COMPUTER STUDIES

FORM 1 NOTES

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INTRODUCTION TO COMPUTERS

Chapter outline

1.1 *Introduction.*

1.2 *Parts* of a *computer.*

1.3 *Classification* of *computers.*

1.4 *Development* of *computers.*

1.5 *Areas where computers are used.*

1. 6 *The computer laboratory.* 1.7 *Practical hands on skills.*

1.1

Introduction

In the past, people have used slow and unreliable methods to generate, send, receive and store information. However, today millions of people are using devices called *computers* to produce, share and store information. Before embarking on taking Computer Studies as a course, it will be necessary to ask the question: What is a computer?

Definition of a computer

A computer is an electronic device that accepts *user input* also referred to as *data* and transforms it under the influence of sets of special instructions called *programs* to produce the *desired output referred* to as *information.*

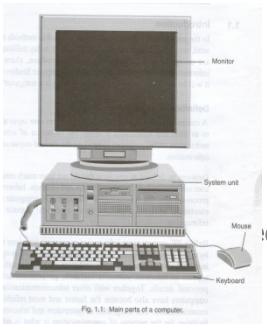
Data can be defined as *raw facts* that do not have much meaning to the user and may include: numbers, letters and symbols. Information is the processed data that is meaningful to the user. The computer is said to be electronic because it utilizes small electrical signals to process information.

Before 20th century, most information processing was done manually or by use of simple machines. Today, millions of people are using computers

In offices and at home to produce and store useful information about all Aspects of business, scientific research, government activities and Personal details. Together with other telecommunication facilities, computers have also become the fastest and most reliable means of communication. The integration of computers and, telecommunication facilities *for* the purpose of communication is what is referred to as *information and communication technology* (ICT).Computers come in different sizes and designs but the most common is a computer referred to as a *personal computer (PC).* Personal computers are mostly used in offices, schools, business premises and at home.

1.2

Parts of a computer



A computer is made up of a collection of different components that are interconnected together in order to function as a single entity. A computer is basically made up of a *system unit* and other devices convicted to the system unit

called *peripheral devices.* Examples of peripheral devices include; the monitor, the keyboard and the mouse.

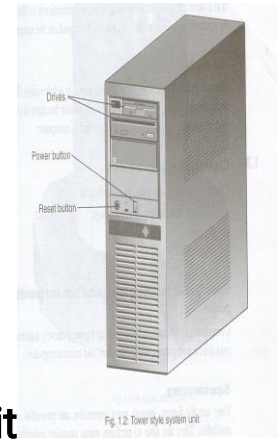


Fig. 1.2: Tower style system unit

The system unit

This is the part that houses *the brain* of the computer called the *central processing unit (CPU).* The system unit also houses other devices called *drives.* Drives are used to store, record and read data.

Figure 1.2 shows a *tower* style system unit.

Peripheral devices

Peripheral devices are connected to the system unit using special cables called *data interface cables* that carry data and information to and from the devices. The cables are attached to the system unit using connectors called *ports.* .

Peripheral. Devices may be arranged as shown in Figure 1.1 with the *monitor* resting on top of the system unit. Sometimes, the system unit may be made to stand alone (tower style) as the one in Figure 1.2.

The keyboard

It is the most common device that enables the user to enter data and instructions in the computer by pressing its keys.

The mouse

It is a device that enables the user to issue instructions to the computer

By controlling a special mouse pointer displayed on the screen.

The monitor

The computer monitor or simply the screen is a television like device used for displaying output. It is called a *monitor* because it enables the user to monitor or see what is going on in the computer.

1.3

Classification of computers

Computers can be categorised according to:

1. Physical size and processing power.

2. Purpose.

3. Functionality.

Classification according to physical size and processing power

Computers can be classified into four main groups namely supercomputers, mainframe computers, minicomputers and microcomputers.

Supercomputers

They are the fastest, largest, most expensive and powerful computers available. They are able to perform many complex calculations in a fraction of a second. Because of their extreme weight, a supercomputer is kept in a special room. Due to their huge processing power supercomputers generate a lot of heat. Special cooling systems are therefore required. Sometimes the whole CPU is

immersed in an aquarium like tank containing liquid fluorocarbon to provide cooling.

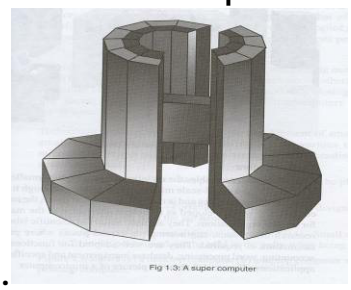


Fig 1.3: A super computer

Supercomputers are mainly used for scientific research, which requires enormous calculations. Applications that justify use of supercomputers include aerodynamic design and simulation, petroleum research, defense and weapon analysis among others. Supercomputers are mainly found in developed countries such as in USA where they are used for advanced

Scientific research such as nuclear physics. Figure 1.3 shows an example of supercomputer.

Mainframe computers

They are less powerful and less expensive than the supercomputers. While supercomputers may be described as giant computers, the mainframes are said to be big in size. They are used for processing data and performing complex mathematical calculations. They have a large storage capacity and can support a variety of peripherals.

Fig. 1.4: Mainframe computer

Mainframe computers handle all kinds of problems whether scientific or commercial. They are mostly found in government agencies, big organizations and companies such as banks, hospitals, airports etc. which Have large information processing needs. Figure 1.4 shows a picture of a mainframe computer.

Minicomputers

A minicomputer resembles the mainframe but is slightly smaller. Thus it is referred to as a small-scale mainframe computer. Although it supports fewer peripheral devices and is not as powerful and fast as the mainframe computer, it was developed as a cheaper alternative to the mainframes for smaller organizations. They are used mainly in scientific laboratories, research institutions, engineering plants and places where processing automation is required. They are well adapted for functions such as accounting, word processing, database management and specific industry applications. Figure 1.5 shows a picture of a minicomputer.

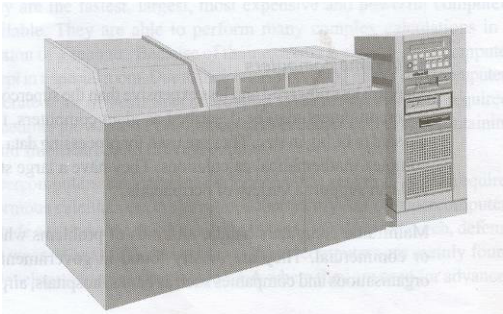


Fig. 1.5: A Minicomputer

Microcomputer

A microcomputer is the smallest, cheapest and relatively least powerful type *of* computer. It is called a microcomputer because; its CPU is called a *microprocessor,* which is very small compared to that *of* a mini, mainframe or supercomputers. Microcomputers are also called *personal computers (PC)* because they are designed to be used by one person at a time.

