through computer terminals. Communication Software typically includes software that enables people keep to send fax and e-mail and dial into other computers and browse through the internet.
Examples are Internet Explorer, Outlook and the Navigator.
**Uses of Communication Software**
(i) It is used for sending messages from one computer to the other.
(ii) it allows the user to access many programmes from several locations around the world.

**Software's for Specialized Areas**
**Accounting Software: -** Account (computer), in relation to computers is a record-keeping arrangement used by the vendor of an online service to identify a subscriber and to maintain a record of customer usage for billing purposes. Banks are using accounting packages like, Peachtree accounting, Dac-easy accounting.

**Payroll Programs:** Payroll programs can be used to make quick work of calculating necessary in state and federal detections. Instead of doing such calculation by hand and handling unfortunate errors, the users can allow the program to do the maths. Many payroll software applications can have ' important task season forms, helping companies to make sure their ' employees receive their salaries on time.

**Banking Programs: -** Enables the management, monitoring and control of transactions for financial institutions and banks. 'Private banks and mutual

fund administrators as well as other wealth management firms utilize banking systems applications which provides front office services as well as back office functions such as customer accounting tracking, credit approval, financial account and information system integration.

**Statistical Software: -** A statistical package and a suite of computer program that are specialized for statistical analysis. It enables people to obtain the result of standard procedures and statistically significant tests, without requiring low-level numerical programming.

**Hospital Management Software: -** is a program written to suite and provide a hospital emergency department services that includes recruiting and hiring, medical doctors and nurses, administrative- services, billing staffing, record keeping, scheduling.

**Database Software:** Database is a structured collection of data. A computer database relies on database software to organize data and enable database users to perform database operations. Database software allows users to store and retrieve data from databases. Examples are Oracle, MSAccess.

**Multimedia Software:** They allow users to create and play audio and video files. They are capable of playing media files. Audio converters, audio players, burners, video encoders and decoders are some forms of multimedia software. Examples of this type of software include Real Player and Media Player.

**Presentation Software:** The software that is used to display information in the form of a slide show is known as presentation software. This type of software includes three functions, namely, editing that allows insertion and formatting of text, methods to include graphics in the text and a functionality of executing slide shows. Microsoft PowerPoint is the best example of presentation software.

**Enterprise Software:** It deals with the needs of organization processes and data flow. Customer relationship management or the financial processes in an organization are carried out with the help of enterprise software.

**Information Worker Software:** Individual projects within a department and individual needs of creation and management of information are handled by information worker software. Documentation tools, resource management tools and personal management systems fall under the category of this type of application software.

**Educational Software:** is software for guiding the teachers and students. It has the capabilities of running tests and tracking progress. It also has the capabilities of a collaborative software. It is often used in teaching and self-learning. Dictionaries like Britannica and Encarta, mathematical software like MATLAB and others like Google Earth and NASA World Wind are some of the well-known.

**Simulation Software:** Used to simulate physical or abstract systems, simulation software finds applications in both, research and entertainment. Flight simulators and scientific simulators are examples of simulation software.

**Differences Between Systems and Application Software**

| | SYSTEM SOFTWARE | APPLICATION-SOFTWARE |
|---|---|---|
| 1 | It is in-built in the computer system | Not in built |
| 2 | Wholly and entirely supplied by Computer+ manufacturers | Supplied by computer manufacturers and computer vendors |
| 3 | Programs for control of computer | Program applied to solve a particular users. |
| 4 | Operating system | User application i.e. loaded by individual users |
| 5 | No modification by users | Can be modified by users |
| 6 | Only developed by computer manufacturers | Can be developed by individual users |
| 7 | Development in the hand of manufacturer is less expensive. | Development in the hands of individual users is very |

| | | |
|---|---|---|
| | | expensive, tedious and cumbersome. |
| **8** | Not in constant revision | Constantly revised and updated. |
| **9** | Some examples are: Operating system, database management (DBMS) and translators e.g. compilers and interpreters | Constantly revised and updated. Examples are: word processing graphics, spreadsheet, integrated software, virus software's etc. |

# *Chapter Nine*
# PROGRAMMING LANGUAGE

**Specific Objective:**
At the end of this chapter, students should be able to
1. Know the meaning of programming language
2. List levels of programming language
3. Mention the features of each level
4. Write the examples of programming language

**INTRODUCTION**
Concepts of programming language
As you know, a computer is not a useful device as an entity without a programming force driving its operations.
Generally, a complete a computer system is made up of the following: User, · Hardware
Operating System Software, · Application Software.
programming plays a very essential role in the usefulness of a computer system, forming the interface link between human users and the computer machinery.

Concepts of programming language are an artificial language designed to communicate instructions to a machine, particularly a computer. Programming language can be used to control the behavior of a machine and/or to express algorithms precisely.
The earliest programming languages predate the invention of the computer, and were used to direct the behavior of machines such as Jacquard looms "

and player pianos. Thousands of different programming languages have been created, mainly in the computer field, with many more being created' every year.

Most programming languages describe computation in an imperative style, i.e., as sequence of" commands, although some languages, such as t e that support functional programming or logic programming, use alternative forms of description. A programming language is usually split into the two components of syntax (form) and semantics (meaning): Some languages are defined by a specification document (for example, the C programming language is specified by an ISO Standard), while other languages, such as Perl, have a dominant implementation that is used as a reference.

**COMPUTER PROGRAM**

A program is an ordered sequence of instructions written for the computer to follow so as to produce a desired result. The instruction are stored in the computer's memory. The concept of storage is unique to the computer and it is an outstanding internal feature that differs the computer from other calculating machines. A PROGRAM is a series of step-by-step instructions that provides a solution to a particular problem and directs the computer on what to do exactly. Now, though a program is a set of instructions, but the statements must be submitted to a computer as a unit to direct the computer behaviour. There are generally two major types of programming:

- ✓ System Programming
- ✓ Application Programming

You will now study the features of the above two types of programming.

**System Programming.**

In short, system programs constitute the driving force behind 'tile operations of the Computer System. They are specially designed to facilitate the use of the hardware and to make the Computer System function efficiently and run quickly. During the early days of Computer Systems, human operators monitored computer operations, decided on the order in which submitted programs should be run and made ready the input and output (I/O) devices. Even though the speeds of Central.

Processing Units (CPUs) increased as a result of early electronicrevolution, the speed of human operators behind the operationalprocedures of the computer did not increase. There were therefore time delays and errors by the human operators which constituted most of the problems that led to the development of a Super-Controller program)* handle the problems caused by human-operators. This special program is what we call an OPERATING SYSTEM (OS). See its definition below:

**Operating System**

An Operating System is a collection of system programs that jointly controls the operations of a computer system and its resources.

There are two types Of programs that make up the Operating System:-

- ❖ Control Programs
- ❖ Processing Programs
- ❖ Control Programs

The OS control programs generally oversee the system operations by carrying out tasks such as Input/Output (I/O), scheduling, communicating with the Computer user or programmer and handling interrupts. An interrupt is just a signal sent to the CPU indicating that an event that had occurred.

Processing Programs

The OS processing programs are those that facilitate efficient processing operations by simplifying program preparation and execution for you as a user. The major processing programs existing in the OS are as follows:

- ➢ Language Translators
- ➢ Linkage Editor
- ➢ Library Programs
- ➢ Utility Programs

**Computer Programming Language**

A programming language is a carefully and clearly sequence of words, letters, numerals and abbreviated words used by people to communicate with the

computer. A computer understands only machine language. Example, the language written in Os and 1s such a language is called a program.

Programs are created through programming languages to control the behavior and output of a machine through accurate algorithms, similar to the human communication process.

A programming language is a notation for writing programs, which are specifications of a computation or algorithm.

**Classification of Languages**

Before you see the general classification of programming languages, you will recall the origin of programming languages mentioned under the Introduction. You have been introduced to what is known as the Machine Language which is generally known as the language that the computer understands. With the birth of the Machine Language, two broad categories of languages are as follows:

- Low-Level Language
- High-Level Language
- Low-Level Language

Machine Language is generally called the lowest- level language and it was the first language available to computer programmers. It is very fast since the language needs no translation because its instructions are made up of zeros and ones (O's and I 's). Thus Machine Language is merely data to the computer and the program can modify itself during execution.

The advantages of Machine Language (ML) can be summarised as follows:

Fast execution speed, Storage Saving·

Programmer's full control of the Computer and its capabilities

However, ML has some disadvantages as follows:

- Difficult to learn
- Highly prone to errors

- ❖ Totally machine-dependent — this means that programs written in ML will only execute on the specific machine they were written.

You have been informed that ML is the lowest-level language. Hence itis the most efficient language and it is good for you to know that every computer responds only to its machine language. The next in the hierarchy of languages that is closer to the Machine Language is the Assembly Language (AL). Assembly Language was developed in the early 1950s to alleviate some of the difficulties associated with the Machine Language. Symbolic names or mnemonics were used to replace the binary code of the Machine Language. Remember that a mnemonic means a memory aid. Hence AL instructions are easier to remember than the O's and I 's of the ML instructions.

**Below are the advantages of the AL:**

- ➢ It is efficient in processing time and in the use of memory space.
- ➢ It encourages Modular Programming, where programs are brokeninto modules.
- ➢ It provides an error listing which is useful in debugging.
- ➢ Since it is very close to machine language, it is also fast.
- ➢ Just as you have seen the disadvantages of Machine Language, the Assembly Language also has its disadvantages. Some of these are statedbelow:
- ➢ It is cumbersome in usage.
- ➢ Assembly Language has one-to-one-relationship with machinelanguage, meaning that one Assembly Language instruction istranslated into one Machine Language instruction. This processleads to long program preparation time.
- ➢ Assembly Language is machine-dependent like the MachineLanguage.

**SELF ASSESSMENT EXERCISE 1**

State the problem associated with machine dependency of ML, and AL.

Now, remember that under introduction to this unit, it was stated that languages can be broadly categorised into two as Low-Level and High-Level languages. However, there are various ways of categorizing computer

programming languages. One way of doing this is to classify them by the following:

- ✓ Level
- ✓ Purpose
- ✓ Orientation
- ✓ Structure
- ✓ Translation Method

**Level Classification**
You have already seen this above as low- level and high- level languages.

- ❖ Classification by Purpose
- ❖ General-Purpose Languages
- ❖ Special-Purpose Languages

A general-purpose language is one that can be used to solve a variety of problem types. From what you have learnt already about low- level language, it means that the lower the level, the more general purpose the language.
A special-purpose language is one that can be used for specific types of problems, such as a language called WPL (Word Processing Language) developed by Apple for word processing.

**Orientation Classification**
**In this classification, you have the following:**

- ❖ Procedure — Oriented Languages
- ❖ Problem — Oriented Languages

In using A procedure-oriented language, you have to specify how tosolve a problem by indicating the procedures the computer will followstep by step. However, in a problem-oriented language, you simplyspecify what to obtain

as your results while the development of the vprocedures is left to the language.

**Translation Method Classification**

Among all the Computer programming languages, only the machinelanguage is in machine-executable form. All other languages must betranslated into O's and l 's, the only things understood by the computer.

**Now, translators take the forms of the following:**

- Interpreter
- Compiler
- Assembler
- Interpreter

Some languages are interpreted by converting the "source program"into machine language as the program is being executed. Interpreterstranslate code line-by- line which therefore makes them run slowly thanother translators. For example, sonic BASIC language versions onlyinterpret programs instead of compiling them. However, in Turbo Basic,KBASIC or BASIC 4GL you can compile the BASIC source code into
an executable code.

**Compiler**

Unlike an Interpreter, a Compiler translates an entire program intomachine language before the execution of the program. A Compilerusually translates the SOURCE program into another program calledthe OBJECT program which is the machine language version of thesource code. With the object program created by your compiler, youwill never use the source program again except when you want tomodify it. Generally, a compiled program runs faster than an interpretedprogram.

**Assembler**

You have already been introduced to the Assembly Language which isneither compiled nor interpreted. For the language, it is simplyassembled. Since the

assembly language is already close to the machinelanguage, assembling a program is therefore less time-consuming thancompilation.
Before you proceed to the next section on High-Level Languages, it isworth noting that advancement in computer programming languageshas added a new classification of languages, called Very High LevelLanguages (VHLL's) or what are usually referred to as the 4$^{th}$Generation Languages (4GL's).

**Below are the basic characteristic layers of a simple 4GL:**

- ❖ Database
- ❖ Data Communication
- ❖ Data Processing
- ❖ End User Facilities (EUF)

From the above, database languages such as FoxPro, Dbase and FoxBASE are 4GL's. A language such as Visual Basic which equally has database capabilities can also be classified as a 4GL from the above characteristics.
Now, you will be introduced to the High- Level Languages in the following section.

### 3.2 High Level Languages

In the previous section, you have learnt about the Low-Level language which is fundamentally machine-dependent. In contrast to machine dependence of low- level language, High-Level Languages (HLL's) are machine-independent.

**High-Level Languages are either**

- ✓ Procedure-Oriented, or
- ✓ Problem-oriented

Two classes of languages were mentioned under orientation classification of languages in the last section. High- Level Languages can further be classified again as follows, remembering that there are many ways of classifying computer programming languages:

- ❖ Scientific-Oriented Languages

- Business-Oriented Languages
- Multi-Purpose Languages
- Education-Oriented languages
- Natural Languages

It is good for you to know that a language can have any of the above characteristics with one of the two earlier features, that is, problem-oriented or procedure-oriented feature. This should not confuse you.

Now, it is time to introduce you to some common high- level languages. Detailed features of some of these languages will be treated in other units in this course.

**FORTRAN**

You are starting with Fortran because it is generally referred to as the first high- level language. The name is the short for "Formula Translator. Fortran is a scientific-oriented and problem-oriented language. Since early computer users were scientists and engineers, it was not therefore surprising that the first high- level language was designed to solve scientific problems. The language was developed by an IBM (International Business Machines) group led by John Backus in1957, though its first appearance was in 1956 according to some authors.

**There have been various versions of the language as follows:**

- Fortran II in 1959
- Fortran IV in 1966
- Fortran 77 in 1977
- Fortran 90/95 — the latest version.

**BASIC**

This is the acronym for "Beginner's All-purpose Symbolic Instruction Code and it is the most popular programming language. It is an Education-oriented language developed in 1965 for use by Colleges and Universities for instructional purposes. It is also a general-purpose and procedure-oriented language. BASIC can be interpreted and also compiled. You will learn more about BASIC in this course. Today, we have a number of BASIC language

versions which you can use to develop beautifully designed software packages.

**PASCAL**

Pascal language was designed in 1971 like BASIC as a teaching language. The language was named after Blaise Pascal who was a French Mathematician and Philosopher and the inventor of the first mechanical adding machine. You are going to learn about the fundamentals of the language in unit 12 of this course.

**C or C++**

The C language was developed as an improvement of the earlier versions, A and B which were developed by Bell Laboratories. Clanguage was developed in conjunction with the UNIX operating system; in fact, it is the language of the Unix operating system. The language is lower in level than a language like Pascal but higher than assembly language. Presently, we have the C++ and Visual C++languages which are the later versions of the original C language.

A good number of big organizations today prefer C++ programmers for their in-house software development because of the essential features of C++ which are absent in other languages ou will also be introduced to the basic features of C/C++ language in this course. A good knowledge of C++ will help you to understand Java language easily which is an essential language in Web publishing.

**COBOL**

COBOL stands for "Common Business Oriented Language" and was developed in 1960 as a language suitable for business applications. Except for some big organization which are unwilling to rewrite their programs using one of the modern languages, COBOL is almost totally abandoned by programmers today.

There are a number of other high-level languages that you may ha ye no cause to study today because of the new trend in programming. Some of these are listed below: ADA - named after Augusta Ada Byron, the 1st Computer programmer. It was developed in 1983 by U.S Defense Department.

- ✓ APL - A Programming Language, developed between 1962 and 1968.
- ✓ PL/1 - Programming Language 1, developed in 1964.
- ✓ LOGO - developed in 1966.
- ✓ RPG - Report Program Generator, developed in the 1970's.
- ✓ LISP - Short for LIST Processor, developed in 1960 as a Special — purpose language designed to manipulate nonnumeric data.

Though you will not be introduced to the essential programming languages in this course until later in your academic programme, however, there are some vital programming languages you will need to study as a programmer. Examples of these are:

- ❖ HTML - Hypertext Markup Language
- ❖ Java - an object-oriented language
- ❖ SQL - Structured Query Language

**CONCLUSION**

In this chapter, you have been introduced to the general classification of computer programming languages, namely, low- level and high-level languages. The two low-level languages are the machine language and the assembly language, the former being the lowest.

The machine language, as you have learnt in this unit is the onlylanguage understood by the Computer and all other languages have to be translated into the language for the Computer to execute their instructions.

**HIGH-LEVEL LANGUAGE**

A high-level language is a programming language whose entries are closer to the user than the machine. High level programming are English-like language which are understood by human beings. They are designed to be closer to human languages and are easier to use.

- A high level language has the following features
- Easier to write
- Easier to read
- Easier to maintain
- Portable : can work across different CPU families
- Supports a wide range of data types

High level languages have been around for more than 60 years and by now there are dozens of them. Some popular ones include BASIC, C++, C, FORTRAN, Pascal Examples are:

(a) BASIC: Beginners All-purpose Symbolic Instruction Code
(b) FORTRAN: Formular Translator.
(c) COBOL: Common Business Oriented Language.
(d) PASCAL: Pascal Language
(e) ALGOL: Algorithmic Language

**LOW-LEVEL LANGUAGE**

This is a programming language specific to a particular computer and is very close to the machine code. It is called A low-level programming language because it is closely tied to the machine architecture. As a result, it isn't very portable. A program written for an Intel chip will not run on a Sparc-chip because the instruction set is very different. Examples are:

(a) Assembly language
(b) Machine language

1. Assembly Language: This is a low-level language that was abbreviated called Mnemonic or Words instead of machine code. The Mnemonic make it easier to remember and interpret operation codes than those written in binary.
2. Machine Language: This is a computer language expressed in binary notation. It is already in computer executable form and hence needs no translation.