Microcomputers are commonly used in training and learning institutions, small business enterprises, and communication centers among others. Today, the

power *of* microcomputers has grown tremendously closing the gap that formerly existed and reserved for the minicomputers and the mainframes.

Technological advancement has seen the development *of* smaller and smaller microcomputers. The following are the various types *of* microcomputers in operation today arranged in descending order according to size.

1. *The desktop computer*

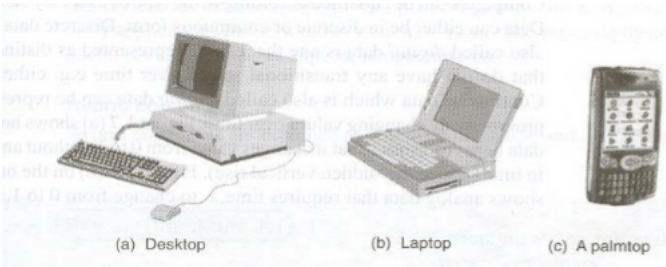
-Not portable. It is designed to be placed on Top *of* an office desk.

2. *The laptop computer*

-Portable like a briefcase. It is designed to be used by placing it on the lap hence its name.

3. *The palmtop e.g. personal digital assistant (PDA)*

- Small enough to fit in the pocket and can he held in the palm when being used.



Classification according to purpose

Computers can be classified according to the tasks they perform either as *general* or *special purpose computers.*

General-purpose computers

General-purpose computers have been designed to be able to perform a variety of tasks when loaded with appropriate programs. They are the most common

types of computers in use today. Their flexibility enables them to be applied in a wide range of applications like document processing, performing calculations, accounting, data and information management among others.

Special purpose computers

Special purpose computers are designed to serve a specific purpose or to accomplish one particular task. Such computers can perform no other task except the one they were meant to do. This means that the set of instructions, which drive a special purpose computer, are limited in number at the time of manufacture. Examples of such computers include, robots used in a manufacturing industry production line, mobile phones for communication only and electronic calculators that carry out calculations only.

Since special purpose computers are dedicated to a single task, they can perform the task quickly and very efficiently.

Classification according to functionality

Computers can be classified according to the type of data they can process. Data can either be in discrete or continuous form. Discrete data which is also called *digital* data is one that can be represented as distinct values that do not have any transitional stages over time e.g. either 1 or O. Continuous data which is also called *analog* data can be represented as progressively changing values overtime. Computers can be classified as digital, analog or hybrid.

Digital computers

Digital computers process digital data only. Any data to be manipulated by a digital computer must first be converted to digital form. Most home appliances today are also digital in nature. For example to increase the volume of a digital television you simply press a button and it changes from 1 to 2, 3 If the same

television is analog, it would have a knob

that you can continuously turn round or slide in a slot to increase or decrease the volume.

Analog computers

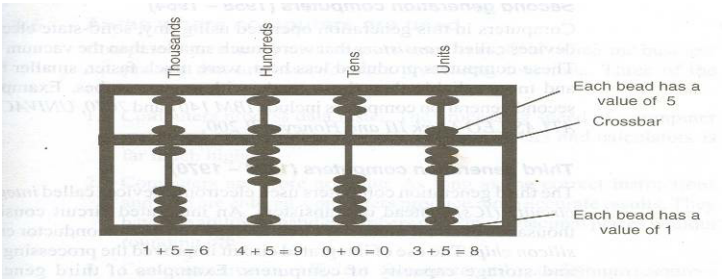
This refers to computers that process data that is analog in nature. Analog computers solve problems by measuring the amount of change that occurs in quantities like speed, temperature and pressure. An analog machine is usually a special purpose device that is dedicated to a single task. Analog computers are used in manufacturing process control like monitoring and regulating furnace, temperatures, and pressures. They are also used in other applications like in weather stations to record and process physical quantities e.g. wind, cloud speed, temperature etc.

Hybrid computers

Hybrid computers are designed to process both analog and digital data.

1.4 Development of computers

Before 1900, most data processing was done manually using simple tools like stones and sticks to count and keep records. Around 2000 years ago, Asian merchants came up with a special calculating tool called *abacus that* could be used to calculate large figures. Abacii, are still in use even today. An abacus is made up of a rectangular frame and a crossbar at the middle. It is fitted with wires or strings running across from the frame to the crossbar as shown in Figure 1.8.



, 1+5=6

Each bead has a value of 5

Crossbar

Each bead has a value of 1 4+5=90+0=0

3+5=8

Fig. 1.8: Representing numbers using an abacus

8 **How to represent a number using an abacus**

Each bead in the lower row represents unitary values while the upper ones represent fives. To represent a number, the bead is moved to the crossbar. Those beads away from the crossbar represent zeros. The abacus in Figure 1.8 represents the number 6 908 (six thousand nine hundred and eight).

The first machine after the abacus that is usually regarded as the forerunner of modem computers was developed by an English mathematician called *Charles Babbage* and was named the *analytical engine.* After the death of Babbage in 1871 there was little improvement on his work until the 1930s. The first computer-like machine Mark 1 was designed by Professor Howard Aken of Horrard University in 1939. Mark 1 became operational in 1943. It weighed 5 tons and was 16 m long. Since then, rapid advancements in computing have been realized and can be categorised into *five generations.*

First generation computers (1940s to 1958)

These computers were very large in physical size and used thousands of

electronic gadgets called *vacuum tubes* or *thermionic valves.* These types of computers consumed a lot of power hence they constantly broke down due to the excessive heat generated. Examples of such computers are the *electronic numeric integrator and calculator (ENIAC)* and the *electronic discrete variable*

automatic computer (ED VA C).