**STAGES IN DEVELOPING COMPUTER PROGRAMS**

In solving any problem on a computer, we must have an idea of the type of problem we are to solve. We must have a good understanding of the type of computer system that is available for solving the problem.

**Stage I: Defining the Problem**
The problem is properly defined and efforts are made to understand all that is involved in solving the problem. There are experts who do this well. They are called System Analysts. They break such a problem into small sections and sometimes programmers handle such sections.

**Stage 2: Listing of Steps**
At this stage, a step-by-step procedure of solving the problems is written out. It is usually in English and some few mathematical notations.

**Stage 3: Symbolic Representation**
This is the step-by-step representation of all that is expected in pictorial forms called flow chart. Flow charting involves the documentation, in symbolic form of the processing steps involved in the program.

**Stage 4: Writing the Instruction**
This involves writing out the set of instruction one after the other in an appropriate computer language for the computer to follow. The programmer uses the flow chart, decision tables and other charts as guides to write the program.

**Stage 5: Preparing data for input**
Data are required for a program to be processed for a desired result. To make such data ready for the program, the following steps have to be taken:
(a) Collecting the data.
(b) Analyzing the data.
(c) Coding the data.
(D) Preparing and entering the data.

**Stage 6: Running the program**
Here, the instructions are fed into the computer and usually tested by simple data to test various sections of the program. The program can be tested with available programs to compare information.

**Stage 7: Documenting the program**
Here, a report is prepared showing the input processing and output. Some of these can be imbedded inside the program. Usually, this stage consists of putting together all information used in the program and this is kept in a program manual.

**Stage 8: Maintenance**
Programming maintenance is the process of updating a previously written program for current use. There are some programs which were written some years ago, which can be updated, and corrected for present day use.

# Chapter Ten
# BASIC PROGRAMMING LANGUAGE

**Specific Objective:**
At the end of this chapter, students should be able to
1. Know the meaning of programming language
2. List levels of programming language
3. Mention the features of each level
4. Write the examples of programming language

**INTRODUCTION**
Concepts of programming language
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Operating System Software, · Application Software.
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been created, mainly in the computer field, with many more being created' every year.

Most programming languages describe computation in an imperative style, i.e., as sequence of" commands, although some languages, such as t e that support functional programming or logic programming, use alternative forms of description.

A programming language is usually split into the two components of syntax (form) and semantics (meaning): Some languages are defined by a specification document (for example, the C programming language is specified by an ISO Standard), while other languages, such as Perl, have a dominant implementation that is used as a reference.

**COMPUTER PROGRAM**

A program is an ordered sequence of instructions written for the computer to follow so as to produce a desired result. The instruction are stored in the computer's memory. The concept of storage is unique to the computer and it is an outstanding internal feature that differs the computer from other calculating machines.

A PROGRAM is a series of step-by-step instructions that provides a solution to a particular problem and directs the computer on what to do exactly. Now, though a program is a set of instructions, but the statements must be submitted to a computer as a unit to direct the computer behaviour. There are generally two major types of programming:

- ✓ System Programming
- ✓ Application Programming

You will now study the features of the above two types of programming.

**System Programming.**

In short, system programs constitute the driving force behind 'tile operations of the Computer System. They are specially designed to facilitate the use of the hardware and to make the Computer System function efficiently and run quickly.

During the early days of Computer Systems, human operators monitored computer operations, decided on the order in which submitted programs should be run and made ready the input and output (I/O) devices. Even though the speeds of Central.
Processing Units (CPUs) increased as a result of early electronicrevolution, the speed of human operators behind the operationalprocedures of the computer did not increase. There were therefore time delays and errors by the human operators which constituted most of the problems that led to the development of a Super-Controller program)* handle the problems caused by human-operators. This special program is what we call an OPERATING SYSTEM (OS). See its definition below:

**Operating System**
An Operating System is a collection of system programs that jointly controls the operations of a computer system and its resources.
There are two types Of programs that make up the Operating System:-

- Control Programs
- Processing Programs
- Control Programs

The OS control programs generally oversee the system operations by carrying out tasks such as Input/Output (I/O), scheduling, communicating with the Computer user or programmer and handling interrupts. An interrupt is just a signal sent to the CPU indicating that an event that had occurred.
Processing Programs
The OS processing programs are those that facilitate efficient processing operations by simplifying program preparation and execution for you as a user. The major processing programs existing in the OS are as follows:

- Language Translators
- Linkage Editor
- Library Programs
- Utility Programs

**COMPUTER PROGRAMMING LANGUAGE**

A programming language is a carefully and clearly sequence of words, letters, numerals and abbreviated words used by people to communicate with the computer. A computer understands only machine language. Example, the language written in Os and 1s such a language is called a program.

Programs are created through programming languages to control the behavior and output of a machine through accurate algorithms, similar to the human communication process.

A programming language is a notation for writing programs, which are specifications of a computation or algorithm.

**Classification of Languages**

Before you see the general classification of programming languages, you will recall the origin of programming languages mentioned under the Introduction. You have been introduced to what is known as the Machine Language which is generally known as the language that the computer understands. With the birth of the Machine Language, two broad categories of languages are as follows:

- Low-Level Language
- High-Level Language
- Low-Level Language

Machine Language is generally called the lowest- level language and it was the first language available to computer programmers. It is very fast since the language needs no translation because its instructions are made up of zeros and ones (O's and I 's). Thus Machine Language is merely data to the computer and the program can modify itself during execution.

The advantages of Machine Language (ML) can be summarised as follows:

Fast execution speed, Storage Saving·

Programmer's full control of the Computer and its capabilities

However, ML has some disadvantages as follows:

- Difficult to learn

- ❖ Highly prone to errors
- ❖ Totally machine-dependent — this means that programs written in ML will only execute on the specific machine they were written.

You have been informed that ML is the lowest-level language. Hence itis the most efficient language and it is good for you to know that every computer responds only to its machine language. The next in the hierarchy of languages that is closer to the Machine Language is the Assembly Language (AL). Assembly Language was developed in the early 1950s to alleviate some of the difficulties associated with the Machine Language. Symbolic names or mnemonics were used to replace the binary code of the Machine Language. Remember that a mnemonic means a memory aid. Hence AL instructions are easier to remember than the O's and I 's of the ML instructions.

**Below are the advantages of the AL:**

- ➢ It is efficient in processing time and in the use of memory space.
- ➢ It encourages Modular Programming, where programs are brokeninto modules.
- ➢ It provides an error listing which is useful in debugging.
- ➢ Since it is very close to machine language, it is also fast.
- ➢ Just as you have seen the disadvantages of Machine Language, the Assembly Language also has its disadvantages. Some of these are statedbelow:
- ➢ It is cumbersome in usage.
- ➢ Assembly Language has one-to-one-relationship with machinelanguage, meaning that one Assembly Language instruction istranslated into one Machine Language instruction. This processleads to long program preparation time.
- ➢ Assembly Language is machine-dependent like the MachineLanguage.

**SELF ASSESSMENT EXERCISE 1**

State the problem associated with machine dependency of ML, and AL.

Now, remember that under introduction to this unit, it was stated that languages can be broadly categorised into two as Low-Level and High-Level languages. However, there are various ways of categorizing computer

programming languages. One way of doing this is to classify them by the following:

- ✓ Level
- ✓ Purpose
- ✓ Orientation
- ✓ Structure
- ✓ Translation Method

**Level Classification**

You have already seen this above as low- level and high- level languages.

- ❖ Classification by Purpose
- ❖ General-Purpose Languages
- ❖ Special-Purpose Languages

A general-purpose language is one that can be used to solve a variety of problem types. From what you have learnt already about low- level language, it means that the lower the level, the more general purpose the language.

A special-purpose language is one that can be used for specific types of problems, such as a language called WPL (Word Processing Language) developed by Apple for word processing.

**Orientation Classification**

**In this classification, you have the following:**

- ❖ Procedure — Oriented Languages
- ❖ Problem — Oriented Languages

In using A procedure-oriented language, you have to specify how tosolve a problem by indicating the procedures the computer will followstep by step. However, in a problem-oriented language, you simplyspecify what to obtain as your results while the development of the vprocedures is left to the language.

**Translation Method Classification**

Among all the Computer programming languages, only the machinelanguage is in machine-executable form. All other languages must betranslated into O's and l 's, the only things understood by the computer.

**Now, translators take the forms of the following:**

- Interpreter
- Compiler
- Assembler
- Interpreter

Some languages are interpreted by converting the "source program"into machine language as the program is being executed. Interpreterstranslate code line-by- line which therefore makes them run slowly thanother translators. For example, sonic BASIC language versions onlyinterpret programs instead of compiling them. However, in Turbo Basic,KBASIC or BASIC 4GL you can compile the BASIC source code into
an executable code.

**Compiler**

Unlike an Interpreter, a Compiler translates an entire program intomachine language before the execution of the program. A Compilerusually translates the SOURCE program into another program calledthe OBJECT program which is the machine language version of thesource code. With the object program created by your compiler, youwill never use the source program again except when you want tomodify it. Generally, a compiled program runs faster than an interpretedprogram.

**Assembler**

You have already been introduced to the Assembly Language which isneither compiled nor interpreted. For the language, it is simplyassembled. Since the assembly language is already close to the machinelanguage, assembling a program is therefore less time-consuming thancompilation.

Before you proceed to the next section on High-Level Languages, it isworth noting that advancement in computer programming languageshas added a new classification of languages, called Very High LevelLanguages (VHLL's) or what are usually referred to as the 4$^{th}$Generation Languages (4GL's).

**Below are the basic characteristic layers of a simple 4GL:**

- ❖ Database
- ❖ Data Communication
- ❖ Data Processing
- ❖ End User Facilities (EUF)

From the above, database languages such as FoxPro, Dbase and FoxBASE are 4GL's. A language such as Visual Basic which equally has database capabilities can also be classified as a 4GL from the above characteristics.
Now, you will be introduced to the High- Level Languages in the following section.

### 3.2 High Level Languages

In the previous section, you have learnt about the Low-Level language which is fundamentally machine-dependent. In contrast to machine dependence of low- level language, High-Level Languages (HLL's) are machine-independent.

**High-Level Languages are either**

- ✓ Procedure-Oriented, or
- ✓ Problem-oriented

Two classes of languages were mentioned under orientation classification of languages in the last section. High- Level Languages can further be classified again as follows, remembering that there are many ways of classifying computer programming languages:

- ❖ Scientific-Oriented Languages
- ❖ Business-Oriented Languages
- ❖ Multi-Purpose Languages
- ❖ Education-Oriented languages
- ❖ Natural Languages

It is good for you to know that a language can have any of the above characteristics with one of the two earlier features, that is, problem-oriented or procedure-oriented feature. This should not confuse you.

Now, it is time to introduce you to some common high- level languages. Detailed features of some of these languages will be treated in other units in this course.

**FORTRAN**

You are starting with Fortran because it is generally referred to as the first high- level language. The name is the short for "Formula Translator. Fortran is a scientific-oriented and problem-oriented language. Since early computer users were scientists and engineers, it was not therefore surprising that the first high- level language was designed to solve scientific problems. The language was developed by an IBM (International Business Machines) group led by John Backus in1957, though its first appearance was in 1956 according to some authors.

**There have been various versions of the language as follows:**

- Fortran II in 1959
- Fortran IV in 1966
- Fortran 77 in 1977
- Fortran 90/95 — the latest version.

**BASIC**

This is the acronym for "Beginner's All-purpose Symbolic Instruction Code and it is the most popular programming language. It is an Education-oriented language developed in 1965 for use by Colleges and Universities for instructional purposes. It is also a general-purpose and procedure-oriented language. BASIC can be interpreted and also compiled. You will learn more about BASIC in this course. Today, we have a number of BASIC language versions which you can use to develop beautifully designed software packages.

**PASCAL**

Pascal language was designed in 1971 like BASIC as a teaching language. The language was named after Blaise Pascal who was a French Mathematician and Philosopher and the inventor of the first mechanical

adding machine. You are going to learn about the fundamentals of the language in unit 12 of this course.

**C or C++**

The C language was developed as an improvement of the earlier versions, A and B which were developed by Bell Laboratories. Clanguage was developed in conjunction with the UNIX operating system; in fact, it is the language of the Unix operating system. The language is lower in level than a language like Pascal but higher than assembly language. Presently, we have the C++ and Visual C++languages which are the later versions of the original C language.

A good number of big organizations today prefer C++ programmers for their in-house software development because of the essential features of C++ which are absent in other languages ou will also be introduced to the basic features of C/C++ language in this course. A good knowledge of C++ will help you to understand Java language easily which is an essential language in Web publishing.

**COBOL**

COBOL stands for "Common Business Oriented Language" and was developed in 1960 as a language suitable for business applications. Except for some big organization which are unwilling to rewrite their programs using one of the modern languages, COBOL is almost totally abandoned by programmers today.

There are a number of other high-level languages that you may ha ye no cause to study today because of the new trend in programming. Some of these are listed below: ADA - named after Augusta Ada Byron, the 1st Computer programmer. It was developed in 1983 by U.S Defense Department.

- ✓ APL - A Programming Language, developed between 1962 and 1968.

- ✓ PL/1 - Programming Language 1, developed in 1964.
- ✓ LOGO - developed in 1966.
- ✓ RPG - Report Program Generator, developed in the 1970's.
- ✓ LISP - Short for LIST Processor, developed in 1960 as a Special — purpose language designed to manipulate nonnumeric data.

Though you will not be introduced to the essential programming languages in this course until later in your academic programme, however, there are some vital programming languages you will need to study as a programmer. Examples of these are:

- ❖ HTML - Hypertext Markup Language
- ❖ Java - an object-oriented language
- ❖ SQL - Structured Query Language

**CONCLUSION**

In this chapter, you have been introduced to the general classification of computer programming languages, namely, low- level and high-level languages. The two low-level languages are the machine language and the assembly language, the former being the lowest.

The machine language, as you have learnt in this unit is the onlylanguage understood by the Computer and all other languages have to be translated into the language for the Computer to execute their instructions.

**HIGH-LEVEL LANGUAGE**

A high-level language is a programming language whose entries are closer to the user than the machine. High level programming are English-like language which are understood by human beings. They are designed to be closer to human languages and are easier to use.

- A high level language has the following features
- Easier to write
- Easier to read
- Easier to maintain
- Portable : can work across different CPU families
- Supports a wide range of data types

High level languages have been around for more than 60 years and by now there are dozens of them. Some popular ones include BASIC, C++, C, FORTRAN, Pascal Examples are:

(a) BASIC: Beginners All-purpose Symbolic Instruction Code
(b) FORTRAN: Formular Translator.
(c) COBOL: Common Business Oriented Language.
(d) PASCAL: Pascal Language
(e) ALGOL: Algorithmic Language

**LOW-LEVEL LANGUAGE**

This is a programming language specific to a particular computer and is very close to the machine code. It is called A low-level programming language because it is closely tied to the machine architecture. As a result, it isn't very portable. A program written for an Intel chip will not run on a Sparc-chip because the instruction set is very different. Examples are:

(a) Assembly language
(b) Machine language

1. Assembly Language: This is a low-level language that was abbreviated called Mnemonic or Words instead of machine code. The Mnemonic make it easier to remember and interpret operation codes than those written in binary.
2. Machine Language: This is a computer language expressed in binary notation. It is already in computer executable form and hence needs no translation.

**STAGES IN DEVELOPING COMPUTER PROGRAMS**

In solving any problem on a computer, we must have an idea of the type of problem we are to solve. We must have a good understanding of the type of computer system that is available for solving the problem.

**Stage I:Defining the Problem**

The problem is properly defined and efforts are made to understand all that is involved in solving the problem. There are experts who do this well. They

are called System Analysts. They break such a problem into small sections and sometimes programmers handle such sections.

**Stage 2:Listing of Steps**
At this stage, a step-by-step procedure of solving the problems is written out. It is usually in English and some few mathematical notations.

**Stage 3:Symbolic Representation**
This is the step-by-step representation of all that is expected in pictorial forms called flow chart. Flow charting involves the documentation, in symbolic form of the processing steps involved in the program.

**Stage 4:Writing the Instruction**
This involves writing out the set of instruction one after the other in an appropriate computer language for the computer to follow. The programmer uses the flow chart, decision tables and other charts as guides to write the program.

**Stage 5: Preparing data for input**
Data are required for a program to be processed for a desired result. To make such data ready for the program, the following steps have to be taken:

(a) Collecting the data.
(b) Analyzing the data.
(c) Coding the data.
(D) Preparing and entering the data.

**Stage 6: Running the program**
Here, the instructions are fed into the computer and usually tested by simple data to test various sections of the program. The program can be tested with available programs to compare information.

**Stage 7: Documenting the program**
Here, a report is prepared showing the input processing and output. Some of these can be imbedded inside the program. Usually, this stage consists of putting together all information used in the program and this is kept in a program manual.

**Stage 8: Maintenance**

Programming maintenance is the process of updating a previously written program for current use. There are some programs which were written some years ago, which can be updated, and corrected for present day use.

# *Chapter Eleven*
# COMMUNICATION SYSTEM

**Specific Objectives:**

- ✓ At the end of this chapter, you should be able to:
- ✓ Know the meaning of communication system
- ✓ State the full meaning of ICT
- ✓ State types of ICT
- ✓ Write the meaning and types of broadcasting
- ✓ Explain telecommunications and types of telecommunication
- ✓ State the meaning and types of data network.
- ✓ State the meaning and types of information system.

**INTRODUCTION**

'ICTs stand for information and communication Technology: is defined, as a "diverse set of technological tool and resources used to communicate, and to create, disseminate, store and manage information. These technologies includes computer and the internet, broadcasting technologies (radio and television) and telephony.

Communication systems are the various processes, both formal and informal, by which information is passed between one person to another within an organization like school, company, or between the business itself and outsiders. Communication—whether written, verbal, nonverbal, visual, or electronic—has a significant impact on the way business is conducted. The basic process of communication begins when a fact or idea is observed by one person. That person (the sender) may decide to translate the observation into a message, and then transmit the message through some communication medium to another person (the receiver). The receiver then must interpret the message and provide feedback to the sender indicating that the message has been understood and appropriate action taken.