***Second** generation computers* (1958 -1964)

Computers in this generation operated using tiny, solid-state electronic devices called *transistors* that were much smaller than the vacuum tubes. These computers produced less heat, were much faster, smaller in size and more reliable than those made with vacuum tubes. Examples of second-generation computers include *IBM 1401* and *7070, UNIVAC 1107, ATLAS LEO Mark III and Honeywell 200.*

Third generation computers (1964 *-1970)*

The third generation computers used electronic devices called *integrated circuits (ICs)* instead of transistors. An integrated circuit consists of thousands of small transistor circuits etched on a semiconductor called a *silicon chip.* The use of integrated circuit improved the processing speed and storage capacity of computers. Examples of third generation computers included smaller and less expensive minicomputers such as *IBM 360* and *ILL 19000 series.*

Fourth generation computers (1970** to **present)

51 From 1970, further technological improvement was done on the silicon chip design by compressing

more tiny circuits and transistors into even smaller space. This design produced what is called *large scale integrated (LS1)* and *very large scale integrated (VLS1)* circuits which were used in the innovation and technological development of the brain of the computer called the *microprocessor.* A microprocessor is a complete central processing unit (Processor) used in microcomputers. The result was development of very small computers with very high processing speed. The first microcomputer was called *Apple* 11

Other fourth generation computers included *IBM 370 and 4300, Honeywell DPS -88 and Burroughs 7700.*

Fifth generation computers

In this generation falls today's computers that have very high processing power and speeds than their predecessors, and whose size is increasingly becoming smaller. These computers have special *instruction sets* that allow them to support complex programs that mimic human intelligence often referred to as *artificial intelligence.*

A lot of research is being done to try and come up with a machine that can work without human intervention. One of the most successful developments in this field is the advent of computers that can help managers to make decisions and those that can offer critical expert services to users instead of relying on human professionals.

Areas where computers are used

Computers have many advantages over other types of office and business equipments that are used for data processing functions. Three of the advantages are:

1. Computers process data faster. The processing speed of a computer measured against other devices like typewriters and calculators is far much higher.

2. Computers are more accurate. As long as the correct instructions and data are entered, computers W produce more accurate results. They have the ability to handle numbers up to many decimal places without rounding off.

3. Computers are more efficient. A computer utilizes minimum resources, to process data as compared to human beings or other machines. For example computers require less effort to process repetitive tasks. In our day to day

activities, we use computers in almost every aspect of our lives. The following are some of the areas where computers are used.

Supermarkets

Most retail stores use computers to help in the management of daily activities like *stock control.* The stock control system keeps account of what is in store, what is to be sold and what is out of stock. The management is automatically alerted when a particular item or items are running out of stock and need reordering.

Offices

Computers have increased efficiency in offices by reducing the time and effort needed to access and receive information. Most modern office functions have been automated for faster message distribution and document processing.

Banks

Special cash dispensing machines called *automated teller machines (ATM* s) have enabled automation of cash deposit and withdrawal services. Efficiency has also been increased due to better record keeping and document processing brought about by computers.

Industries

Computers are being used to monitor and control. Industrial processes. The computer age has seen the wide use of remote controlled devices called *robots.* A robot is machine that works like a human being but performs tasks that are too unpleasant, dangerous, or complex and tedious to assign to human beings.

Hospitals

Computers are used to keep patients records in order to provide easy access to a patient s treatment and diagnosis history. Computerized medical devices are now being used to get a *cross sectional view of the Patient* s *body* that enables physicians to get proper. Diagnosis of the affected part of the body with high levels of accuracy. Computers also control life support machines in *intensive care units (ICU).*

Transport

Computers are used to monitor vehicle traffic in a busy town, aircraft navigation and to make reservations.

Communication

Integration of computers and telecommunication facilities has made message transmission and reception to be very fast and efficient. Because of the speed with which information can be transmitted around in the world using computers the world is said to have become a *global village.*

Law enforcement agencies

Information held in computers such as fingerprints, photographs and other identification details helps law enforcers to carry out criminal investigations speedily.

Education

Computers are widely used in the teaching and learning process. Learning and teaching using computers is referred to as *computer-aided learning (CAL)* and *computer aided teaching (CAT).* For example experiments in subjects like Chemistry or Physics may be demonstrated using a special computer programs that can depict them on the screen through a process called

simulation.

Domestic and entertainment

Computers can be used at home for recreational activities such as watching movies, playing music and computer games. They can also be used in storing personal information, calculating, keeping home budgets and for research in various fields.

Library services

In a computerized library, a computer enables library personnel to easily access and keep updated records of books and other library materials. Library users can also use computers to search for titles instead of using the manual card catalogue.

1.6 The computer laboratory

A computer laboratory is a room that has been specially prepared to facilitate installation of computers and to provide a safe conducive environment for teaching and learning of computer studies. The following factors must be considered when preparing a computer laboratory.

1. Security of computers, programs and other resources.

2. Reliability of the source of power.

3. The number of computers to be installed and the available floor space.

4. The maximum number of users that the laboratory can accommodate.

Safety precautions and practices in the computer Laboratory

After the establishment of the computer laboratory, a number of safety

precautions, rules and practices need to be observed in order to avoid' accidental injury to the users, damage of computers or lack of a conducive environment for teaching and learning. The safety precautions and practices include:

Behavior in *the computer laboratory*

The following rules must be followed in and around a computer laboratory.

1. Avoid smoking or exposing computers to dust. This is because smoke and dust contain small abrasive particles that can damage computer components and cause wearing of moving parts.

2. Avoid carrying food and beverages to the computer room. Food may fall into the moving parts of the computer and damage them. Liquids may spill into computer parts causing rusting or electrical defaults.

3. Avoid unnecessary movements because you may accidentally knock down peripheral devices.

4. At all times follow the correct procedure for starting and shutting down the computer to avoid loss of data and damage to computer Programs.

5. Do not open up the metallic covers of computers or peripheral devices without permission and particularly when the computers power is still on.

Protection against fire

A computer room should have gaseous fire extinguishers like those filled with carbon dioxide. Water based or powder extinguishers should be avoided because they can cause damage to computer components.

Cables insulation

All power cables in the computer room must be properly insulated and laid away from busy pathways in the room. Lay them preferably along the wall in trunks. This avoids the danger of exposing the user to electric shock and power interruptions caused by stumbling on cables.

Stable power supply

Computers are delicate devices that require a stable source of power. Power from mains supply is not always stable and may sometimes experience power surges or under voltage sometimes referred to as brownout. To protect the computer from being damaged due to power instabilities, avoid connecting it directly to the mains supply. Instead, connect it to a special device called *un-interruptible power supply* (UPS) then connect the UPS to the mains as shown below

The UPS charges when mains power is on and has power surge and. brownout protection capabilities. When the mains power goes off, it gives some sound alert (usually a beeping sound) to alert the user.

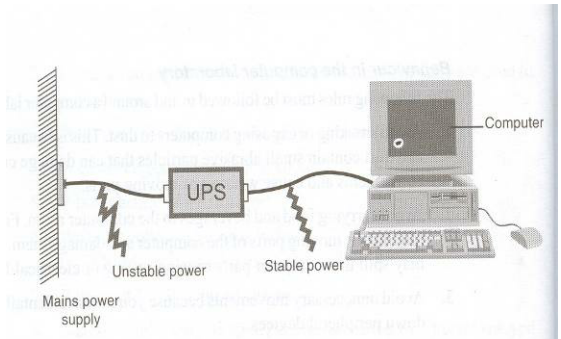


Fig. 1.9 A computer connected to a UPS

The UPS performs two main functions namely:

1. It regulates power from an unstable power source to the required Clean stable voltage by eliminating surges and brownouts.