Seven major elements of communication process are: (1) sender (2) ideas (3) encoding (4) communication channel (5) receiver (6) decoding and (7) feedback.

Communication may be defined as a process concerning exchange of facts or ideas between persons holding different positions in an organization to achieve mutual harmony. The communication process is dynamic in nature rather than a static phenomenon.

Communication process as such must be considered a continuous and dynamic inter-action, both affecting and being affected by many variables.

(1) Sender: The person who intends to convey the message with the intention of passing information and ideas to others is known as sender or communicator.

(2) Ideas: This is the subject matter of the communication. This may be an opinion, attitude, feelings, views, orders, or suggestions.

(3) Encoding: Since the subject matter of communication is theoretical and intangible, its further passing requires use of certain symbols such as words, actions or pictures etc. Conversion of subject matter into these symbols is the process of encoding.

(4) Communication Channel: The person who is interested in communicating has to choose the channel for sending the required information, ideas etc. This information is transmitted to the receiver through certain channels which may be either formal or informal.

(5) Receiver: Receiver is the person who receives the message or for whom the message is meant for. It is the receiver who tries to understand the message in the best possible manner in achieving the desired objectives.

(6) Decoding: The person who receives the message or symbol from the communicator tries to convert the same in such a way so that he may extract its meaning to his complete understanding.

(7) Feedback: Feedback is the process of ensuring that the receiver has received the message and understood in the same sense as sender meant it.

Communication system: is a collection of individual communications networks, transmission systems, relay stations, tributary stations, and data

terminal equipment (DTE) usually capable of interconnection and inter-operation to form an integrated whole.
**Inter- Com:**(Inter Communication System) is a Communication system linking different rooms within a building or ship etc.

**P A System (Public Address System): -** is an electronic amplification system include used as a communication system in public areas.

**Radio.** Wireless is a communication system based on broadcasting electromagnetic waves.
**Radio Link:** it Link - a two-way radio communication system (usually microwave); part of a more extensive telecommunication network System Instrumentality that combines interrelated interacting artifacts designed to work as a coherent entity.
Telecommunication system: is a communication that contacts someone at a distance. Telecommunications, or telecom, is the transmission of signals over long distances. It began with the invention of the telegraph in 1837, followed by the telephone in 1876. Radio broadcasts began the late 1800s and the first television broadcasts started in the early 1900s. Today, popular forms of telecommunications include the Internet and cellular phone networks.

Early telecommunications transmissions used analog signals, which were transferred over copper wires. Today, telephone and cable companies still use these same lines, though most transmissions are now digital. For this reason, most new telecommunications wiring is done with cables that are optimized for digital communication, such as fiber optic cables and digital phone lines.

Since both analog and digital communications are based on electrical signals, transmitted data is received almost instantaneously, regardless of the distance. This allows people to quickly communicate with others across the street or across the globe. So whether you're watching TV, sending an email to a costudent, or talking on the phone with a friend, you can thank telecommunications for making it possible.

Phone System or Telephone System - a communication system that transmits sound between distant points.

Therefore, communication system facilities consist of the physical plant: and equipment for disseminating information. Communication Equipment includes the following:

1 Booster amplifier,
2 Booster station
3 Relay link
4 Relay station
5 Relay transmitter,
6 Booster.

Communication Satellite - is an artificial satellite that signals back to earth: moves in a geostationary orbit. Facility Installation is a building or place that provides a particular industry e.g. Generator is an enormous facility. Fiber Optic Transmission system FOTS - is a communication system using fibre optics cables. Network (broadcasting) a communication system which consist of a broadcasting stations that transmit the same program In telecommunication, a communication system is a collection of different communication networks, transmission systems, relay stations, tributary stations, and data terminal equipment (OTE) usually cable of Interconnection and inter-operation to form an integrated whole. The component of a communication system serve a common purpose, are technically compatible, use common procedures, respond to controls and operate in unison

**BROADCASTING**

Broadcasting is a distribution of audio and video content to a dispersed audience through radio, television or other, often digital transmission media. Broadcasting is a term that refers to a form of communication that distributes contents such as video and audio to receiving audience. Broadcasting forms a very large segment of the Mass Media. Broadcasting to a very narrow range of audience is called narrow casting. In general, to broadcast (verb) is to cast or throw forth something in all directions at the same time. A radio or television broadcast (noun) is a program that is transmitted over airwaves for public reception by anyone with a receiver tuned to the right signal channel. Therefore, Broadcasting is sending entertainment and information via mass electronic media to the general public.

Therefore, it is the practice of creating audio and video program content and distributing it to the mass audiences of radio, television and Internet media. To broadcast is to send entertainment and information via one-way electronic media to the general public.

**Some broadcast terms**

**Antenna:** a metal conductor through which radio waves are sent or received.

**Broadcast:** a program of entertainment and information sent via one-way electronic media to the general public.

Broadcasts usually are intended for recreation, enlightenment, education, experimentation or emergency messaging. Broadcasters are the professionals working in the various electronic mass.

Broadcasting: the practice of creating audio and video program content and distributing it to the mass audiences of radio, television and Web media.

Interpersonal communication: one-on-one or face-to-face communication among people.

Mass communication: one-way communication to a public via a mass medium such as newspaper, magazine, book, radio, television, the Web, etc.

Mass media: systems and devices such as newspaper, magazine, book, broadcasting radio, television or the Web, for sending one-way communication to a public.

**Medium/media:** an intermediate device such as newspaper, magazine, telephone-be book, radio, television or the Web, for carrying one-way communication to a public.

News: information about recent and important events.

One-way communication: information carried to an audience without need for immediate feedback, that is one-to-many. Radio: is a transmission of intelligence by modulation waves of electromagnetic radiation at specific frequencies. Radio signals are said to travel over the air.

Receiver: a device that gathers radio or television signals and presents their programs to the audience.

**Station:** transmits information and entertainment programs to a mass audience, either over the air or via streaming Internet media.

**Telecast:** a television broadcast

**Television:** a mass medium for transmitting and receiving video images and sound.
**Transmitter:** a device that sends radio or television programs to a mass audience via radio signal technology.
Two-way communication: information exchanged with feedback among people, i.e. one-to-one or face-to-face.
**Web:** a system of interlinked hypertext documents accessed via the Internet, ie. WWW, World Wide Web.

**Fig. 11. 1**
**Booster Amplifier**

**Fig. 11. 2**
**Booster Station**

Fig. 11. 3
Relay link

Fig. 11.4
Relay Station

**Types/Forms of Broadcasting.**

Historically, there have been several different types of electronic broadcasting media.

1). Telephone broadcasting (1881-1832): Telephone broadcasting began with the advent of Theatrophone (TheatrePhone) systems, which were telephone-based distribution system allowing subscribers to listen to live Opera and theater performances over telephone lines created by French inventor ClementAder in 1881. Telephone broadcasting also grew to include telephone newspaper services for news and entertainment programming which were introduced in the 1890s, primarily located in large European cities. It is the first Electronical/electronic broadcasting that offered a wide variety of programs.

2) Radio broadcasting (experimentally from 1906, commercially from 1920): Radio broadcasting is an audio (sound) broadcasting service, broadcast through the air as radio waves from a transmitter to an antenna and thus, to a receiving device. Stations can be linked into radio networks to broadcast common programming, either in syndication or simulcast or both.

3)Television broadcasting (telecast) experimentally from 1925, commercially from the 1930s: this Video-programming medium was long-awaited by the general public and rapidly rose to compete with its older radio broadcasting sibling.

4)Cable radio (also called "cable from 1928) and cable television (from 1932) both through Coaxial Cable serving principally as transmission ) medium for programming produced at either radio or television stations, with limited production of cable-dedicated programming

5)Satellite television (from Circa 1974) and Satellite radio (from Circa 1990): Meant for direct-to-home broadcast programming (as opposed to studio network up-links and down links), provides a mix of traditional radio or television broadcast programming, or both with satellite-dedicated programming.

6)Webcasting of Video /television (1993) and audio/radio (1994) streams: - offers a mix of traditional radio and television A station broadcast programming with inter-dedicated web-cast programming.

Telecommunication technology includes anything used by humans to communicate information over a distance. It is the transmission of signals over a distance for the purpose of communication.

**Types of Telecommunication**

1. Public switched telephone network (Land line) land
2. Mobile Phone
3. Circuit switched packet Telephone System (CSPTS)
4. Satellite telephone system
5. Wireless fixed telephone system.

1) The Public Switched Telephone Network (PSTN): is the network of the world's public circuit - switched telephone networks. It consistsofA. telephone line, fiber optic cable, micro wave transmission links, cellu networks, communications satellites, and undersea telephone cables inter-connected by switching centers which allows any telephone in li world to communicate with any other. Originally a network of fixed-i' analog telephone systems, the PSTN is now almost entirely digital in its co and includes Mobile as well as fixed telephone.

2) Mobile Phone also Called (Mobile Cellular Telephone, Or Cell Phone) is an electronic device used for two-way radio telecommunication over a cellular network of base stations known as cell sites. Mobile phonediffers from Cordless telephones, which only offers telephone service within limited range through a single base station attached to a fixed land line, e.g. within a home or an office.

A mobile phone allows its user to make and receive telephone calls to and from the public telephone network which include fixedline phones across world. It does this by connecting to a cellular network owned by a mobile network operator.

3. Circuit Switched Packet Telephone System (CSPTS): is telecommunication technology by which two network nodes establish a dedicated communication network line channel (circuit), connecting them for the duration of the communication session before the nodes may communicated. The circuit functions as if the nodes were physical, connected with an electrical circuit.

Virtual Circuit Switching is a packet switching technology that may emulate circuit switching, in the sense that the connection is established before packets are transferred, and that packets are delivered in order call for call set up and control (and other administrative purpose), it is possible to use a separate dedicated signaling channel from the end node to the network.

4. Satellite Telephone System: A satellite telephone or satphone is a type of Mobile phone that connects to orbiting satellites instead of terrestrial cell sites. They provide similar functionality to terrestrial mobile telephone; voice, short messaging service and low bandwidth internet access are supported through the system.

5. Wireless Fixed Telephone System; is the operation of wireless devices or systems used to connect to fixed location (e.g buildings) with a radio or other wireless links, such as laser bridge. The point -to- point signal transmission which occurs through the air over a terrestrial microwaves platform signal transmission occurs through copper or optical fiber. Therefore, fixed wireless does not require satellite feeds or local telephone service.

Data Network interface- standard specifies the RF subsystem connections to computers, data networks or external data source. In data networking and queuing theory, network congestion occurs when a link or node is carrying so much data that its quality of service deteriorates.

Data Network:

Data Network is any set of computer or device connected to each other with the ability to exchange data. It is simply an electronic communications process that allows for the orderly transmission and receptive of data, such as letters, spreadsheets, and other types of documents. The difference data

network and other forms of communication such as an audio network, is that the data network is configured to transmit data only.
This is in contrast to the audio or voice network, which is often employed for both voice communications and the transmission of data such as a facsimile transmission.

**Types of Data Network**

1. Personal Area Network (PAN) .
2. Local Area Network (LAN).
3. Metropolitan Area Network (MAN)
4. Wide Area Network (WAN)
5. Internet
6. Global Area Network (GAN)
7. Virtual private Network (VPN)

**1. Personal Area Network (PAN):** is a Computer network used for communication among computer and different information technological devices close to one person examples of devices that are used in a PAN are personal computers, printer, fax machines, telephones, universal modem, scanner and even video game consoles.

A PAN may include wired and wireless devices. A wired PAN is usually constructed with USB and firewire connections while technologies such as Bluetooth and infrared communication typically form a wireless PAN.

**2. Local Area Network (LAN):**Is a network that connects computers and devices in a limited geographical area such as home, school, computer laboratory, office building or closely positioned group of buildings. Each computer or device on the network is a node.

**3. Home Area Network (HAN):**Is a residential LAN which is used for communication between digital devices typically deployed in the home, Usually a small number of personal computers and accessories, such as printers and mobile computing devices. It can also be referred to as an Office Area Network.

**4. Wide Area Network (WAN):**Is a Computer network that covers a large geographic area such as a City, country or spans even intercontinental

distances, using a communication channels that combines many types of media such as telephone line, cables, and air waves.

**5. Campus Area Network (CAN):-**Is a computer network made up of an interconnection of local area networks within a limitr3d geographical area. The networking equipments (switches, routers) and transmission media (optical fiber, copper plant, etc) are almost entirely owned (by the campus tenant/owner; an enterprise, University, government etc).

**6. Metropolitan Area Network (MAN):**Is a large network that usually spans a city or a large university or state.

**7. Virtual Private Network (VPN):**Is a computer network in which some of the links between nodes are carried by open connections or virtual circuits in some larger network

**8. Internet:**Is the connection of two or more private computer networks through a common routine technology using routers. The Internet is an aggregation of many internet works, hence its name was shortened to internet.

**9. Global Area Network (GAN):**Is a network used for supporting mobile communication across an arbitrary number of wireless LANs, Satellite Coverage area etc. The key challenge in mobile communication is handing off the user communication from one local coverage area to the next.

**Information System (IS):**

**An information system (Is):** is any combination of information technology and people's activities using technology to support operations, management, and decision making. In a very broad sense, the term information system is frequently used to refer to the interaction between people, algorithmic processes, data and technology. In this sense, the term is ·used to refer not only to the Information and Communication technology (ICT).

Data Processing System: In information processing a data processing system is a system which processes data which has been captured and encoded in a format recognizable by the data processing system or has been created and stored by another unit of an information processing system.

**Global positioning system (GPS):** is a space-based global navigation Satellite system (GNSS) that provides reliable location and time information

in all weather and at all times and anywhere on or near the Earth, when and where there is an unobstructed line of sight to four or more GPS satellites.

**Advantages**

As with other technologies that have been implemented in education throughout the years, lets offer a number of advantages to both students and educators when successfully integrated into a learning environment. Some of these advantages include:

Increased Access to Resources: Unlike the traditional classroom that is locked at the end of the school day, ICTs allow students to access educational resources from anywhere at any time. This increased access to resources is especially valuable for students with special needs and those students who live in rural areas or developing countries.

**Interactive Learning Experiences:** Many educators deliver information to their students in the form of lectures. ICTs allow students to access information through videos, podcasts, and a variety of other interactive media, which creates a more engaging, learning experience for students.

Student-Centered Learning: In a traditional classroom, students cannot control how lessons are planned. Through the use of ICTs, students can take control of their learning experiences.

Globalization -Information Technology has not only brought the world closer together, but it has allowed the world's economy to become a single interdependent system. This means that we cannot only share information quickly and efficiently, but we can also bring down barriers of linguistic and geographic boundaries.

Communication - With the help of information technology, communication has also become cheaper, quicker, and more efficient. We can now communicate with anyone around the globe by Simply text messaging them, or sending them an email, for an almost instantaneous response.

Cost effectiveness - Information technology has helped to computerize the business process, thus streamlining businesses to make them extremely cost effective money-making m8~hines'is, in turn, increases Productivity, which ultimately gives rise to profits; that means better pay and less strenuous working conditions,

Bridging the cultural gap - Information technology has helped to bridge the cultural gap by helping 'people from different cultures to communicate with one another, and allow for the exchange of views and ideas, thus increasing awareness and reducing prejudice.

More time - IT has made it possible for businesses to be open 24 x7 all over the globe. This means that a business can be open anytime, anywhere, making purchases from different countries easier and more convenient. It also means that you can have your goods delivered right to your doorstep without having to move a single muscle.

Creation of new jobs - Probably, the best advantage of information technology is the creation of new and interesting jobs. Computer programmers, Systems analyzers, Hardware and Software developers and Web designers are just some of the many new employment opportunities created with the help of IT.

**Disadvantages**

Although ICTs can enhance student learning in many ways, there are some disadvantages associated with implementing these sophisticated technologies in schools and universities around the world. Some of these disadvantages include:

High Costs: Implementing ICTs in the education setting can be quite costly regarding updating existing infrastructures, training teachers and developing quality Course materials. To make matters worse. funding for such projects is often scarce.

Teacher Training: Many teachers are unfamiliar with using ICTs in the classroom and are resistant to incorporating such technologies into their established pedagogies. To succeed, the use of ICTs in education needs to be supported by well-trained teachers.

Uncertain Success Rates: Currently, no large-scale studies have been conducted that show whether or not the use of ICTs in an educational setting will result in a measurable increase in individual student achievement, making school administrators hesitant to invest in these technologies.

Unemployment - While information technology may have streamlined the business process, it has also created job redundancies, downsizing and outsourcing.

Privacy - Though information technology may have made communication quicker, easier and more convenient, it has also brought along privacy issues.
Lack of job security - Industry experts believe that the internet has made job security a big issue, since technology keeps on changing with each day. This means that one has to be in a constant learning mode, if he or she wishes for their job to be secure.
Dominant culture - While information technology may have made the world a global village, it has also contributed to one culture dominating another weaker one.

# *Chapter Twelve*

# APPLICATION OF ICT TO EVERYDAY LIFE

ICT means Information Communication Technology. ICT are the technologies used in the conveying, manipulation and storage of data by electronic means.

**Uses of ICT**

1. Communication
2. Timing and control
3. Information processing and management

**1. Communication:** Communication is commonly defined as "the imparting or interchange of thoughts, opinions, or information by speech, writing or signs. It is a two-way process in which there is an exchange and progression of thoughts, feelings or ideas towards a mutually accepted goal or direction.

**2.Timing and Control:** This is design to monitor and control the uses of ICT, i.e., internet, computer networks, multimedia and satellite systems and their associated hardware and software components which enables people to interact worldwide provided they are on-line.

**3. Information Processing and Management:** In computer science, it is the analysis and organization of information by the repeated use of one or more computer programs. Information processing is used extensively in business, engineering and science and to an increasing extent in nearly all areas in which computers are used.

## ICT AND SOCIETY

The term information society and network society have been used to analyse the social and economic changes that are taking place in conjunction with technological developments. These ideas are used by policy makers to drive forward changes in our technological infrastructure. For example, the Nigerian government vision is that many public services will be accessible online and billions of pounds have been spent to get computers into schools and local communities. The language used by politicians has drawn strongly on the inevitability of technological change and the need.