2. It temporarily provides power to the computer in case of a sudden power failure hence allowing the user to store his/her work and shut down the computer using the correct procedure

To enable continuity of work even in the absence of mains power, organizations that give critical services like banks, schools and hospitals usually install a *standby generator* that automatically comes on in case of a power failure. Power from the generator *must* pass through a UPS before being

fed to the computer because it is also *not stable.*

NB: Generally speaking, devices that provide alternative source of power are usually referred to as *power backups.*

Burglar proofing

To deter unauthorized access to the computer room, it is important to implement the following controls.

1. Fit strong metallic grills and locks on doors, windows and roof in Case the roofing is weak.

2. Do not welcome strangers into the computer room.

3. Consider installing security alarms at strategic access points that would alert the security personnel in case of a break in.

Ventilation

There must be good air circulation in the computer room to avoid suffocation and overheating. Remember that both computers and human beings emit heat energy into the environment. Proper ventilation enables the computer to cool and hence, avoids damage to electronic parts that can be caused By overheating. Proper ventilation can be ensured by:

1. Ensuring that the room has enough ventilation points like windows.

2. Installing an air-conditioning system.

3. Avoiding overcrowding of either machines or people in the room.

Dust and dump control

a computer laboratory should be located away from excessive dust. The room

should also be fitted with special curtains that would reduce entry of dust particles. Computers must remain covered using dust covers when not in use.

Humidity should be at an optimum of 50%. Humidity lower than this allows static electricity to build up and causes damage to sensitive electronic components. also high humidity of over 70% cause rusting of the metallic parts of the computer system. To prevent both high and low humidity place humidifiers in the room

Lighting

a well lit computer room prevents eyestrain that eventually leads to headaches, stress and fatigue. It is important to adjust the brightness of the computer monitor until the eyes feel comfortable before using a computer to avoid damaging your eyes:

fit *radiation filter screens.* Which are specially *tinted* to reduce the light that reaches the eye. Avoid using *a flickering monitor* because this can cause extreme eyestrain that can damage eyesight.

Standard furniture

The table on which a computer is placed must be strong and wide enough to bear the weight and accommodate all the peripheral devices. The chair for the user must be comfortable, and have a straight backrest for one to sit upright as illustrated below to avoid muscle pains and backaches caused by poor posture. The seat must be high enough relative to the table for comfortable use of the hands on the keyboard and the eyes must be the same level as the top of the screen when the user is seated

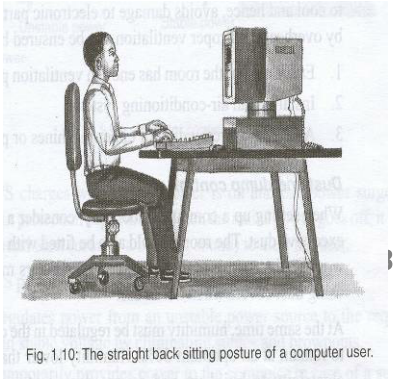


Fig. 1.10: The straight back sitting posture of a computer user.

Practical hands on skills

Starting-up (Booting) a computer

1. make sure that all the components are properly

connected. The computer must be connected to an active power source.

2. Switch on the monitor first,

3. Switch on the system unit

When the power is on, the computer automatically goes through a process of self-test and preparation for use. This process is called *booting.* There are two types of booting namely:

cold booting

warm booting.

Cold booting

This happens when the computer, originally off, is switched on by pressing the power button of the system unit.

The computer starts by checking all its components to determine whether they are functioning correctly and whether they are available for use. This process is called the *power-on-self-test (POST).* During this process, the monitor will display information showing the status of each device being tested. In case one of the devices is faulty or missing, this process will halt and a message alerting the user is displayed on the screen. The special program that directs the POST process is called the *basic input output system (BIOS).*

When the POST process is over, the computer displays a prompt message requesting one to start using it.

Some computers have programs that require a person to identify them selves by providing a *user name* and a *password (a secret word given to the user)* before it can allow one to use them. The process of providing such information is called *logging on* and it is a security measure meant to deter unauthorized users from using the computer.

Warm ***booting (restarting)***

This happens when the computer, originally on, is forced to restart by pressing the restart button on the system unit or by pressing a combination of keys on the keyboard. It is also possible to warm boot a computer by using the restart command found in a special program called *an operating system.*

Shutting down a computer

It is important that the user follows the correct procedure of shutting down the computer at all times. If the procedure is not followed then loss of data, damage of programs and computer components may occur.

Procedure for shutting down a *computer*

1. Ensure that all the work has been properly stored. This process is called *saving.*

2. Close all programs that may be currently running.

3. If your computer is running on Microsoft Windows 98 or later versions then:

(a) Click the start button on the screen.

(b) Select the shut down command from the menu list.

(c) In the computer prompt that appears, select shut down then press the enter key on the keyboard. (d) After a few seconds the message **IT IS NOW** SAVE **TO TURN OFF THE COMPUTER** appears on the screen. Switch of the system unit then the monitor.

NB: Some system units switch themselves off automatically when you do steps 3 (a), (b) and (c) above.

Keyboard layout

The keys on the keyboard can be categorized into *five* groups as shown in Figure 1.11.

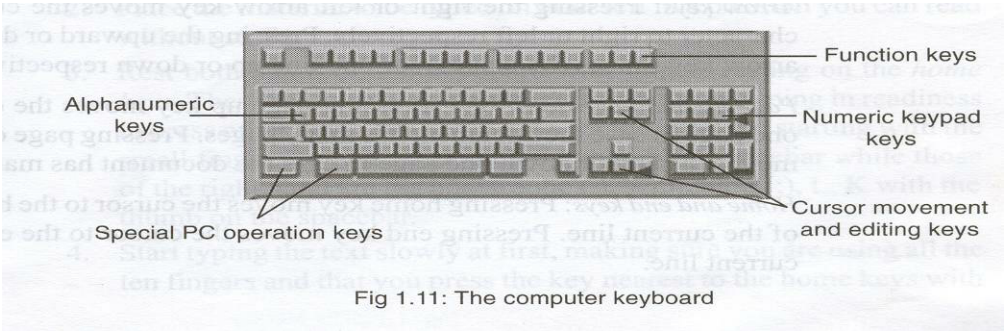


Fig 1.11: The computer keyboard

Alphanumeric keys

Keys are labeled with alphabetic letters A-Z, numbers arranged in a line 1,2, ……..0 respectively and symbols like:?,], % etc. This group also includes the following keys: cap lock, enter tab. space bar and backspace.

Caps lock key: Pressing this key let's the user type in upper case-letters,(capitals) To switch back to lower case letters simply press the same key again.

Enter key (return key): Pressing this key forces the text cursor to move to the beginning of the next line. A cursor is a blinking underscore (-) or a vertical beam (I) that shows where, the next character to be typed will appear. The enter key is also used to instruct .the computer to execute a command that has been selected on the screen.

Tab key: This key is used to move the text cursor at set intervals on the same line e.g. 10 mm, 20 mm etc.

The space bar: This bar creates a space between words during typing.

The backspace key: This key deletes characters from right to left on the same line.

Function keys

Function keys are usually located along the top of the keyboard. They are labeled FI, F2 up to FI2. They are used for tasks that occur frequently in various programs. For example pressing FI key in J most programs starts the HELP MENU.

Cursor movement *and editing keys*

Cursor movement keys are used to move the *cursor* on the screen. These keys are:

Arrow keys: Pressing the right or left arrow key moves the cursor one character to right or left respectively. Pressing the upward or downward arrow key moves the text cursor one line up or down respectively.

Page up and page down keys: Pressing page up key moves the cursor up one page in case the document has many pages. Pressing page down key moves the cursor down one page in case the document has many pages.

Home and end keys: Pressing home key moves the cursor to the beginning of the current line. Pressing end key moves the cursor to the end of the current line.

Editing keys are used to delete or insert characters in a document. These are:

Insert key: This key helps the user to insert or replace a character at the cursor position.

Delete (Del) key: This key deletes characters at the cursor position from left to right.

Special PC operation keys

These keys are rarely used singly but in combination with other keys to give special instructions to the computer. They include SHIFT, CTRL, ALT and ESC keys.

Numeric keypad keys

The numeric keypad consists of a set of numbers 0 to 9 and the arithmetic signs like + (addition), (minus), * (multiplication) and / (division). They are located on the right hand side of the keyboard. The keypad is meant to help the user to rapidly enter numeric data. The numbers on the numeric keypad can only be used when the, situated on the numeric keypad, is turned on.

Otherwise, they can be used as cursor movement and editing keys when num lock key is turned off. It is important to note that not all keyboards have the numeric keypad. For example portable computers may lack a separate numeric keypad due to size limitations.

Practical keyboard skills

TYPING RULES:

1. Sit upright with both feet firmly on the ground maintaining an alert Posture.

2. Place the material to be typed on your left in a position you can read Without strain.

3. Rest both hands on the keyboard with fingers resting on the *home keys.* These are keys on which fingers rest during typing in readiness to press other keys. The home keys for the left hand starting with the small finger are A, S, D, F with the thumb on spacebar while those of the right hand are the apostrophe (') semicolon (;), L, K with the thumb on the spacebar.

4. Start typing the text slowly at first, making sure you are using all the Ten fingers and that you press the key nearest to the home keys with the closest finger, e.g. to press Q, use the small finger on the left hand while to press J, use the index finger on the right hand.

Mouse skills

Mice (the plural of mouse) comes in various shapes, colors and designs. Today one can even get a mouse that uses wireless technology that is, it does not have a connection cable. Most mice have two buttons but some may have

three. Figure 1.12 is an illustration of a mouse.

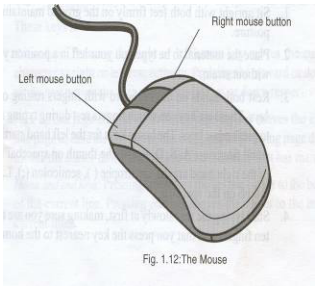


Fig. 1.12:The Mouse

Using the mouse

When the mouse is made to slide on a flat surface, it controls a pointer on the screen, which is called a *mouse pointer* or a *cursor.* To make a selection, the pointer must be on the item that is to be selected. After selecting, the user can manipulate the item by pressing a mouse button

USING THE MOUSE:

1. Place the mouse on a flat smooth surface.

2. Gently hold the mouse with your right hand, using the thumb and the two right-most fingers.

3. The index finger should rest on the left button while the middle finger rests on the right button.

NB: For left handed people, it is possible to change the mouse settings in order to comfortably hold it using the left hand.

*Terminologies **associated with the use of** **a** **mouse***

Clicking: This means pressing and releasing the left mouse button once. A click often selects an object.

Double clicking: This means pressing the left button twice in quick succession. Double clicking usually opens a file or starts a program

Right clicking: Pressing the right hand side mouse button once displays a list of commands from which the user can make a selection. This list of commands

is called a *shortcut menu or context sensitive menu.* It is called a context sensitive menu because the commands on it apply to the right clicked item.

Drag and drop*:* This is whereby the user drags an item from one location on the screen to another. The procedure to accomplish this operation is as follows:

1. Point to the item you want to drag.
2. Press the left hand side mouse button and hold it down
3. Slide the mouse until the pointer reaches the desired position on the screen.
4. Finally release the mouse button and the item will be dropped in the new location.

COMPUTER SYSTEMS

Chapter outline

2.1 *Introduction*

2.2 *Input devices*

2.3 *The central processing unit (CPU)*

2.4 *Output devices*

2.5 *Secondary (auxiliary) storage devices and media* 2.6 *Power and interface cables*

2.7 *Basic computer setup and cabling*

2.8 *Computer software*

2.9 *Criteria for selecting a computer system*

Introduction

In the previous chapter, you were introduced to some of the parts or devices that make up a computer. However, a computer system requires more than just a collection of devices. The term *system* can be defined as a collection of independent entities that collectively work together to achieve a desired goal.

The systems approach to computing was borrowed from the social scientists who believe that all things can be viewed as being made up of small independent components(subsystems) that come together to form a bigger more complex system. For example, a school can be seen as a system with the students, teachers, accounts department and the administration as subsystems. The school system itself is a subsystem of the ministry of education! Therefore, the term *computer system* refers to a collection of entities that work together to process and manage information using computers. It is important to note that, systems exist whether computerized or manual. However, the computer is replacing many manual processes hence the need to study the idea of a computer system. For example, a document processing system in the secretary s office can be made more efficient by computerizing it.

A computer system consists of three main components namely the *hardware,* the *software* and the *computer user (liveware).* All the physical components both mechanical and electronic that make up a computer system such as the monitor, the system unit, keyboard and mouse etc. are called *hardware. Software* is a set of computer programs that guides the computer in each and every activity that happens inside the computer during data processing operations. Human beings by themselves have the ability though limited, to process data and manage information. Computers have been designed to help human beings to enhance the efficiency of processing and managing information. It is the human being who issues commands to a computer

depending on his or her needs.