In our society today, computers have found a wide range of applications, which can be classified into small and large scales.

**A. Small Scale Applications of ICT:** Small applications of computer is common in activities or processes that do not require much computing power. Example:

1. Computerised clocks and wrist watches have replaced grandfathers' clock with pendulums. Electronic watch you wear.
2. **Computerised door lock:** You can find this in the banks. Some offices and big companies with security alerts. Here it requires a password to lock and unlock.
3. **Automated gates:** This provides better security through the use of access control mechanism.
4. **Word processing:** Computers are widely used in word processing to create documents quickly, neatly and efficiently.
5. Internet: The society is growing higher on globalization through Internet, the Internet provides every information you need from all aspect of life.
6. **Automated garage doors:** Ordinary garage door can easily be opened by car thieves. But automated garage doors provide better security by allowing only the car owner to pass.
7. **Automated traffic control mechanism:** Traffic wardens (yellow fever) get tired and sick controlling traffic all day. Apart from that, as human beings they make fatal errors and could be run over by

vehicles. But automated traffic control mechanism, work accurately all day without getting tired.

8. **Cat-Scan used in hospitals:** This is used in place of x-ray technology. Cat-Scan is more accurate and does not have the negative effect that x-ray has on human beings. Cat is an abbreviation for Computerised Axial Tomography.
9. **Games:** Computer game is a brain work widely used for entertainment.
10. **Education Sector:** ICT serves as a learning tools. This is called E-learning. Modern Video Projectors used in lectures and presentation of papers at seminars, workshop and conferences have inbuilt computers.

**B. Large Scale Applications of ICT**: Certain processes in life require a lot of computing power, resulting from large amounts of data to be processed within a given period of time. Such systems are said to require large scale application of computers. For example:

1. **Auto-pilot used in big aeroplane**: An auto-pilot is a device that can control an aeroplane without the intervention of the pilot. The auto-pilot has an embedded computer.
2. **Satellite Communication:** Broadcasting such as CNN, BBC, NTA, AIT, etc. use computerised satellite communication for news reporting.
3. **Office Automation:** Computers control and process documents, scan images, access information from the internet, send and receive messages through fax, e-mail, etc.
4. **Space Exploration:** Computers are used in space exploration to direct the flight of aeroplanes, e.g., the space shuttle.
5. **ATM and Flexi-teller Card:** Banks now use computerised teller machines from which money can be withdrawn using an ATM card.
6. **Weather Forecasting:** Weather forecasters use computer to monitor and read the state (mode) of the weather.
7. **Robotic in manufacturing industries:** Computers are used to control industries robots in manufacturing plants.

# Chapter Thirteen

# WINDOWS DESKTOP

**Performance objective**

By the end of this topic pupils should be able to

1. Define desktop
2. State the functions of the desktop
3. Identify the programs icons on the desktop
4. Create and delete folders on the desktop
5. Use computer to explore (examine) files
6. Copy a file from one folder to the other.
7. Shut down windows

**Introduction**

Before a computer can carry out any operations some software called operating system must be store in the main memory of the compute. An operating system is a set of programmes that manages computer operations. For instances, the operating system tells the computer how to save typed work on a diskette, load software from a CD-ROM, type in letters from the keyboard, work with the mouse, display results on the screen of the computer, print documents on the printer etc. examples of operating system are MS-DOS, PC-DOS, LINUX, UNIX, OS/2 and windows. Window is a powerful multi-tasking operating system designed for microcomputers and microcomputer networks. It has a pleasant and friendly graphics user interface (GUI) that makes it easy to use and fun to work with. It is currently the most popular operating system with several variations such as

WINDOWS 95, WINDOWS 98, WINDOW NT, WINDOWS 2000 professional, WINDOWS ME and WINDOWS XP.

**Booting the computer**

Booting is a process by which the computer starts up itself the moment it is switched on, carries out a self-test. to ensure that all its parts are right, checks for connected devices, and then loads frequently used parts of the operating system from a disk storage into the memory of the computer. The loaded part of the operating system remains in the memory of the computer while programmes are running until the computer is shut down.

When booting, WINDOWS may ask you to - enter your username and password if you want to have access to network. if you do not want access to network, simply click on the Cancel button. After booting, WINDOWS displays a desktop containing graphic items called icons.

**WINDOWS DESKTOP**

The desktop is the WINDOWS screen where icons are displayed. An icon is a graphic symbol that represents a file, folder, or a shortcut to a programme or document on the desktop. An icon usually has a label below it. At the bottom of the screen is a grey band called the task bar? On the task bar is the Start button.

**Contents of the desktop**

The desktop contains the following items:

The start button: The start button is always on the left side of the task bar. Its main function is to vice access to all software and documents on a computer, and also to vice access to the control panel and system configuration. When the start button is clicked, the start menu appears. The start menu also contains items, which can have sub-menus.

**Icons and Shortcuts**

All files and folders are represented by icons. Shortcuts are also represented by icons. A shortcut to a programme is a means by which that programme can be easily accessed. For example, you can star5t MICROSOFT WORD

easily by simply double-clicking on its shortcut on the desktop, instead of going through the start button. A shortcut has a black arrow.


**The Task bar**

The task bar is a gray bar that usually resides at the bottom of the screen. Although is always visible, it can be made to vanish, and then reappear as the mouse curst approaches its hiding place. The task bar contains icons and names of all programme that are running on the computer. Standard desktop icons: This is the icon that always appears on the desktop. The Icon can be my computer or recycle bin. All other icons are added by the user of the computer.

**My computer**

My computer is used to examine all files, folders, and printers on all drives on computer. To do this simply double-click on my computer then double click on the item to open it.

**The recycle bin**

The icon represents the recycle bin, whose function is to contain all deleted files, which can be permanently removed or later restored. To permanently remove all items, click empty recycle bin, and to restore all items back to their original locations, clicks restore all.

**Creating a Folder the Desktop**
Follow these steps to create and delete a folder on the desktop:

Step 1: Using the mouse take the cursor to an empty space on the desktop.
Step 2: Click the right mouse button
Step 3: Select new on the pop-up menu.
Step 4: Select folder on the sub-menu. A folder appears on the desktop with the name new folder.
Step 5: Type the name you prefer to have and press enter key.

**Exploration of Files on a System**
File exploration is a process by which files on a computer are examined. In windows 7 ultimate, a programmed called the windows explorer is used for this purpose. To start the windows explorer, click on the start button, and then select programmed from the start menu, and from the programmed menu select and click on the Accessories and the click on windows explorer.

Most file procedures used in my computer are the same as n windows explorer. However, windows explorer has two panes (or windows) which you can use to view the entire structure of your drives and folders, and to copy or move files from one folder or drive to another.

The drive (or folder on a drive) that is open in windows explorer is shown at the top left on the title bar. When you select a folder, its name will appear in the drive box (address bar), its name will be highlighted, its folder icon will appear open, and its contents will appear in the right pane.

On the left side of your explorer window are the folders in your chosen drive. The explorer view (the left pane) begins with desktop, followed by my computer, disk drive, and then other folders or programmed contained within the desktop and my computer. A minus sign on a folder means that it is fully expanded. A plus sign on a folder means that more files are contained inside it than are visible.

**Using the explorer**
The explorer can be used in the following ways:

- To make one pane smaller or larger drag the line between the two panes
- To contract and expanded folder double click on it; double click a contracted folder to expand it.
- To move between drives, folders and files use the down and up arrow keys.
- Pressing control and home will take you to the top.
- Pressing page-up will take you to the top.
- Pressing page-up will take you one screen up.
- Press control and end to go to the bottom of your directory list.
- Press page down to go down one screen.
- If you have selected any folder, you can scroll immediately to the folder you seek by typing the first letter of its name.

**Copying files**

The task of copying will be a lot easier if you make the folder (or drive) to which you are copying the selected file (or files) visible in the left pane. With windows explorer, you can copy files from one folder (or drive) to another folder (or drive) using any of the following methods. Dragging, using the toolbar, using the menu bar, and right clicking.

**Dragging**

To use this method both directories have to be visible. Click on the file you wish to copy without releasing the button, then drag and drop it precisely on the folder or drive to which it will go. As small highlighted box will be visible around the selected folder, so that you can drop it within that folder. If you miss, check the folders above and below your selected folder to see if the file landed there. Otherwise, you may have to search to locate it.

**Using the toolbar**

Your toolbar has to be visible. If it is not, you can make it visible by clicking view, then toolbar, and then standard. Select the file you are copying, then click the copy icon on the toolbar. Select the folder (or drive) where you wish to place your file. Click the paste icon.

**Using the menu bar**

Select the file you are copying, choose edit on themenu then click on copy. Select the folder (drive) where you wish to place your file. Click edit on the menu bar, then click on paste

**Right clicking**

Right clicking the file, you wish to copy, and then on the menu choose copy. Select the folder (or drive) where you wish to place your file Right click that folder (or drive), and choose paste.

**Shutting down windows**

When you have finished using your computer you need to shut it down properly. On the screen in windows XP. To do this, click on the start button and select shut down from the dialogue box, then click the OK button. You can then switch off the compute when the message "it is now safe to switch off your computer" is displayed on the screen. In windows 7 is different, click on this icon on the task bar, a popup menu will appear, shutdown is by the right side on the first row of the pop-up menu, click on it, and the computer will automatically quit by itself.

**Summary**

An operating system is software that manages all computer operations. Windows is a popular operating system with a pleasant graphics user interface and has several versions. Booting is a process by which a computer starts and checks itself then loads part of the operating system into its memory. Desktop is the windows screen where icons are placed. At the bottom of the desktop is the task bar with the start button on its left. Icons are graphic symbols that represent files, folders and shortcuts to programmed, documents or folder. Windows explorer is a program that is used to examine, delete, copy or move file. Before a computer is switched off, windows has to be properly shut down by clicking start button and selecting shutdown and then click the OK button.

# *Chapter Fourteen*
# COMPUTER ETHICS

Ethics deals with placing a "value" on acts according to whether they are "good" or "bad". Every society has its rules about everything which is known as laws when written. Today, computer has its ethics the "dos" and "don't" and has been formulated as laws, either national or international. Here we are going to look into the computer room management ethics and laboratory rule and regulations.

**A**. Methods/Ways of taking good care of a computer room/laboratory.

1. **Maintaining Dust Free Environment:** The computer room/laboratory must be swept and thoroughly dusted every day to avoid dust sticking into the circuit boards of your computer. As dust which can result to the increase of the systems internal temperature and interfere with the operation of various system components.

2. **Appropriate Ventilation:** The computer room must have adequate ventilation to avoid computer damage. Either artificial or natural ventilation is needed to sustain the computer.
   Artificial involves the uses of Air Conditioners and fans while natural involves the opening of all the windows in the computer room when computer is in use.

3. **Appropriate Lighting System:** Here, there must be Uninterrupted Power Supply, because power surges can cause a lot of damages to the computer. Any time you turn on your computer, avoid surges, don't turn off computer often, always get enough time in between turning off. Avoid connecting wrong voltages and maintain steady power supply by using stabilizer, uninterrupted power supply (UPS). It is advisable to leave computer on often.

4. **Setting Computer:** Computers must be arranged in 3 or 4 circles of five computers per circle. Depending on how many students and computers you have would see how they would need to be. By arranging them in a circle, they can stay interactive, even though it is an elementary classroom, they are bound to interact with each other. It should be evenly spaced; you must have enough room or else that might cause computer damage.

**Before setting computer there are things you must put into consideration:**

(a) How many computers are there in the lab?
(b) How many students are expected to be in the lab at one time?
(c) Will there be more than one student in each computer at once?
(d) What sort of furniture do you have to work with?
(e) What size is it? How much of it do you have?
(f) What is the floor space and layout of the lab room?
(g) Is there any special light?

**B. Computer Laboratory Rules and Regulations**

1. Arrangement of chairs and tables in a comfortable manner.
   (a) Do check the position of your screen.
   (b) Have your chairs at the right height so your eyes are level with your screen, and
   (c) Your knees are slightly lowered than your hip joints.
   (d) Let your wrists rest on the desk.
   (e) Have your computer in front of you.
   (f) Let your feet sit flat on the floor and not tacked under your chair.
2. Arrangement of computer and their peripherals in an orderly manner.

(a) Each monitor must be placed on top of the desk with the level of the students' eyes.
(b) CPU (Central Processing Unit) can be placed under the desk with the wires connected to the monitor.
(c) The printer can be located at the right-hand side of the monitor with the scanner.

(d) The keyboard should be placed directly in front of the monitor and the same height as the mouse, track ball on touch pad.
(e) The monitor should be between 18 to 24 inches away from your face.
(f) The document holder must be at the same level with your monitor.

**QUESTIONS**

1. List three ways of taking good care of the computer room.
2. State 3 computer laboratory rules and regulations.
3. Mention 3 things you must consider before setting up a computer in a lab.
4. State 3 things involved in arranging computers and peripherals in good manner.
5. Write 2 steps of arranging chairs and tables in a computer room.

# Chapter Fifteen

# AREAS OF APPLICATION OF COMPUTERS: EDUCATION

## INTRODUCTION

Computer has become a universal tool of any modern man (or woman). Literacy, today is not defined only in terms of the ability to read and/or write but in addition, it includes the ability to use and communicate with the aid of computer. In the education sector, computers are being used to promote teaching and learning.

### Application of Computers in Education

The field of education provides the most fascinating application of computing system. This has consequently attracted considerable attention from educationist and policy makers since the late 1960s, when computers were introduced into the classroom. The entry of the computer into the classroom has now offered opportunities and possibilities for students to develop their potentials with computer-aided instructions packages. A considerable number of fascinating and entertaining educational computer software packages are now available in almost every subject. These self-tutor instruction packages are well designed to enable the user to learn on his or her own time, speed and convenience. The role of the teacher here is that of a guide so that the student can think more logically and can gain meaningful experience in such structured situations, role playing and other well programmed exercise so that the student can have a better understanding of the interrelationships of variables to real life situations.

Apart from the use of computer as an instructional aide, it is also used in the execution of routine and administrative tasks such as the

keeping of academic and administrative records on admissions, examinations, staffing and other routine functions.

The computer has also revolutionized the services rendered by libraries to readers. A computer based on-line public access catalogue system manages a search for materials using indices such as author's name, book title, subject and class-mark. Readers using public terminals can go through a menu-driven programme to find specific books or periodicals, recall books on loans and also make requisition for short loan items.

Furthermore, optical character reading devices are used to scan the bar codes on readers library cards to offer a computer based issuing of books to readers. A computer-based security system is used to maintain security services in libraries as well. In educational institutions such as nursery schools, primary schools, secondary schools, polytechnics, colleges of education and universities, computer can be used for the following:

- ✓ Computer aided self-tutored application packages.
- ✓ Computer instructional aids e.g. digital projectors.
- ✓ Microsoft PowerPoint application software for preparing slide shows, speeches, seminars, workshop, lectures etc.
- ✓ Computer simulated graded exercises, group work.
- ✓ Computer-aided laboratory experiments and investigations.
- ✓ Computer-aided software packages for special students e.g. the mentally/physically disable (the blinds, deaf etc), adults, KGs, teenagers etc.
- ✓ Distant learning programmes e.g. sandwich programmes, through the Virtual Library Technology.
- ✓ Teleconferencing technology.
- ✓ Placing and sourcing of educational materials/resources e.g. papers, journals, newsletters, magazines, textbooks, films, on the internet.

- ✓ Computerization of Library Services to make cataloguing indexing, retrieval, borrowing, return and other library services easier and faster.
- ✓ Keeping the records of students, teachers and teaching facilities.
- ✓ Estimating the teachers-student ratio with a view to assessing the adequacy of teaching and learning.
- ✓ Estimating the ratio of students to teachers and teachers to teaching facilities with a view to assessing the adequacy of teaching and learning.
- ✓ Timely generation of students examination results.
- ✓ Automatic generation of lecture and examination time tables.
- ✓ Aiding students to learn basic theoretical concepts. There are currently, some computer aided learning software packages and hardware devices that are readily available in the market.

# Chapter Sixteen

# AREAS OF APPLICATION OF COMPUTERS: BUSINESSS AND INDUSTRY

## INTRODUCTION

In the early days of computing, computers were originally meant to assist in scientific and engineering applications. Today, computers are widely used to perform wide ranging tasks from routine accounting operations to management decision making. Corporate operations are becoming more complex and competitive thus increasing the need to produce and process more accurate and timely data both in quantity and quality. More accurate, reliable and timely data are needed for corporate planning, policy formulation and decision making

## Business and Industry

The following areas of application of computer technology in business will be discussed in details:

(i) Payroll
(ii) Inventory Control
(iii) Auditing Operations
(iv) Personnel Record Keeping
(v) Preparation of Customer Utility Bills and Payment Orders
(vi) Management Information System
(vii) High Quality Production Controls
(viii) Point of Sale Service
(ix) Financial Market Transactions
(x) Publishing Industry

**Payroll**

Payroll preparation is essentially a repetitive and a routine task which has to be done periodically for every single employee in an organization at particular points in time either weekly, fortnightly or monthly. Payroll preparation is a work schedule which demands speed, accuracy, carefulness and honesty. It involves making references to a number of source documents which by their nature also require constant and periodic updating.

These attributes obviously lend themselves to the use of computers which have the capabilities to meet the challenging demands in payroll preparation. These include the capability of the computer to:

(a) Handle the enormous amount of information required in payroll preparation
(b) Store information and make the information available as at when it is needed
(c) Handled repetitive recurring tasks and check on its own work as a way of controlling human errors
(d) Provide a much better and reliable procedure for the necessary security checks to monitor and detect fraud and other malpractices. Computer application in payroll preparation involves a number of procedures which include the following:
(a) Updating the personal records of employees whenever new appointments, resignations, terminations, dismissals and other changes are made within a period of time
(b) Computing wages and salaries for each individual workers based on regular and overtime hours worked
(c) Making deductions for income tax and for other payments such as union dues and repayment of loans
(d) Preparation of pay advice slips and cheques to employees and banks
(e) Updating the master payroll file based on the records received from the personnel department
(f) Preparation of summary report and analysis for management.