The hardware elements of a computer are generally grouped into four major categories namely input devices, central processing unit, output devices and storage devices.

Input devices

'Data may be entered into a computer using keying devices such as the keyboard, or using pointing devices such the mouse, or by devices that automatically capture data from the source referred to as *data capture devices* e.g. scanners and digital cameras, or by voice recognition devices such as microphones. The main purpose of input devices is to convert the human readable data into electronic or machine readable form.

Input devices can be classified according to how they are used to enter data. This includes:

1. Keying devices such as the keyboard, keypad etc.
2. Pointing devices such as mouse, trackball etc.
3. Scanning and other data capture devices.
4. Speech recognition or voice input devices.
5. Touch screen, digitizer and digital cameras.

Keying devices

Keyboard and keypad

These are the most common input devices. These devices enter data into a

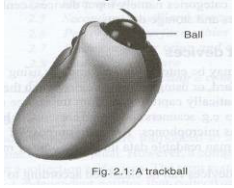


Fig. 2.1: A trackball

computer by typing. Apart from a few differences, a computer keyboard is similar to the typewriter keyboard. A keypad is a miniature (tiny) keyboard which is mostly used on small portable computers, calculators palm notes, mobile phones etc.

Pointing devices

These are the input devices that enter data or instructions by controlling a pointer on the screen. Apart from the mouse, the other pointing devices include the trackball, joystick and light pen.

Trackball

A trackball works just like the mouse but instead of moving it on a flat surface, a ball fixed on its top is rolled using the index finger. As the ball rotates, it moves a pointer on the screen; one can then click its button to execute the selected command. Figure 2.1 shows a *drawing* of a trackball. The advantage of a trackball over the mouse is that it neither requires an extra space nor a flat surface for movement. Today some computers are coming with a track ball on top of a keyboard and a mouse.

Joystick

A joystick is an input 
Fig 2.2 A Joystick
device that looks like a car

gear lever which can be moved sideways, upwards or downwards to control

the position of the cursor. Just like the mouse, it has a button which is used for selecting an item. It is commonly used in playing video games.

Light pen

A light pen is a hand held pen-like device that has a light sensitive point. A light pen can make selections, place images, draw and indicate dimensions by simply touching the screen. A light pen does not emit light 'but instead, it reacts to the light emitted by the display using a photosensitive. detector at its base.

Scanning devices

These are devices that enter (capture) data into the computer directly. Scanners can be classified according to the technology they use to capture data. These are *optical scanners* and *magnetic ink scanners.*

Optical scanners

These types of scanners capture data using light. A special type of concentrated beam of light is passed over the object, image or text which needs to be entered into the computer. The scanner converts the data into digital form and then passes it to the computer for processing. There are three types of optical scanners:

Optical mark recognition (OMR)

These types of scanners detect marks made on a piece of paper using a soft pen or pencil. The reader scans the marks with a special type of light called *infrared light.* Where there are no marks, a strong light is reflected than where one exists. These types of scanners are used in marking multiple choice questions, questionnaires, selecting numbers in lottery tickets etc.

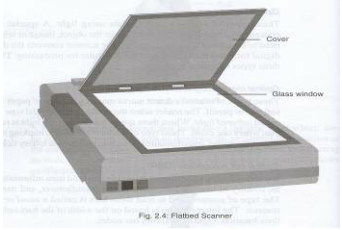


Fig. 2.4: Flatbed Scanner

Optical bar recognition (OBR)

Bar codes are lines of different thickness that hold item information such as, country of manufacture, name of the manufacturer, and item code. The type of scanner used to read these bars is called a *wand or a laser* scanner. The interpretation is based on the width of the bars rather than their location. Figure 2.3 shows bar codes.

Optical character recognition (OCR) / image scanners

This is the most sophisticated type of scanner that operates like the human eye. It not only scans characters but also can scan real objects, pictures and drawings.

The most *common* type of this scanner is the *flatbed scanner,* Using this scanner, one can scan text, a real object or a picture by placing it on a glass plate exactly the way photocopy machine works. The text or a picture scanned is displayed on the screen or saved so that one can edit or print it.

Magnetic scanners

These types of scanners capture data by using magnetic technology. The data being read can either be in form of special magnetic characters or a continuous magnetic strip. The following are some of the common examples of magnetic scanners.

Magnetic-ink character recognition (MICR)

MICR was developed to help banks process cheques. MICR allows special devices to read magnetic characters written in a special format. An example of MICR device is a cheque reader that reads the cheque number, and sends the details to the computer to be used in updating the customer s account.

Magnetic stripe recognition

A magnetic stripe is a thin magnetic tape, often found at the back of a plastic card e.g. an automated teller machine card (ATM) and a credit card. An ATM card is used to get banking services without necessarily going to the counter, while a credit card allows the holder to get services in any centre where the card is acceptable. The amount spent is deducted from the holder's bank account.

Speech recognition or voice input

Voice recognition is a type of input method where a microphone is used to enter data in form of spoken words into the computer. This method is mostly suitable for the handicapped especially those with impaired hands. Although this is a fast and easier method, it has some disadvantages.

It is complex to develop and it does not take care of speech related problem' such as accents, inflections and tone. This implies that the device must learn the unique speech of an individual.

Touch screen, digitizers and digital cameras

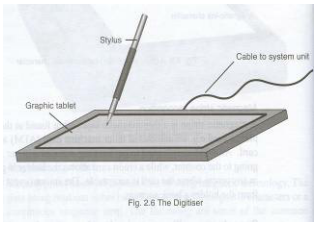
Touch Screen

Touch screen input method utilises the technology of a *touch sensitive screen.* When the user touches the screen, the computer detects the position of the finger and responds accordingly. Touch screens are mostly used in public places like in banking halls, hotels, in airports (to provide guidance information) etc.

Digitisers

A digitiser or a graphic tablet is almost similar to a light pen but instead it has a

graphic tablet on which the user writes on using a device similar to a pen, called a *stylus.* (Figure 2.6). As the stylus moves on the tablet, it s drawing is directly reflected on the screen. Digitisers are mostly used for architectural and engineering designs.



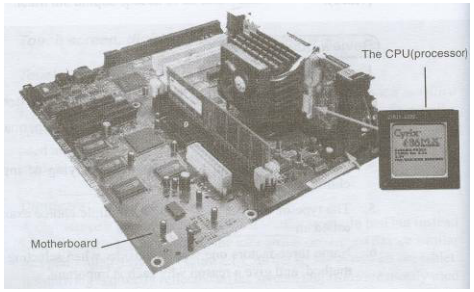
Digital cameras

A digital camera stores its images in digital form. These images can then be *streamed* (entered) directly into a computer for editing or printing by connecting the camera to a computer using a special cable. As with the ordinary camera, there are two types of digitals cameras: One that can takes still images i.e. photographs and another that takes motion pictures (video).