In addition to payroll preparation, the computer is also used for other routine and repetitive book keeping and accounting operations involving recording,

classifying and summarizing accounting data. This may involve preparing and updating ledger and journal accounts, invoicing, accounts receivable and payable. Other operations may also include updating and preparing accounts on sales, purchases and inventory. The computer is also used for the preparation and evaluation of the balance sheet and statements of accounts, preparation of dividends and summary accounts for shareholders and management.

**(ii) Inventory Control**

An equally important business application of the computer is seen in the execution of the important business function involved in maintaining a desirable level of inventory in a business organization. This is to ensure that working capital is not unduly tied in stocks while at the same time available stocks can meet the demands of continued production process. In this direction, the computer is used as a tool in updating records of inventory and also in the preparation of forecasts and demand predictions based on economic order quantity analysis and other forecasting techniques.

**Auditing Operations**

The computer is used as a tool by auditors to report accurately on the transaction register which constitutes the most crucial aspect in the audit trail. With the aid of the computer, it is easier for auditors, in their examination of the accounting records of a business, to trace routine business operations so that variances can be detected and verified accurately using various computer audit packages.

**Management Information System**

An equally challenging and revolutionary application of the computer in business is the important role the computer-based Management Information System (MIS) is playing in management decision making. The computer is used as a tool for the online storage, retrieval, processing and maintenance of corporate data meant to be shared by all the users' departments.

A management Information System involves a computerized system of data processing procedures which are integrated in an organisation to

provide accurate, complete, concise, timely and effective data which management can use at various level of decision making for planning, organizing, directing, controlling and monitoring procedures. Included in Management Information System to be used for the various decision-making procedures are a number of systems comprising.

(a) Controlling and operational planning support systems to deal with day-to-day decisions involving routine processing and transaction procedures.
(b) Tactical support systems to deal with short-run and middle level management decisions.
(c) Strategic support systems to deal with corporate strategic and top-level management decisions.

With the aid of these support systems, data can be retrieved and analyzed on a continuous and timely basis to aid management decision making and other management functions about sales, finances, purchases, acquisition of plant and equipment, research, market analysis and so on.

**Personnel Record Keeping**

One of the important functions of the personnel department is to maintain and continually update a master file and other records in the personnel department in an organization. The computer facilitates the effective keeping of a comprehensive and up-to-date record of each employee by providing a comprehensive database involving names, addresses, ages, qualifications, marital status, salaries, dates of promotion and so on. By keeping such an up-to-date record, a steady flow of various reports can be prepared at the appropriate time to provide the necessary data to aid management decision making in areas such as appointments, promotions, awards of incremental credits, leave periods, staff training, staff development and so on. Furthermore, management can provide the necessary accurate and up-to-date reports on a timely and continual basis to facilitate payroll preparation and also to satisfy other mandatory data requirements from data users such as governments, trade unions, banks, credit unions and tax collectors.

**Preparation of Customers Utility Bills**

The routine and periodic preparation of customers utility bills particularly those based on meter readings for such utility services as water, electricity, telephone, gas, demands accuracy and speed in which the computer has proved very effective and efficient. With the aid of the computer, accurate and up-to-date customer's bills can be sent to them periodically and in good time to enable settlement to be made. Computers can be used to generate notices of defaulters. Equally important is the use of the computer to calculate dividend, pension and other periodic payments as and when they become due.

**High Quality Production Controls**

Another important application of the computer which has proved very beneficial in the world of business is the monitoring of production processes so that high quality products and services are provided to customers. Computer Aided Designs (CAD) devices are used in the design of products while computer monitored quality control procedures are used in production process to detect items that fail to meet the approved quality standards and specifications. Such automated devices are used in car assembly plants, oil refineries, manufacturing of drugs and so on. Computer aided quality control devices are also used to monitor weight, size, quantity, contents and other standard specifications in the course of a manufacturing process.

**Point of Sale Services**

Check-out points in supermarkets and departmental stores are now highly computerized to detect the prices of items. Magnetic Character Readers are used to scan Universal Product Codes on items to provide fast, efficient and satisfactory services to customers in commercial transaction in retail outlets, departmental stores, libraries and other point of sale service.

**Financial Market Transactions**

Computer application in the financial market is manifested in its use to monitor financial market operations and to disseminate timely and up-to-date information which are announced daily on the radio, television or consumers

magazines. Stock exchange centres are highly computerized to provide accurate and up-to-date prices of stock and shares and also to execute the buying and selling transactions that take place in the markets. The computer has long been used to assess, evaluate and monitor stock market prices. With the aid of the computer, market trends are predicted with accuracy and inventors are provided with the appropriate and up-to-date data to enable them make intelligent decisions and also to guide them to manage their portfolios effectively. Furthermore, the computer is used to calculate the foreign exchange rates of major currencies as well as the prices of major commodities such as gold, crude oil, cocoa, coffee, and other commodities that enter into international trade. Computer is also used to provide accurate and up-to-date information on interest rates, gilts and bonds to reflect market trends. The computer application in business is further seen in its use in discounting bills and bonds and other financial market instruments to their present values. Closely related to this is the use of the computer to carefully monitor the movement of a basket of goods and services which measures the rate of inflation in an economy and which further provides a barometer of the standard of living in a country. Most banking operations are now highly computerized as a move to provide fast, effective and efficient services to customers. These include the use of Magnetic Ink Character Readers to process cheques and the provision of Magnetic Credit Cards to customers to have access to funds twenty-four hours a day at an unattended automatic teller machine. Customers also use their credit cards to open doors to some banking houses to transact business. There are other Electronic Funds Transfer terminals to perform automatic financial transactions at checkout counters in hotels, stores, airlines, railways and other terminals.

In the banking industry, computer can also be used to:
(a) Keep the records of customers or clients' accounts.
(b) Monitor, control and evaluate the transactions of the customers and clients on their accounts.
(c) Reconcile accounts and assist in producing cashbook balance.
(d) Monitor, control and evaluate the bank or insurance company's revenue and expenditure.

(e) Automate the production of statement of accounts and assist in generating the accurate the correct addresses to which the statement of account should be sent.

**Publishing industry**

In the publishing industry, computer is used in the following ways:

(a) Creative writing
(b) Typesetting manuscript
(c) Drawing illustrations.
(d)Generating the table of contents and the index of a book automatically.
(e)Generating the page size of a book and cut and paste illustrations automatically.
(f)Processing images such as the scanning of pictures and recording them automatically in the computer store for future retrieval or printing.
(g)Verification and validation of spellings.
(h)Assisting the writer of an article to identify the words that have similar meaning.

# Chapter Seventeen

# COMPUTER APPLICATIONS IN GOVERNMENT, SCIENCE, ENGINEERING, TRANSPORT, COMMUNICATIONS, RECREATION AND THE MILITARY

**Science and Engineering**

Computer is commonly used to find the accurate solutions to both scientific and engineering problems. Weather forecasting has now become a daily activity to which the computer has proved very useful in providing information on the kind of weather we are likely to expect over a period of time. Such accurate predictions help the farmers, airline operators, navigators and other activities which depend on the weather for their operations. Computer aided critical path study is used to monitor the optimum and efficient use to time, money, material and human resource in the execution and implementation of projects. Such critical path study is used successfully on various projects, for example, the construction of roads, bridges, buildings, manufacturing, the conduct of election and sales campaigns.

Another scientific application of the computer is the monitoring, simulation modeling techniques to provide indicators as to how systems such as the human body, economy, weather, demographic variables and so on react to changes in situations. The application of simulation techniques helps in taking decision and precautions in advance should in case such repercussions happen when the desired changes are introduced in practical situations. Computers are also to design buildings, roads, bridges, vehicles, aero planes, ships and complex architectural, ships and complex works and so on. Prototyping is increasingly being used to minimize the financial commitment to the real-life construction of these systems.

The computer is used to find solution to very complex mathematical and statistical computations at incredible speed and accuracy. Furthermore, various software packages are now increasingly being developed to analyse

surveyed data, construct life tables, perform mortality demographic and other multivariate data analysis designed to revolutionize scientific research and to find practical solutions to complex, challenging and everyday life situations. We now outline the use of computer in the following specific areas among others.

**Research Institutions**

(a) Evaluating, monitoring and controlling laboratory experiments.
(b) Storing the readings obtained in laboratory experiments.
(c) Standardizing the reading obtained in laboratory experiments.
(d) Tabulating or plotting the graph of the results obtained from laboratory experiments.
(e) Interpreting the results obtained from laboratory experiments.
(f) Modeling and simulating systems.
(g) Developing the prototypes of systems.

**Engineering and Architecture**

(a) Designing and drawing with very high precision, accuracy and at minimum cost.
(b) Modeling and simulating the behaviour of engineering or architectural systems.
(c) Developing the prototype of say, an aircraft, a motor car, assembly plant and so on. It is possible to test and monitor the performance of these systems without serious financial commitments.
(d) Fabricating, constructing and assembling the component parts of machines such as motor car, aircraft and engineering plants without any hazards.

**Marketing Department**

(a) Comparative analysis of products of two or more companies with a view to predicting some areas of improvement.
b. Market survey, statistical analysis of proportional market gains and prediction of new market areas.
c. Creation of the awareness and appreciation of products.

**Agriculture**

(a) Keep records of soil, rainfall, weather conditions, land size, crops, chemicals and ultimately process the records to estimate the soil fertility and yield per hectare over a number of years.

(a) Keep records, of poultry and animal husbandry farm with a view to estimating the feed mix, environmental condition desirable for optimal yield.

(b) Assess the behaviour patterns of farmers in a cooperative venture and assist in matching the farmers that have identical behaviour with a view to optimizing their productivity.

**Law and Justice**

(a) Modeling and simulating legislative procedures.
(b) Indexing, storage and retrieval of law reports.
(c) Indexing, storage and retrieval of court proceedings.
(d) Assisting the human experts in crime investigation.
(e) Statistical analysis of criminal and civil cases in the law court and estimating the rate of growth.
(f) Assisting the court registrar in the allocation of cases to courts.
(g) Monitoring and evaluating congestion in police custody and prisons.
(h) Identifying the causes of crime and assisting with the provision of preventive and curative measures.

**Health Care**

The delivery of health care facilities has been one of the notable areas in which computer applications have proved most beneficial to mankind. The computer is used to conduct fast and accurate laboratory tests for blood, urine, stool and so on. The computer is used in the diagnosis and physiological monitoring of patients life during surgical operation and intensive care programme. There is also a wide range of application packages for the scientific preparation and administration of drugs, x-ray techniques, blood bank management and so on. An equally important application of the computer is the computer simulation provided in the training of medical and paramedical staff and students. Computers are being used to

perform routine clerical functions in hospitals such as keeping records of hospital admission and discharges, administration of drugs and prescriptions and other hospital administrative functions. Furthermore, the computer is used to provide a data bank of medical history to meet the data needs of health insurance schemes and vital health care statistical reports.

**The summary that can be drawn about the use of computers in the hospitals are as follows:**

(a) Keeping and reviewing in a timely, effective and efficient manner the records of patients, staff, drugs and equipment.
(b) Monitoring the temperature, blood pressure, heart beat and a host of other parameters of patients and raising an alarm when abnormal situation is about to occur.
(c) Assisting medical practitioners in the diagnosis of patient disease.
(d) Assisting the medical practitioners in the prescription of drugs to patients and ultimately the treatment of patients.
(e) Assisting the medical practioners in the monitoring, controlling and reviewing basic health services, birth rate, death rate, outbreak of disease and a host of others.

**Transport and Communications**

The most dramatic computer application is witnessed in the transport and communications sectors with increased sophistication but geared towards making life easier and safer for mankind. Today, mankind world-wide is linked by computer controlled orbiting communications satellite. Telecommunications and computing are today electronically linked together. As a result, information can now be transmitted around the globe on the radio, television, telex, facsimile and so on through microwave communication satellites

Man's advancement in information technology has led to the development of the popular computer controlled electronic mail service which provides a more effective and efficient method of disseminating information to users in a computer network environment. The electronic mail service now provides

faster, more convenient and cheaper electronic flow of information than the telephone, fax and telex transmission.

Computer application in communications has led to the use of computer terminals at home. This development enables viewers to read electronic newspapers on the television while the teletext provides computerized information to viewers on events around the globe in the field of politics, business, transport, sports, airline, hotel reservations and many others. the Cabled Network News (CNN) is a practical example.

Computer application is now felt in traffic control and vehicle maintenance.

Traffic congestion is cities are monitored by computer-controlled traffic switching system which controls traffic flows. Computer aided input devices in a form of railcards or tickets are used to operate automatic gates in underground railway lines. When a ticket coated with magnetic stripes is slotted down wards into a device, the gate automatically opens for you to enter while you take your ticket. The device will return your ticket if it is valid for another journey; if not, it will keep the ticket and allow you to go. A passenger with an invalid ticket is given a red message and there is no way he or she can enter through the gate.

In the delivery of postal services, the computer is used to sort letters according to

post codes. In the field of aeronautics, computer simulations are used to train pilots while air traffic movements are monitored by computer-controlled radars. The scheduling of trains, subways, and by real-time sophisticated computer systems. Another important computer application is the introduction of computer devices to improve personal safety on aircrafts and vehicles and also to detect engine faults and help in the maintenance of aircrafts and vehicles.

**Government**

The business of governance is a serious business. In a multi-cultural, multilingual, multiethnic, setting such as Nigeria, a lot of complex and often conflicting variable interplay or are taken into consideration before a broad-based decision can be taken. Computers can assist government business in the following ways:

(a) Planning
(b) Decision marking

(c) Policy formulating
(d) Monitoring and control of operations

The availability of data, timely access to the data and timely reporting on the data are very crucial to the above listed business of government. Computers can be used to:

(a) Keep accurate records of government assets and periodically estimates the market value and insurance value.
(b) Keep accurate records of the population, behaviour patterns, consumption patterns of utilities and estimates the distribution of basic needs such as electricity, water, telephone and postal services.
(c) Keep records of government revenue and expenditure and assist government in monitoring, controlling and evaluating the revenue and expenditure
(d) Keep records of government employees with a view to:
(i) Preventing ghost workers
(ii) Estimating the strength of the human resources of government
(iii) Producing statistical data on employees
(e) Computers can be used in the issuance of identity cards to the citizens.
(f) Compilation of a broad-based and accurate voters register. This will check the incidence of ghost voting, multiple voting and other electoral malpractices which has bedeviled the electoral processes and stable polity in the third world countries.
(g) Computers are used to keep track of crime in the society thereby helping the government security agencies to check crime in the society.
(h) Computers can be used to build and to main the database of the mineral resources and other resources of the nation.

**The Military**

One of the areas in which computer has been applied intensively and extensively is the military. The first generation of the modern computers were designed and used during the first and the second world wars. The use of computer for processing data became more popular during these periods due to the need to procure, store and process large volume of data. Over the years, the use of computer has transcended the traditional role of "crunching

numbers" to sophisticated applications. Specifically, computers are being used in the following ways, in the military operations:

(a) Training the personnel through the use of simulated war situations.
(b) Reconnaissance surveys.
(c) Automatic detection of mines.
(d) Monitoring and tracking of planes with a view to crash landing any un-authorized plane flying in the nation's airspace.
(e) Monitoring operations in the military base.
(f) Launching of missiles from distant military base to the enemy territory. Such missiles are programmed to ensure that only the desired targets are hit.
(g) Manufacture of state-of-the-art military hardware and consumables.
(h) Communications and transmission of highly coded classified military information.
(i) Military games, adventures and expeditions.
(j) Keeping records of military personnel and logistics.
(k) Keeping records of military assets – hardware
(l) Management of military stock with a view to maintaining war-ready stock of materials, ammunitions and assets at any point in time.
(m) Monitoring the environmental and storage conditions of lethal weapons in order to prevent accidents like sudden explosions caused by improper storage.
(n) Generation and maintenance of necessary data that would enhance planning, policy formulation, decision making and forecast.

**Recreation, Amusement and Gaming**

One of the major areas in which computer has affected the society positively is in the area of recreation, amusement and gaming. "Work and no play make Jack a dull boy". With increasing civilization and urbanization, there is the need for people to relax and keep their mind off the tension that is associated with daily activities, some of which are tension soaked.

Computer games help one to learn in the private (even in the comfort of your own room or office), keeps you off the streets and arcades, reduces tension and boredom, engages the mind on constructive things and teaches you new skills. There are different kinds of games such as adventure games, business games, war games, traditional games, and simulation games.

**Conclusion**

Computer as a universal machine is being applied to almost every area of human society. The discussions in this unit clearly demonstrate this fact.

# Chapter Eighteen
# COMPUTER VIRUS

**Introduction**

One of the biggest fears of having computers are viruses, viruses are malicious programs designed entirely for destruction and havoc. Viruses are created by people who either know a lot about programming or know a lot about computers.

**Computer Virus**

Computer virus is one of the greatest threats to computers and computer applications. Once the virus is made it will generally be distributed through shareware, pirated software, e-mail or other various ways of transporting data, once the virus infects someone's computer it will either start infecting other data, destroying data, overwriting data, or corrupting software. The reason that these programs are called viruses is because it is spreads like a human virus, once you have become infected either by downloading something off of the Internet or sharing software any disks or write able media that you placed into the computer will then be infected. When that disk is put into another computer their computer is then infected, and then if that person puts files on the Internet and hundreds of people download that file, they are all infected and then the process continues infecting thousands if not millions of people.

**Mode of Transmission of Computer Virus**

The majority of viruses are contract by floppy's by bringing information from one source and then put onto your computer. VIRUSES can infect disks and when that disk is put into your computer your computer will then become infected with that virus, a recent survey done in 1997 by NCSA given to 80

percent of PC users showed that 90% of PC users contract viruses by floppy diskettes.
In the survey done above it showed that the other 20% of viruses were contracted by email attachments and over the Internet. This means that you received an email with an attached file and opened the file. Or downloaded a file over the Internet.

**Virus Properties**
Your computer can be infected even if files are just copied. Because some viruses are memory resident as soon as a diskette or program is loaded into memory the virus then attaches itself into memory.

Can be Polymorphic. Some viruses have the capability of modifying their code which means one virus could have various amounts of similar variants.

Can be memory / Non memory resident. Depending on the virus can be memory resident virus which first attaches itself into memory and then infects the computer. The virus can also be Non memory resident which means a program must be ran in order to infect the computer.

Can be a stealth virus. Stealth viruses will first attach itself to files on the computer and then attack the computer this causes the virus to spread more rapidly.

Viruses can carry other viruses and infect that system and also infect with the other virus as well. Because viruses are generally written by different individuals and do not infect the same locations of memory and or files this could mean multiple viruses can be stored in one file, diskette or computer. They can make the system never show outward signs. Some viruses will hide changes made such as when infecting a file, the file will stay the same size. They can stay on the computer even if the computer is formatted. Viruses have the capability of infecting different portions of the computer such as the CMOS battery or master

**How Viruses May Effect Files**

Viruses can affect any files however usually attack .com, .exe, .sys, .bin, .pif or any data files. Viruses have the capability of infecting any file however will generally infect executable files or data files such as word or excel documents which are open frequently.

It can increase the files size; however, this can be hidden. When infecting files virtues will generally increase the size of the file however with more sophisticated viruses these changes can be hidden.

It can delete files as the file is ran. Because most files are loaded into memory and then ran once the program is in memory the Virus can delete the file.

It can corrupt files randomly. Some destructive viruses are not designed to destroy random data but instead randomly delete or corrupt files.

It can cause write protect errors when executing .exe files from a write protected disk. Viruses may need to write themselves to files which are executed because of this if a diskette is write protected you may receive a write protection error.

It can convert .exe files to .com files. Viruses may use a separate file to run the program and rename the original file to another extension so the exe is run before the com.

It can reboot the computer when a file is run. Various computers may be designed to reboot the computer when ran.

**WHAT VIRUSES' MAY DO**

The following are possibilities you may experience when you are infected with a virus. Remember that you also may be experiencing any of the following issues and not have a virus.

Once the hard drive is infected any disk that is non-write protected disk that is accessed can be infected.

**Deleted files**

Various messages in files or on programs.

Changes volume label.

Marks clusters as bad in the FAT.

Randomly overwrites sectors on the hard disk.

Replaces the MBR with own code.

Create more than one partitions.

Attempts to access the hard disk drive can result in error messages such as invalid drive specification.

**Causes cross linked files.**
Causes a "sector not found" error.
Cause the system to run slow.
Logical partitions created; partitions decrease in size.
A directory may be displayed as garbage.
Directory order may be modified so files such as COM files will start at the beginning of the directory.
Cause Hardware problems such as keyboard keys not working, printer issues, modem issues etc.
Disable ports such as LPT or COM ports
Caused keyboard keys to be remapped
Alter the system time / date
Cause system to hang or freeze randomly.
Cause activity on HDD or FDD randomly.

**Increase file size.**
Increase or decrease memory size.
Randomly change file or memory size.
Extended boot times
Increase disk access times
Cause computer to make strange noises, make music, clicking noises or beeps.
Display pictures
Different types of error messages

## DETECTING VIRUSES

The most commonly used method of protecting against and detecting viruses is to purchase a third-party application designed to scan for all types of viruses. A list of these protection programs is listed above.
Alternatively, a user can look at various aspects of the computer and detect possible signs indicating a virus is on the computer. While this method can

be used to determine some viruses, it cannot clean or determine the exact virus you may or may not have.

**Conclusion**

Computer viruses are perhaps the greatest threats to the computer. If not detected and promptly cured, computer virus attack could lead to the total breakdown of computer installation. With the aid of our discussion in this unit, students should be able to prevent, detect and clean viruses in a computer installation.

# Chapter Nineteen
# NETWORK

Computer Network often refers to as a collection of Computers and services interconnected by communication channel that facilitate communications among users and allows users to share resources. Networks may be classified according to a wide variety of characteristics.

**Networking**
Computer networking can be defined as an act of connecting many computers together for the purpose of exchanging information and data peripheral equipment can also be shared.

**Brief History**
Early network of Communicating Computers includes the military radar system Semi-Automatic Ground Environment (SAGE) and its relatives the Commercial airline reservation system Semi-Automatic Business Research Environment (SABRE) started in late 1950s.
In the 1960s the Advance Research project Agency (ARPA) started finding the design of the Advanced Research projects Agency Network (ARPN ET) for the United States Department of Defense. Development of network began in 1969, based on designs developed during the 19605 the (ARPAN ET) evolved into the modem internet.

**Purposes**
Computer networks can be used for a variety of purposes.

1. **Facilitating Communication: --**Using a network, people can stay in a room and make telephone calls, video telephone calls and video conferencing.
2. **Sharing Hardware: -** In a networked environment, each computer on a network may access and use hardware resources on the network, such as printing document on a shared network print.

3. **Sharing files, data and Information: -** in a network environment, authorized users may access data and information stored on other computers on the network. The capacity of providing access to data and information on shared storage devices is an important feature of many networks.
4. **Sharing Software: -** Users connected to a network may run application programs on remote computers.
5. Information preservation
6. Security

**Network Classification**

The following list presents categories used for classification of network. Connection method, wired technologies, wireless technologies scales.

**Connection Method:** Computer networks can be classified according to the hardware and software technology that is used to interconnect the individual Such as optic fiber, Ethernet, Wireless LAN, HOME, PAN, power line communication or Ghn. Ethernet as it is defined by IEEE 802 utilized various standards and mediums that enable communication between devices. Frequently deployed devices include hubs, switches, bridges and routers. Wireless LAN technologies is designed to connect devices without wiring.

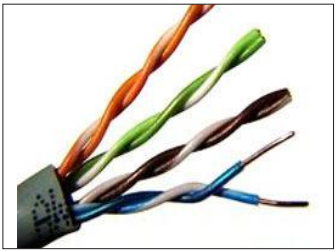
These devices use radio waves or infrared signals as a transmission medium. ITU-TG.hn technology uses existing home wiring (coaxial cable) phone lines and power lines) to create a high-speed (up to 1Gigabytes) local area network.

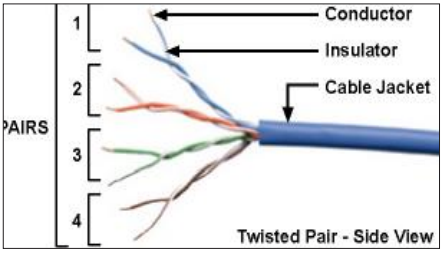
Wired Technologies

**(1) Twisted Pair:** wire is the most widely used medium for telecommunication. Twisted pair consists of copper wires that are twisted into pairs wires. Ordinary telephone wires consist of two insulated copper wires twisted into pairs. Computer networking cable consist of 4 pairs of copper cables that can be utilized for both voice and data transmission. The use of two wires twisted together helps to reduce crosstalk and electromagnetic induction. The transmission speed ranges 2 million bits per second to 100 million bits per second. Twisted pairs cabling comes in two forms which are

unshielded twisted pair (UTP)and shielded twisted-pair (STP) which are rated in categories which are manufactured in different increments for various scenarios.

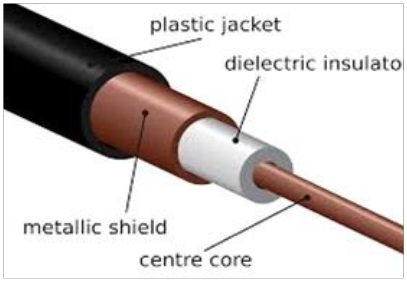
**Coaxial Cable:** is widely used for cable television systems, office buildings and other work-sites for local area networks. The cables consist of copper or aluminum wired wrapped with insulating layer typically of a flexible material with a high dielectric constant all of which surrounded by a Conductive layer. The layers of insulation help minimize interference and distortion.





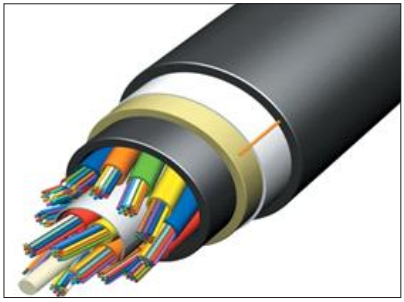

Transmission speed ranges from 200 million to more than 500 million bits per second

**Optical Fiber:** cable consists of one or more filaments of glass fiber wrapped in protective layers. It transmits tight which can travel over extended distances. Fiber optics cables are not affected by electromagnetic radiation. Transmission speed may reach trillions of bits per second. The transmission speed of fiber-optic is hundreds of times faster than for coaxial cable and thousands of times faster than a twisted-pair wire.



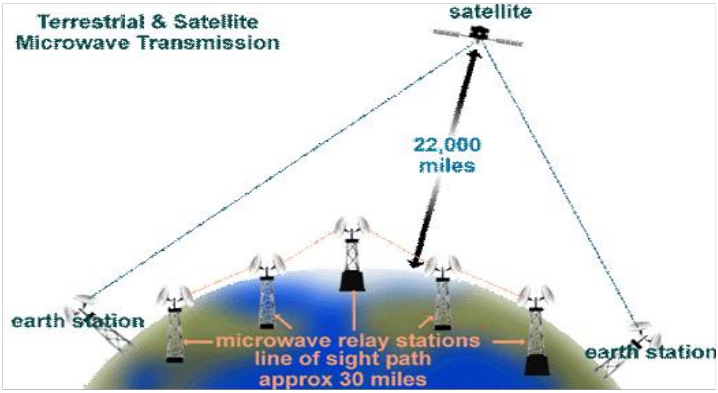

**WIRELESS TECHNOLOGIES**

**Terrestrial Microwave:** Terrestrial microwave used Earth-based transmitter and receiver. The equipment looks similar to satellite dishes. Terrestrial microwaves use low gigahertz range which limited communications to line-of-sight. Path between relay stations spaced approximated 30 miles apart. Microwave antennas are usually placed on top of buildings.

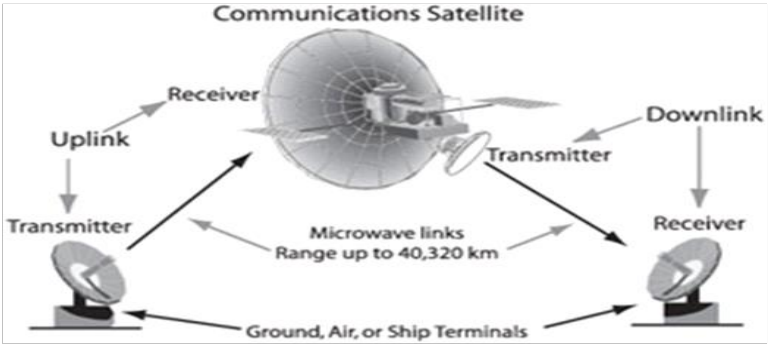


Communications Satellites - The satellites use microwave radio as their telecommunications medium which are not deflected by the earth's atmosphere. The satellites are stationed in space, typically 22 000 miles (for

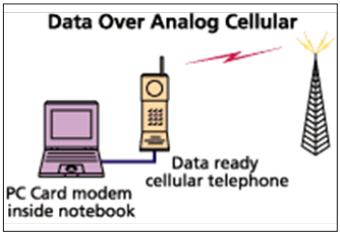
geosynchronous satellites) above the equator. These earth-orbiting systems are capable of receiving and relaying voice, data and TV signals.

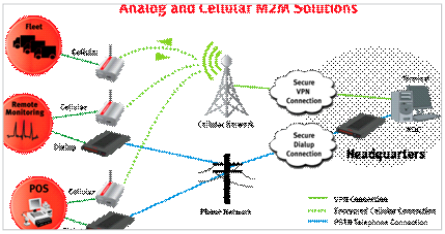



**Cellulars and PCS Systems:** Use several radio communication technologies. The systems are divided into different geographical areas. Each area has a low-power transmitter or radio relay antenna device to relay calls from one area to the next area.



**Wireless LAN:** Wireless local area network uses a high frequency radio technology similar to digital cellular and a low frequency radio technology. Wireless LANs use spread spectrum technology to enable communication between multiple devices in a limited area. An example of open standards wireless radio-wave technology is IEEE.




**Infrared Communication: -** Which can transmit signals between devices within small distances not more than 10 meters' peer to peer (face to face) without any body in the line of transmitting.

**Types of Network Based on Scale and Physical Scope**
Networks can often be classified in scale as


1. Local Area Network (LAN)
2. Wide Area Network (WAN)
3. Metropolitan Area Network (MAN)
4. Personal Area Network (PAN),

5. Virtual private Network (VPN),
6. Campus Area Network (CAN),
7. Storage Area Network (SAN), and others depending on their scale scope and purpose e.g Controller area Network (CAN), usage, trust level and Access right often differ between these types of networks. LANs tend to be designed for internet systems and employees in individual physical locations such as a building while WANs may connect physically separated parts of an organization and may include connections to third parties in another country.

**Common types of computer networks may be identified by their scales**
**Local Area Network:** is a network that connects computers and devices in a limited geographical area such as home, school, computer laboratory, office building or closely positioned group of buildings. Each computer or device on the network is a node. Currently wired LANs are most likely to be based on Ethernet technology.

Personal Area Network (PAN) is a computer network used for communication among computers in different information technological devices close to one person. Some examples of devices that are used in a PAN are personal computers (PC), Printers, fax machines, telephones PDAS scanners and even video games consoles. (PAN) may include wired and wireless devices. The reach a PAN typically extends to 10 meters. A wired PAN is usually constructed with USB and fire wire connections while technologies such as Bluetooth and infrared communication typically form a wireless PAN.

HOME Area Network (HAN) is a residential LAN which is used for communication between digital devices typically deployed in the home, usually a small number of personal computers and accessories such as printers and mobile computing devices. An important function is the faring of internet access, often a broad band service through a CATV or (DSL) provider. It can also be referred to as an Office Area Network (OAN).

**CAMPUS AREA NETWORK:** is a computer Network made up of interconnection of local area networks (LANs without a limit geographical area. The networking equipment are switches, routers) and transmission

media (optical fiber copper plant, C t5 cabling etc.) are almost entirely owned by the campus tenants and enterprise, university government etc. In case of university campus-base network, the network is likely to link a variety of campus building including academic departments, the university library and student's resident halls.

Wide Area Network (WAN) is a computer network that covers a large geographical area such as a city, country or spans even intercontinental distances. Using a communication channel that combines many types of media such as telephone line, cables and air waves. A WAN often uses transmission facilities provided by common carriers such as telephone companies. WAN technologies generally function at the lower three layers of the OSI reference model: the physical layer, the Data link layer and the Network layer. WAN can be subdivided into the following parts.

Metropolitan Area network; is a large computer network that usually spans or covers a city or a large state. eg (EPN) Enterprise private network made of Frame Relay WAN Connections and dialup remote access, and VPN used to interconnect offices and remote users.

Enterprises Private Network is a Network built by an enterprise to interconnect various company sites. eg. Production site, head offices, remote office, shops in order to share computer resources.

Virtual Private Network (VPN) is a computer network in which some of the links between nodes are carried by open connections or virtual circuits in some larger networks eg. (internet) connected by physical wires. The data link layer protocols of the virtual network are said to be tunneled through the larger network, when this is the case, one common application is to secure communication through the public internet, but a VPN need not have explicit security features such as authentication or content encryption. VPNs for instance can be used to separate the traffic of different user communicated over an underlying network with strong security features. VPN may have best effort performance or may have a defined Service Level Agreement (SLA) between the PN customer and the VPN service provider. Generally, a VPN has a topology more complex than point-to-point.

**Internetwork:** An internetwork is the connection of two or more private computer networks through a common routing technology (OSI layer 3) using

routers. The internet is an aggregation of many internetworks hence its name was shortened to internet.

**Backbone Network:** A Backbone network (BBN) or network backbone is part of a computer network infrastructure that interconnects various pieces of network providing a path for the exchange of information between different LANs or sub-networks. A Backbone can tie together diverse networks in the same building, in different buildings in a school environment or over wide areas.

Normally, the backbone's capacity is greater than the networks connected to it. A large corporation that has many locations may have a backbone network that ties all the locations together, e.g if a sewer cluster needs to be accessed by different departments of a company that are located at different geographical locations the pieces of the network connections (for instance, Ethernet, wireless) that bring these departments together is often mentioned as network backbone. Network congestion is often taken into consideration while designing backbones. Backbone networks should not be confused with the internet backbone.

Global Area Network (GAN) is a network used for supporting mobile communications across an arbitrary number of wireless LANS, satellite coverage erases the key challenge in mobile communication in handing of the user communications from one local coverage area to the next.

**Internet: -**The internet is a global system of interconnection governmental, academic, corporate, public and private computer networks. It is based on the networking technologies of the internet protocol suite. It is the successor of the Advanced Research Projects Agency Network (ARPANET) developed by DARPA of the United States Department of Defense. The internet is also the communication backbone underlying the World Wide Web (www).

Participants in the internet, uses a diverse array of methods of several hundred documented, and often standardized, protocols compatible with the internet protocol suite and an addressing system (IP addresses) administered by the Internet Assigned Numbers Authority and address registers. Service providers and large enterprise exchange information about the reach ability of their spaces through the Border Gateway Protocol (BGP) forming a

redundant worldwide mesh of transmission paths. Intranet and Extranet: are parts or extension of a computer network usually a local area network.