The central processing unit (CPU)

The central processing unit (CPU) also known as the *Processor* is the most important component of the computer. It is actually regarded as the brain of the computer. This is so because all data processing and control operations are coordinated here. In microcomputers, the CPU is housed inside the system unit. It is mounted on a circuit board known as, the *motherboard* or the *system board. The f*igure below shows the location where a processor called *Cyrix* is mounted on the motherboard.

The CPU has three different functional units called arithmetic and logic unit, control unit and the main memory.



Arithmetic and logic unit (ALU)

The arithmetic and logic unit is a unit of central processing unit where all arithmetic and logical operations are carried out. The basic arithmetic operations includes; addition, subtraction, multiplication and division. Logic operations are based on the computer s capacity to compare two or more values. For example, it may compare whether a piece of data is greater than or less than, equal to or not equal to etc.

In order for the ALU to be able to process data, it has special temporary storage locations called *registers,* which holds the data just before processing. It also holds the results after processing.

Control unit

Control unit coordinates all processing activities in the CPU as well as input, storage and output operations. It determines which operation or instruction is to be executed next. To coordinate these activities, the control unit uses a *system clock.* The system clock sends electric signals as its means of communication, just like the way the traffic signals or a traffic officer does *in* a round about or junction to direct motorists and other road users. The number of pulses per second determines the speed of a microprocessor. The faster the clock pulses, the faster the CPU hence the faster the computer can process data.

Main memory (primary storage or working storage)

Main memory also known as *primary storage* provides storage location for data and instructions accessed by the control unit. Computer memory can be classified into *read only memory (ROM)* and *random access memory (RAM).*

Read only memory (ROM)

Read only memory is used to store programmed instructions and data permanently or semi permanently. Data and instructions stored in ROM are

those required to remain unchanged for long periods of time e.g. booting instructions, special purpose computers and computerized fuel pumps instructions etc.

Depending *on* permanence of the instructions or data written *on* it, there are four types of read only memory namely;

Mask read only memory: Once the content is written *on* it by the manufacturer, it cannot be changed.

Programmable read only memory (PROM): This allows the user to alter it only once after the content is written on it.

Erasable programmable read only memory (EPROM): This has a transparent quartz window through which its contents, can be erased by exposing it to ultra violet (UV) light, and then reprogrammed for another use.

Electrically erasable programmable read only memory (EEPROM): This type of ROM can be erased and reprogrammed using electricity. *An* example of EEPROM is the memory that stores the *basic input/output system (BIOS).*

Characteristics of read only memory (ROM) are;

1. *One* can only read its content but you cannot write *on* it unless it is

a special type of ROM.

2. It is non-volatile i.e. its content is not lost when the computer is switched off

3. Stores permanent or semi permanent instructions from the manufacturer called *firmware.* It can store semi permanent instructions because some variations of ROM chips can be programmed according to the user s specification.

Random access memory (RAM)

This is the most common type of main memory. It is called *random access memory (RAM)* because; its content can be read directly regardless of the sequence in which it was stored. As opposed to ROM, the content in RAM is held temporarily and its content is lost once the computer is turned off Therefore, before switching off the computer, it is important that one stores (saves) his/her work in a device that offers relatively permanent storage facility.

Characteristics of random access memory (RAM) are:

1. Data can be read *(retrieved)* and written *(stored)* in it.

2. RAM is a temporary *(volatile)* storage because its content disappears when the computer is switched off.

3. Its content is user defined i.e. the user dictates what is to be contained in the RAM.

Types of RAM

There are two types of-RAM namely, *static RAM (SRAM)* and *dynamic RAM (DRAM).* Static RAM is very fast compared to dynamic RAM and holds its content as long as there is power. Dynamic RAM on the other hand can only hold its content for a short while even when power is all. To maintain the content of dynamic RAM, the memory chip is designed in a way that its content is *refreshed* (automatically rewritten) severally per second. Static RAM is more expensive. It is mostly used to make special types of memories.

Special purpose memories

Apart from ROM and RAM there are several types of special purpose memories found insijkde the CPU or in the input and output devices. These memories are vital because they increase the overall performance of data and instructions moving in and out of the CPU. These memories include buffers, registers and cache memory.

Buffers

This is a temporary holding place that may be part of the CPU or built in an input or output device. Because the CPU is very fast compared to the input or output devices, buffers provide temporary storage so that the CPU is set free to carry out other activities instead of waiting for all data to be entered or information to be output. For example since a printer cannot work at the speed of a CPU, the printer buffers temporarily holds the output to be printed hence freeing the CPU to perform other functions. Buffers can hold more than one piece of data at a time.

Registers

As opposed to buffers, registers hold one piece of data at a time and are inside the CPU. Examples of registers are:

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

Instruction register: This temporarily holds an instruction just before it is interpreted into a form that CPU can understand it.

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

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

Cache Memory

Most modem processors incorporate small high-speed type of SRAM called *cache memory.* The purpose of cache memory is to allow the processor to access data and instructions even faster than it would have taken to fetch it

from the relatively slow DRAM.

Memory capacities

Memory and storage capacity is measured in special units called *bytes.* A byte is equivalent to a single character. Characters can be a number from 0 to 9, letters A to Z or a special symbo1. For example, a number like 2545 has four bytes while the words, *My Home* has *seven* bytes since, and the space between them has 1 byte.

Memory quantities can be expressed in;

Kilobytes (kB): Approximately one thousand bytes.(1024)

Megabytes (MB): Approximately one million bytes.

Gigabytes (GB): Approximately one billion bytes.

Terabytes: Approximately one trillion bytes.