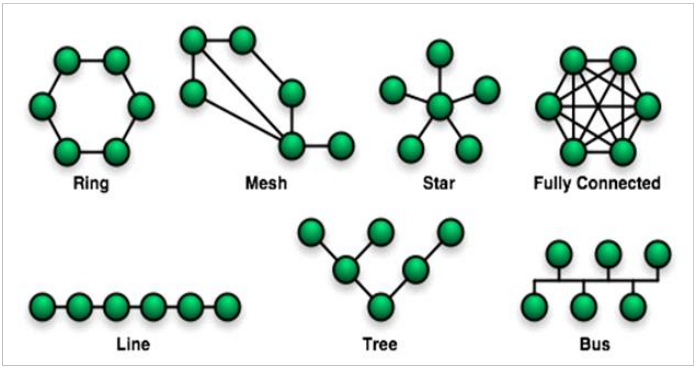
Intranet is a set of networks using the Internet protocol and IP-based tools such as web browsers and file transfer administrative entity. That administrative entity closes the internet to all but specific authorized users. Most commonly, an Intranet is the internal network of an organization. A large intranet will typically have at least one web server to provide user with organizational information. Extranet is a network that is limited in scope to a single organization or entity and also has limited connections to the networks of one or more, usually but not necessarily trusted organizations or entities a company's customers may be given access to some parts of its intranet while at the same time the customers may not be considered trusted from a security standpoint. Technically, an extranet may also be categorized as a CAN, MAN, WAN or other types of network, although an extranet cannot consist of a single LAN, it must have at least one connection with an external network.

**Overlay Network**

An overlay network is a virtual computer network that is built on top of another network. Nodes in the overlay are connected by virtual or logical links, each of which corresponds to a path, perhaps through many physical links in the underlying network. IP over SONET over OPTICAL e.g. Many peer-to-peer networks are overlay network because they are organized as nodes of a virtual system of links that runs on top of the Internet. The internet was initially built as an overlay on the telephone network. Overlay network have been around since the invention of networking when computer systems were connected over phone line using modem before any data network existed. Nowadays the internet is the basis for many overlay networks that can be constructed to permit routing of messages to destinations specified by an IP address. eg. Distributed hash tables can be used to route message to a node having a specific Logical address whose IP address is known in advance.

**Token-ring Network:** A type of computer network in which all the computers are arranged (schematically) in a circle. A token which is a special bit pattern travels round the circle. To send a message, a computer catches the token, attaches a message to it and then let it continue to travel around the network. ARCnet (Attached Resources Computer Network) is one of the oldest

simplest and least expensive type of local area network. ARCnet was introduced by Data point corporation in 1997. It uses a token ring architecture supports data rates of 2.5 MBPs and connects up to 255 computers. A special advantage of ARCnet is that, it permits various types of transmission media, twisted pair wire, coaxial cable and fiber optics cable to be mixed on the same network. Look at Networking Topology below:




Network length, the maximum when linking data closets with twisted pair is 500 meters between the furthest two devices. If multi-node fiber optic is used to link closets, then the distance between closets can be up to 2,000 meters.

**Advantages**

1. More suited for larger networks
2. Easy to expand network
3. Easy to troubleshoot because problem usually isolates itself
4. Cabling types can be mixed.

**Disadvantages**

1.Hubs become a single point of network failure, not the cabling.
2.Cabling is more expensive due to home run need of every device.
Because each computer uses a separate cable, the failure of a network connection affects only the single machine involved. The other computers can continue to function normally.

**Benefits of Networking**

1.Being active: - Being active is a benefit of network, when you got an e-mail address you are out there connecting to people you are moving your career forward. By going to your internet news group for assignment you are taking the first step towards improving yourself and your business.
2.Openness: Openness is a benefit of networking by allowing yourself to be open (share your problems), you gain more information for yourself and share information with others.
3.Information: - is a benefit of networking, when you go to daily news, CNN news and other news updates to get current information for your Education and business.
4.Knowledge: - The more information you have the more power you have. Networking helps you explain your knowledge about where you want to grow and put in position to help others.
5.New Ideas: Networking allows you to gain new ideas and new approaches that you did not think of before.
6.Contacts: - Gaining new contacts is one of the benefits of computer networking, you are sure of making great friends and business contacts (about new products).
7.Skills: Developing skills is a benefit of networking; Networking is skill in itself. The more you know people, the better you engage yourself in skills which are open to you and your friends. e.g. (Tochukwu myson was taught how to prepare a bread cake in the internet by his friends).
8.Reputation: improving your reputation is one of the networking contributions. In newsgroup and conference meeting one can quote you or reference you when speaking or writing.
9.Support: A good reputation leads to support, getting people to be on your side is like word-of-mouth advertising. These people will help spread good information about who you are and what you can do.
10.Self Esteem: - Gaining self-esteem is a benefit of networking. As humans we need to socialized which led to making friends and getting people to like us. All these leads to higher self-esteem. Higher self-esteem makes you happy and in turn makes you create a better position for yourself and your educational background.

11. File Sharing: - Network file sharing between computers gives you more flexibility than using floppy drive or flash drives. Not only can you share photos, music files, and documents, you can also use a home network to save copies of all of your important data on a different computer. Backups are one of the most critical yet overlooked tasks in home networking.
12. Printer/Peripherals Sharing: - When one's home network is in place, it is easy to then set up all of the computers to share a single printer. No longer will you need to bounce from one system or another just to print out an e-mail message or other computer peripherals can be shared Similarly such as network scanners, web cams, and CD burners.
13. Internet Connection Sharing: - Using home network, multiple family members can access the internet simultaneously without having to pay an ISP for multiple access. You will notice the internet connection shows down when several people share it, but broadband internet can handle the extra load with little trouble. Sharing dial-up internet connections works, too painfully slow sometimes, you will still appreciate having shared dial-up on these occasions you really need it.
14. Games: - Many popular home computer games support LAN (local Area Network) mode where friends, students and family can play together, if they have their computers networked.
15. Internet telephone Service: So, called (voice over IP) services allow you to make and receive phone calls through your home network across the internet saving your money.
16. Home Entertainment: Home Entertainment Products such as digital video recorders (DVRs) and video game consoles now support either wired or wireless home networking. Having these products integrated into your network enables outline gaming, video sharing and other advanced features.

# Chapter Twenty

# THE INTERNET

Summarized History of Information Transmission - The Internet and Web
In this chapter, we will learn about:

1. The start of Information Transmission after the Flood.
2. The start of the Transmission of Written Information using the Wire.
3. The start of the transmission of voice signals electronically.
4. The start of the Electronic Transmission of Pictures.
5. The Birth and the growth of the Internet.

Information transmission is as old as man. From creation until now man has used different means to better and transmit his information. Below are his attempts to get and transmit the right and desired information over the years.

**Information Transmission using Birds**
In the book of Genesis 8: 10 to 11, it is recorded “After waiting seven more days, He (Noah) again released the Dove from the Ark. In the evening, the dove came back to him and there, in its beak, was a freshly picked Olive leaf! So, Noah realized that the waters were receding from the earth”. After the flood, the dove brought an Olive leaf as data that’ was interpreted by Noah to mean that the water was dried up. This is the beginning of data transfer immediately after the flood. In 700 BC, Homing pigeons carried messages in ancient Greece. They were the periods in the history of man when birds were used to transmit messages. What these birds carried was information; the birds were the means of transporting the information and they interpreted the transmitted information.

**Transmission of Written Information using the Wires**

The @ sign was used for the first time in a letter written by Florentine Merchant on the 4th of May 1536. In 1819 a better medium that would carry the information signal was discovered by a Danish Physicist, Hans Christian Orsted, who discovered that a wire carrying an electric current creates a field that deflects a magnetic needle. This discovery eventually led to the creation of the telegraph. By 1837, William F. Cooke and Charles Wheatstone installed the first railway telegraph in England. By 24th May 1844, Samuel F.B. Morse demonstrated a magnetic telegraph using his Morse Code to send the message 'What hath God wrought' from Baltimore to Washington.

In August 1858 the first transatlantic cable was installed between Ireland and Canada. Unfortunately, the Signal was so weak and indistinguishable from background noise that it took hours to send a few words. The owners tried to fix the situation by boosting the voltage from 600 to 2000 volts, melting the cable's insulation and leaving it dead in the water. Later, cables were installed in 1866 which remained useful for almost 100 years.

On April 3, 1860 the Pony Express opened for business, pledging to 'deliver the goods in 10 days or less'. "It's first route carried mails between St. Joseph, Missouri and San Francisco, California. In October 1861 the last Pony Express run was made as the telegraph took over.

In 1863 Giovanni Caselli received a U.S. patent for a fax machine called the 'pantelegraph'. The machine was built based on Alexander Bain's 1840 idea of synchronised pendulums. It provided services between Paris and Lyons, France between 1865 and 1870, until the Franco-Prussian War.

**Transmission of Voice Signals Electronically**

On March 7th, 1876 voice was for the first time transmitted electronically. Alexander Graham Bell received a patent on a device, which transmitted speech electronically. By 1877, the first commercial telephone was introduced and the first telephone line was installed between Charlie William's electrical shop on Court Street, Boston and his home about three miles away. January 25th 1915, saw to the completion of the first transcontinental call from New York to San-Francisco as Alexander Graham Bell, in New York, spoke to Tom Watson "in San-Francisco, repeating the first complete sentence transmitted by telephone ... 'Mr Watson - come here - I want you'.

**Electronic Transmission of Pictures**

On May 19th 1924, "Bell' System engineers demonstrated the first transmission of pictures over telephone wires. In 1927 telephone services became commercialized by AT&T establishing commercial transatlantic telephone service to London using two-way radio. Calls cost $75 for five minutes.

**The Start of the Regulations of the Communication Industry**

The Communications Act of 1934 became law on July 1st of the year 1934; that was the first effort to regulate the telephone industry by the Federal Communications Commission instead of the Interstate Commerce Commission. Between 1934, and 1957, there were other discoveries like the transistor and the building of the hard disk and the hard disk drive, which are going to form the background of the new dimension in information communication.

The launching of the Satellites, invention of the Mouse, the Beginning of the Internet and the Use of Fiber Optics to Transmit Information

In October 4th 1957, USSR launched Sputnik, the first artificial earth satellite. The year 1958 saw to a lot of inventions, starting from the month of January when Bell System announced its Data-Phone Service, which permits transmission of data over regular telephone circuits. On February 7th and in response to the launch of Sputnik, the Department of Defense issued directive 5105.15 establishing Advanced Research Projects Agency (ARPA). The directive tasks the agency with 'direction or performance of such advanced projects in the field of research and development...' On September 12th Jack Kilby demonstrated the first integrated circuit to fellow researchers and executives as Texas Instruments. On December 15th Arthur L. Schawlow and Charles H. Townes published Infrared and Optical Masers, describing what would later be known as the laser, (Light Amplification by Stimulated Emission of Radiation), while at Bell Labs; earlier in the year they had applied for a patent which was granted in 1960, the same year Theodore Maiman built the first working model while at the Hughes Aircraft Company.

In the year 1960, the first communication satellite, Echo, was launched. A year after, on May 31st 1961 at MIT, Leonard Kleinrock

published the first paper on Packet Switching Networks Information Flow in Large Communication Nets. Modulator Demodulators (modem) entered into the market by the year 1962 when ATT sold the first commercial modem (the Bell 103). The modem provided full-duplex - transmission, frequency-shift keying or FSK, and had a speed of 300 bits per second or 300 bauds.

On July 23rd 1960, the first live trans-Atlantic television broadcast was hosted by Walter Cronkite and made via ATT's Telstar 1 satellite, launched 13 days earlier on July 10. In August, Joseph Licklider and Wesley-Clark published 'On-Line Man-Computer Communication' discussing their 'Galactic Network' concept that would allow people to access data from any site connected through a vast network. And by October, Joseph Licklider became the first head of the computer research program at ARPA.

In 1963, Doug Engelbart invented the 'X·-Y Position Indicator for a Display System', known today as the mouse. The following year 1964, Digital 'Equipment Corporation released its PDP-8 computer, the first mass-produced minicomputer.

In August of the same year 1963, RAND's Paul Baran published "On Distributed Communications: Introduction to Distributed Communications Network", which outlines packet-switching networks.

This paper did discuss nuclear war, and is probably the source of the false rumour that the Internet was built with the goal of withstanding a nuclear attack. In the year 1965 Ted Nelson coined the word 'hypertext'. Tom Van Vleck and Noel Morris created a Mail Command for the Compatible Time-Sharing System at MIT. Watching the unfolding of events and inventions, on April 19, Gordon Moore declared that computing power will double every 18 months, a prophecy that holds true today and is known as Moore's Law. Moore and Robert Noyce later left Fairchild semiconductor to start Intel in the summer of 1968.

In October 1965, Thomas Marill and Lawrence Roberts set up the first WAN (Wide Area Network) between MIT's Lincoln Lab TX-2 and System Development Corporation's Q-32 in California. Later they would write "Toward' a Cooperative Network of Time-Shared Computers", describing it.

In 1966 Scientists used fiber optics to carry telephone signals for the first time. In the same year, Donald Davies coined the term 'packets' and

'packet switching'. ARPA's Bob Taylor received funding for a networking experiment that would tie together a number of universities the agency was funding. With no formal requests and in under an hour, Charles Herzfeld agreed to fund what, three years later, would become the ARPANET.

In 1967 Wesley Clark came up with the idea of using dedicated hardware to perform network functions while at a meeting of ARPA principal investigators. The devices would eventually be called Interface Message Processors (IMP's), and today are generally referred to as routers. Still in 1967, the final standard for ASCII was published (An earlier version that included only upper-case letters was proposed' by Bob Bemer in May 1961.) By June of the same 1967, Lawrence Roberts published the first design paper on ARPANET entitled "Multiple Computer Networks and Intercomputer Communication" ACM's Gatlinburg conference.

The first WAN to use packet switching was tested at the National Research Laboratory (NRL) in Great Britain in the year 1968. In April of the same year, Joseph Licklider and Robert Taylor published the computer as a Communication Device. By August, Larry Roberts of ARPA released a Request for Quotation (RFQ) looking for bids to construct a network of 4 IMPs, with possible growth to 19. Many large companies like ATT and IBM do not submit bits, saying that such a network was not possible. But by December, a small consulting company called Bolt Beranek and Newman (BBN) located in Cambridge won the ARPA IMP: contract. The group, headed by Frank Heart, would have $1 million and less than a year to turn theory into a working system.

'Sometime in March' 1969, Honeywell delivered the first IMP prototype (IMP 0) to BBN. The unit was a modified version of Honeywell's rugged 516 computer. Unfortunately, it didn't work correctly; Ben Barker spent several weeks rewiring it by hand into the correct configuration. In April 7th 1969, Steve Crocker created the first "Request for Comment (RFC)" document titled 'Host Software' (RFCI). It outlined the interface between hosts and BBN's IMP devices, each site would be responsible for creating the host software that connected their computers to the ARPANET's IMPs. The name RFC was chosen to avoid sounding too self-righteous. Crocker hoped to create an environment in which everyone felt comfortable participating; a spirit which would help the network to thrive in the coming decades. In July

20th 1969, the information systems transmitted the pictures of man from the moon to the earth, this is Apollo 11 landing on the Moon. Neil Armstrong became the first man on the Moon. While Buzz Aldrin became the second man. They spent 21.5 hours on the lunar surface, including 2.5. hours outside their lunar excursion module while millions watched from the earth.

**INTERNET SPREADS TO THE SCHOOLS**

By September 2nd 1969, 'The IMP Guys' from BBN finished installing the first ARPANET IMP node (IMPl) at UCLA. It was attached to the school's SDS Sigma-7 without a hitch. October 1st, saw The ARPANET's second node set up at the Stanford Research Institute (SRI), connecting to their SDS 940. In October 29th, after a bit of tweaking, the first connection was made from UCLA to the SRI machine over the 50Kbps connection and, after typing "1" and "0" of the login command, the SRI system crashed. The two computers were finally successfully linked up on November 21st. On December 1st IMP number three was installed at the University of California at Santa Barbara and by December, the fourth node was installed at the University of Utah.

Norman Abrahamson of the University of Hawaii developed ALOHAnet with funding from ARPA in 1970. It carried data at a lowly 4.8Kbps, but would lay the groundwork for Ethernet several years later. By March 1970, the fifth ARPANET node was installed at BBN's headquarters and in December ARPANET hosts started using Network Control Protocol (NCP) created by the Network Working Group' (NWG) headed by Steve Crocker.

By the year 1971, ARPANET had 15 sites (23 total hosts): UCLA, SR): UCSB, University of Utah, BBN, MIT, RAND, SDC, Harvard, Lincoln Lab, Stanford, UIU(C), CWRU, CMU, NASNAmes and averaged about 700,000 packets per day. The same 1971, Project Gutenberg was started by Michael Hart. Its first text was the US Declaration of Independence. Studies about the computer date system showed a non-compliance of date structure by "'the year 2000. This led to a publication in a Honeywell Computer Journal editorial titled 'What's' Date?'. In this publication, Bob Bemer published the first warning about the Y2K bug. On June 23rd, RFC 172 was released establishing the File Transfer Protocol (FTP). In September 1971, the first Terminal Interface Processor (TIP) was deployed on the 'ARPANET, which

enabled computer terminals to connect directly into the ARPANET for the first time. In March 1972, BBN's Ray Tomlinson created the first software (SNGMSG and READMAIL) that allowed e-mail to be sent between computers. E-mail quickly became the network's most popular application. On March 23rd, ARPA's name was changed to the Defense Advanced Research Projects Agency (DARPA), and was established as a separate defense agency under the Office of the Secretary of Defense. On April 3rd, Jon Postel created the 1st Telnet specification (RFC 318) entitled: 'Ad hoc Telnet Protocol'. In

October Bob Kahn organised a demonstration of ARPANET between 40 machines at the International Conference on Computer Communications. The Inter-Networking Group (INWG) was created to develop standards for the ARPANET: Vinton Cerf was named the chairman.

1973 saw the first international connections to the ARPANET: this connection was between the University College of London in England and the Royal Radar Establishment in Norway. With this ARPANET traffic grew to more than 3 million packets 'per day. In March, Vinton Cerf sketched his gateway architecture on the back of envelope while sitting in a hotel lobby, building on Bob Kahn's ideas for an improved version of NCP. On May 22nd, Robert Metcalfe wrote a l3-page description of what would become Ethernet as part of his 'Harvard PhD thesis. He and David Boggs would later create the first ethernet network (running at 2.944 Mbps) between computers named Michelson and Morley. Between October 15th and 17th Ken Thompson and Dennis Ritchie presented their first paper on UNIX at the Symposium on Operating Systems Principles at Purdue University.

**The Birth of TCP**

In May 1974, Vint Cerf and Bob Kahn published 'A Protocol for Packet Network Internetworking', which established the Transmission Control n July 1975, the AEPANET was transferred by DARPA to the Defense Communications Agency (now, the Defense Information Systems Agency) as an operational network. In November, Jon Postel noted that the design of most mail systems made it difficult to block junk mail. This was a foresight

that was proved to be correct when spam began to fill user's mail boxes twenty years later.

In 1976, UUCP (Unix-to-Unix Copy) was developed at AT&T Bell Labs. It was distributed with UNIX one year later. In the same 1976, Leonard Kleinrock published the first book about ARPANET technologies: 'Queueing Systems Volume II - Computer Applications' which helped packet switching gain wide-spread acceptance. The CCITT (now the ITU) defines the X.25 protocol for public packet switched networks. During their presidential campaign in USA, Jimmy Carter and Walter Mondale used e-mail every day during their campaign to coordinate itineraries. Then a single message cost $4. In February 1976, Queen Elizabeth II of England became the first head of state to send an e-mail message.

On January 3rd, 1977 Apple Computer was incorporated in the state of California by Steve Jobs and Steve Wozniak. In March, the ARPANET had 111 computers attached to it. The first Cray-1 computer was shipped to Los Alamos National Laboratory. The computer was designed by Seymour Cray and had 8 megabytes of memory, a peak speed of 160 megaflops, and a price tag of $8.8 million. In April, Dennis C. Hayes sold his first modem product to computer hobbyists. He went on to create the Hayes Standard AT command set in June 1981, which became the de-facto standard for modem interfaces.

In July of 1977, Vint Cerf, Bob Kahn and others demonstrated the first gateway system connecting packet radio and the ARPANET.

In 1978, the Aspen Movie Map was shown at MIT. It was the first hypermedia videodisc. The same year, Vint Cerf, Steve Crocker, and Danny Cohen created a plan to separate TCP's routing functions into separate protocol called the Internet Protocol (IP), error handling datagram functions would remain a part of TCP. The University' California at Berkeley released Berkeley Software Distribution (BSD - UNIX based on version 7 of ATT's UNIX. On May 3rd, the unsolicited e-mail message was sent to 400 people across the ARPANET by Gary Thuerk inviting west coast users to a demonstration of Digital Equipment Corporation's new Decsystem-20 computer.

In 1979, DARPA established the Internet Configuration Control Board (ICCB) to help the process of creating the gateways between hosts and the network. On April 12th, Kevia MacKenzie sent the first ever emotion picture in a message to the MsgGroup. The first was with a tongue-in-cheek. On October 27th 1980, The ARPANET stopped functioning for several hours when the routing processes in all of the IMPs crashed after one of them corrupted the network's routing tables.

In the year 1981, Ted Nelson conceptualised 'Xanadu', a central, pay-per-document hypertext database encompassing all written information. On August 12th, IBM released its IBM Persona'! Computer. It retailed for between $1500 and $4500 and sold more' than 65,000 in the first 4 months. On September 1st RFC 791, which defines Internetwork Protocol version 4 (IPv4), was released.

In 1982, the Defense Data Network was created (soon to become the Milnet). And in March, Richard Delauer, the United States Under Secretary of Defense, issued a military directive .. It established the Transmission Control Protocol (TCP) and Internet Protocol (IP), as the protocol suite for ARPANET (and all military networks). The cutover date was, as at then, set for January lst 1983. In June, the first Drew Major, Kyle Powell, and Dale Neibaur demonstrated PC LAN at the National Computer Conference. Their software would eventually become Novell's Netware. In October Eric Rosen finished the External Gateway Protocol (RFC 827) specification.

The separation of the Military and the ARPANET and the coining of the word CYBERSPACE.

The year 1983, saw to a significant distinction. The Internet became a reality when the ARPANET was split into Military and Civilian sections. On January 1st 1983, the entire ARPANET switched from NCP to IP. The transition was said to have gone smoothly. On June 23rd, Jon Postel and Paul Mockapetris of the University of Southern California ran the first successful test of their automated 'domain name system, which allowed users to use human-readable names for machines instead of needing to use the machine's physical address. In November 1983 Paul, Mockapetris published RFCs 882 and 883 which outline the Domain Name Service. Paul's first implementation of a DNS server was called JEEVES. Kevin Dunlap and later

Paul Vixie would soon write BIND, which is by far the most common implementation today. By December 1983, Mike Muuss had written Ping while at the US Army Ballistics Research Laboratory.
In 1984, William Gibson coined the, term 'cyberspace' in the novel 'Neuromancer'.

In May 1985, Quantum Computer Services was founded. In November, its first online service Q-Link, was launched on Commodore Business Machines. The company would' become American' Online in October 1991.

In July 1986, The National Science "Foundation established 5 super-computing centers' to provide high-computing power for all (JVNC at Princeton, PSC at Pittsburgh, SDSC at UCSD, NCSA aa UIUC, Theory Center at Cornell). The NSFNE was created to connect the sites with a backbone speed of 56Kbps. In August, Dan Lynch organises the first TCP/IP Implementor's Workshop (which would become Interop in a few years), and held it in Monterey.

In 1987, the number of Internet hosts broke 10,000 and the NSF signed an agreement to manage the NSFNET backbone with Merit Network, Inc. By August, Apple Computer introduced HyperCard, the first widely; available personal hypermedia authoring system. In the same month, Jeff Case, Mark Fedor, Martin Schoffstall, and James Davin showed off their Simple Gateway Monitoring Protocol (SGMP). Amazingly, a major Internet outage occurred during the presentation, showing just how badly the system was needed. Their protocol- would later evolve into SNMP."

On December 9th, any form of information was entirely transmitted. That was the Christmas Virus, which found its way onto BITNET, causing many mail servers to crash because of the overload. Eventually much of the network was shut down for a time to stop its spread. On December 18th, Larry Wall released the first version of his Practical Extraction and Reporting Language, Pearl (its name would soon be shortened to simply Perl).

**Establishment of Transatlantic Fiber Optic and the Birth of Ethernet**

1988 saw the establishment of the first transatlantic fiber-optic cable linking North America and Europe. It was able to handle 40,000 telephone calls simultaneously. Another important event was that Van Jacobson wrote

"traceroute" while at Lawrence Berkeley National Lab after a conversation with Steve Deering of Stanford University.

This same year, Bernard Daines created the first Ethernet switch to add Ethernet support to Northern Telecom carrier-class telephone switches. In July the NSFNET, backbone was upgraded to DS-l (1.544Mbps) links. It handled more than 75 million packets a day. In August, Internet Relay Chat (IRC) was written by Jarkko Oikarinen at the University of Oulu, Finland. And on November 2nd, another dangerous information evolved. The Internet Worm was released by Robert Morris Jr. It affected about 6,000 of the 60,000 hosts on the Internet. CERT (Computer Emergency Response Team) was later formed by DARPA in response to concerns raised by the Worm.

By 1989, the number of Internet hosts exceeded 100,000. The IAB consolidated its growing list of task forces into two groups, the Internet Engineering Task Force (IETF) and the Internet Research Task Force (IRTF). The IETF (one of the original Task Forces) was given near term responsibility for developments and standards while the smaller IRTF focused on longer-range research. Steering, working, and research groups were all formed under the IETF and IRTF. In the same year, the first gateways between private electronic mail carriers and the Internet were established. The Cuckoo's Egg was written this year by Clifford Stoll. The book tells the real-life tale of a German cracker group who infiltrated numerous US facilities, and how Cliff traced and caught him after finding a 75 percent accounting error. In March, the first Web Project proposal was distributed by CERN's Tim Berners-Lee. His proposal was for a 'hypertext system' to aid the sharing of information between teams of researchers in the High Energy Physics community. In November 1989, the first specification for Point to Point Protocol (PPP) was released in RFC 1134. Today almost all dial-up Internet users use PPP to connect.

**The First World Wide Web Software was developed**

In the year 1990, Peter Deutsch, Alan Emtage, and Bill Heelan at McGill University released Archie. The Internet Toaster, developed by Simon Hackett and John Romkey made appearances at Interop. Patrick Naughton sent an angry resignation letter to the CEO of Sun Microsystems detailing the woeful state of the company's operating systems. The company

commissioned Naughton, Bill Joy, James' Gosling, and three others to create a solution to the problem. They would create a simple object-oriented programming language named Oak, which later evolved into Java few years later. In March 1990, the ARPANET ceased to exist. By November, the first Tim Berners-Lee created World-Wide Web software. And in December, Peter Scott introduced hytelnet.

In 1991, The number of Internet hosts exceeded 600,000. The NSFNET backbone was upgraded to DS-3 (44.736Mbps) as traffic passes 1 trillion bytes and 10 billion packets per month. Wide Area Information Servers (WAIS) was invented by Brewster Kahle. Pretty Good Privacy (PGP) was released by Philip Zimmerman. The Trojan Room Coffee Machine made its debut, which several years later became the first webcam.

The number of Internet hosts hits above one million

In 1992 the number of Internet hosts exceeded 1 million. The term Netizen was coined in an article by Michael Hauben entitled: The Net and Netizerls: The Impact the Net Has on People's Lives. In 1992 January, The Internet Society (ISOC) was chartered. The Internet Activities Board name was changed to the Internet Architecture Board as it started operating as a part of the Internet Society. On January 12th, the Line Mode Browser v1.1 (www) was made available by anonymous FTP. On February 12th Line Mode v1.2 announced on alt.hypertext, comp.infosystems,comp.mail.multi-media, cern.sting, comp.archives.admin, and several mailing lists. In June, Jean Armour Polly coined the term 'Surfing the Net'. The Internet Activities Board (IAB) met and decided to build a new version of IP out of CLNP.

In 1993, the number of Internet hosts exceeded 2 million. ISO 10646 Universal Multiple-Octet Coded Character Set was released. The White House and United Nations came on-line. Robert Hayden, created the first version of The Geek Code. In January; WinSock· 1.1 was released. WinSock standardised APIs used to create Windows-based,. TCPIP applications. Geoff Arnold and Martin Hall started it during Interopin 1991. On February 22nd 1993, DARPA was redesignated as the Advanced Research Projects Agency (ARPA) in President Clinton's strategy paper, 'Technology for America's' Economic Growth; A New Direction to Build Economic Strength'. On May 14th, Gleason Sackmann created the Net-happenings listsrv to

distribute announcements about the latest Internet resources. On July 5th, Peter Steiner's famous 'On the Internet, nobody knows you're a dog,' cartoon appeared on page 61 of The New Yorker, (Vol.69 (LXIX) no. 20). In August, the first World-Wide Web developers' conference was held in Cambridge, Massachusetts. On December, Marc Andressen left the NCSA to work for a small software company. He soon forms a partnership with SGI founder Jim Clark the partnership later became Netscape Communications Corp.
By 1994, the web was growing at annual rate of 341,634% and Gopher, 997%. The NSFNET backbone was upgraded to OC-3 (155mbps) links as traffic passed 10 trillion bytes per month. The first cyberbank, 'First Virtual', opened. In March, Marc Andressen and Jim Clark formed Mosaic Communications Corp. (now Netscape; Communications). On May 25th, the first international, WWW conference was held at CERN in Geneva. It was heavily oversubscribed and known as the 'Woodstock of the Web'. In July 1994, the number of internet hosts exceeded 3 million. The final specifications for IPv6 were released by IAB. They recommended 128 bit addresses, enough to number 1 quadrillion computers connected through 1 trillion networks. In August, the International WWW Conference Committee (IW3C2) was created by CERN and the NCSA. September 1st, the Internet! ARPANET celebrated its 25th anniversary. On October 10th, Mosaic Communications Corporation (now called Netscape Communications) announced the first version of its Netscape web browser (version 0.9 Beta).

**From Internet to World Wide Web**

So far, the net's development was almost entirely 'science-led'. All this time, however, we must remember that parallel advances in computer capacities and speeds (not to mention the introduction of glass-fibre cables into communications networks) were enabling the system to expand. This expansion, in its turn, started to produce supply' constraints, which stimulated further advances. By the early 1980s".' when the internet proper started operation, it was already beginning to face problems created by its own success. First, there were more computer 'hosts' linked to the net than had originally been envisaged (in 1984 the number of hosts topped 1000 for the first time) and, second, the volume of traffic per host was much larger (mainly

because of the phenomenal success of e-mail). Increasingly, predictions were voiced that the entire system would eventually grind to a halt.

One early, and essential development, was the introduction in 1984, of Domain Name Servers (DNS). Until then each host computer had been assigned a name, and there was— a single integrated list of names and addresses that could easily be consulted. The new system introduced some tiering into US internet addresses such as edu (educational), com. (commercial), gov. (governmental) in addition to org. (international organisation) and a series of country codes. This made the names of host computers easier to remember.

A second development was the decision by national governments to encourage the use of the Internet throughout the higher educational system, regardless of discipline. In 1984, the British government announced the construction of JANET (Joint Academic Network) to serve British universities, but more important was the decision, the following year, of the US National Science Foundation to establish NSFNet for the same purpose (one explicit requirement for receiving funding was that access had to be for "all qualified users on campus"). The American program involved a number of decisions that were crucial for the further development of the Internet:

The use of TCP/IP protocol was mandatory for all participants in the program.

Federal Agencies would share the cost of establishing common infrastructures (as trans-oceanic connections) and support the

gateways

NSFNet signed shared infrastructure 'no-metered-cost' agreements with other scientific networks, ARPANET), which formed the model for all subsequent agreements.

It threw its support behind the ''Internet Activities Board' (the direct descendant of the Internetworking Working Group established back in 1972) and encouraged international cooperation in further Research.

Finally, NSFNet agreed to provide the 'backbone' for the US Internet service, and provided five 'supercomputers' to service the envisaged traffic. The first computers provided a network capacity of 56,000 bytes per second but the capacity was upgraded in 1988 to 1,544,000,000 bytes per second.

There was one proviso: this facility excluded "purposes not in support of research and education".

Thirdly, the exclusion of commercial users from the back-bone had had the (intended) consequence of encouraging the development of private Internet providers. In 1985, it organised the first workshop, specifically targeting the private sector, to discuss the potentials (and current limitations) of TCP/IP protocols, beginning a dialogue between government/academic scientists and the private sector, and among private entrepreneurs themselves (who, from the beginning were thus able to ensure the interoperability of their products). In 1987, the first subscription based commercial internet company, UUNET was founded. Others followed. At this stage, the Internet was still quite a forbidding place for the uninitiated. Access commands to find data range from the complicated to the impenetrable, the documentation available was mostly (highly) scientific and the presentation unattractive (courier script, no colour). Also, finding required information was a pain in the neck and transfer times were relatively slow). The main attractions for the commercial sector are the e-mail facilities and access to e-mail, news groups, 'chat' facilities and computer games.

Although commercial exploitation of the net had started, the expansion of the Internet continued to be driven by the government and academic communities. It was also becoming ever more international. By 1989, the number of hosts surpassed 100,000 for the first time and had; climbed to 300,000 a year later. The end of the 1980s and the start of the 1990s provided a convenient cut-off point for several reasons:

In 1990, ARPANET (which had been stripped of its military research functions in 1983) became a victim of its own success. The network had been reduced to a pale shadow of its former self and was wound up.

In 1990, the first Internet search-engine for finding and retrieving computer files, archie, was developed at McGill University, Montreal.

In 1991, the NSF removed its restriction on private access to its backbone computers.

"Information superhighway" project came into being. This was the name given to popularise Al Gore's High Performance Computing Act which provided funds for further research into computing and improving the infrastructure of the Internet's (US) structure. Its largest provisions from 1992-

96 were $1,500 mln for the NSF, $600 mln for NASA and $660 for the Department of Energy.

Again in 1991, the World Wide Web was released to the public and, on a personal note, Richard T. Griffiths (famous for his phrase 'a user friendly interface is a secretary') got kicked into Word Perfect and was launched into cyber-space.

**The World Wide Web (WWW)**

The World Wide Web is a network of sues that can be searched and retrieved by a special protocol known as a Hpertext Transfer Protocol (HTTP). The protocol simplified the writing of addresses and automatically searched the internet for ~the address indicated and automatically called up the document for viewing.

The WWW concept was designed in 1989 by Tim Berners-Lee and scientists at CERN (Geneva), the European: Centre for High Energy Physics, who were interested in making it easier to retrieve research documentation. A year later, he had developed a 'browser/editor' program and had coined the name World Wide Web as a name for the program. The program is released free on an FTP site. This does not sound very dramatic but anyone used to the hassle of getting documents previously will testify that it represented a major leap forward. Once the entire dial- and retrieve-language had been simplified, the next step was to design an improved 'browser', a system which allowed the links to be hidden behind text (using a Hypertext Markup Language, HTML) and activated by a click with the 'mouse'.

**The difference between "the Internet as it has then existed 2nd in the Web**

"The Internet ('Net) is a network of networks. Basically it is made from computers and cables', used to send around little "packets" of information. A packet is a bit like a postcard with a simple address on it. If you put the right address on a packet, and gave it to any computer which was connected as part of the Net, each computer would figure out which cable to send it down next, so that it would get to its destination. That's what the Internet does. It delivers packets, anywhere in the world, normally well under a second.

Lots of different programs use the Internet electronic mail, for example, was around long before, the global hypertext system was invented and called the World Wide Web ('Web). Now, videoconferencing and streamed audio channels are among other things, which, like the Web, encode information in different ways and use different languages between computers ("protocols") to provide a service.

The Web is an abstract (imaginary) space of information. On the Net, you find computers; on the Web, you find document, sounds, video information. On the Net, the connections are cables between computers; on the Web, connections are hypertext links. The Web exists because of programs, which communicate between computers on the Net. The Web could not be without the Net. The Web, made the Net useful because people are really interested in information (not to mention knowledge and wisdom!) and do not really want to know about computers and cables.

The development of the ever-more powerful (and cheap) personal computers increased both the number of netizens (net citizens) and the potential market for businesses. There was also the increase in capacity of the communications infrastructure. With all these developments put together, the Web now exploded.