Overall functional organization of the CPU

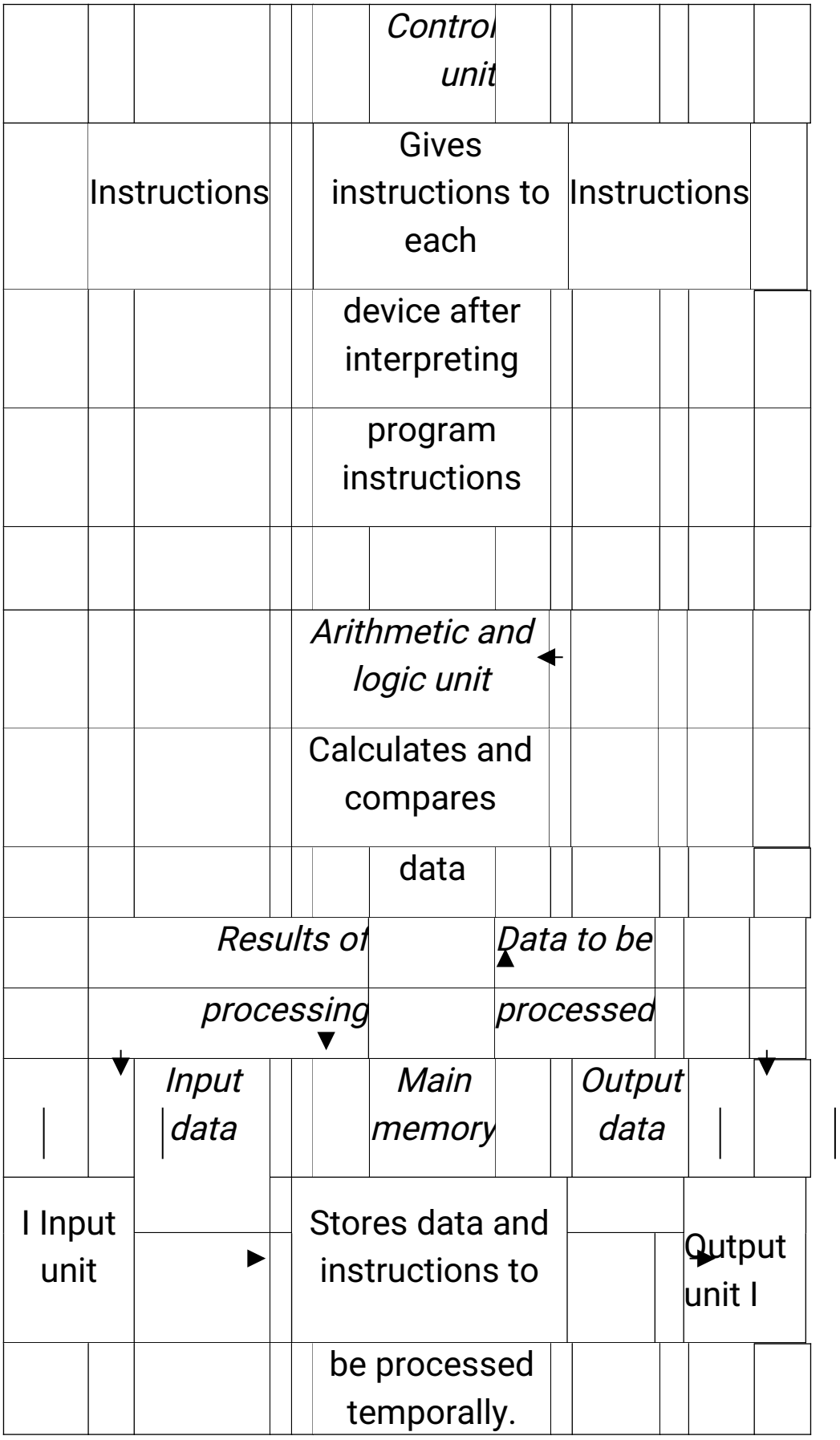
The arithmetic and logic unit, the control unit and the main memory use electrical pathways or links referred to as *buses.* There are three types of buses namely;

Control bus: This is the pathway for all timing and controlling functions sent by the control unit to other parts of the system.

Address bus: This is the pathway used to locate the storage position in memory where the next instruction data to be processed is to be found.

Data bus: This is the pathway where the actual data transfer takes place.

Figure 2.8 is a summary of the overall organisation of the CPU and how it controls other computer components.


Control unit
Instructions
Gives instructions to each
Instructions
device after interpreting
program instructions
Arithmetic and logic unit
Calculates and compares
data
Results of processing
Data to be processed
Input data
Main memory
Output data
I Input unit
Stores data and instructions to
Qutput unit I
be processed temporally.

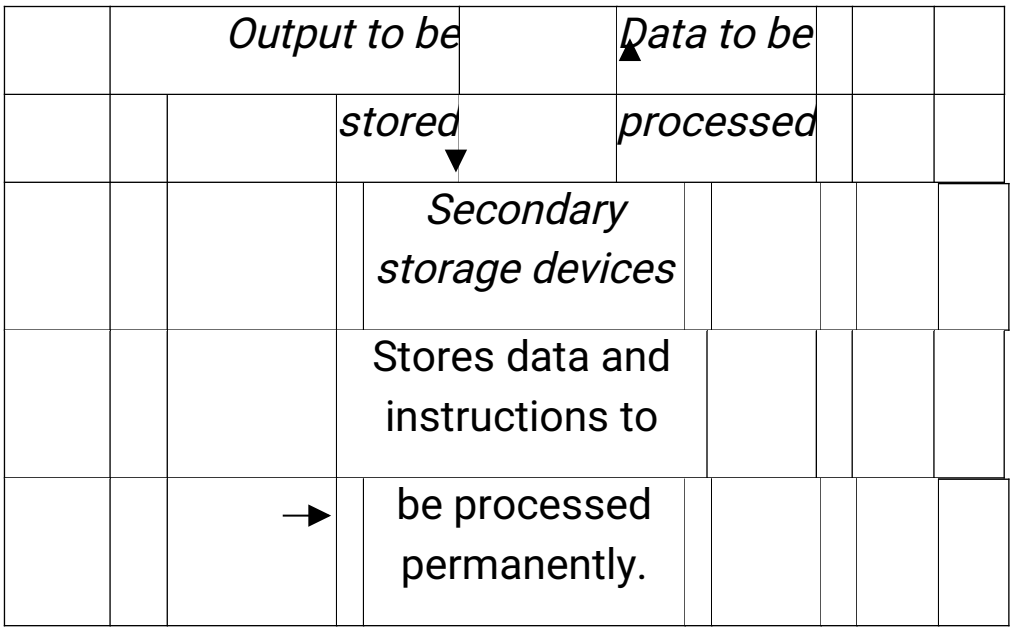


Fig. 2.8 Functional organisation of the CPU

Types of processors and their clock speeds

Processors

In 1971, a company called *Intel* that specialises in manufacturing central processing units managed to combine the arithmetic-logic unit and the control unit on a single tiny processor called *microprocessor* and called it *Intel 4004.* This microprocessor was used in electronic calculators. The first microprocessor to be used on microcomputers was called *Intel 8086* developed in 1974. Since then, there has been a tremendous growth in

microprocessor technology marked by great increase in processing capability and speed.

Until 1989, *Intel corporation* enjoyed monopoly in the field of microprocessor technology with her famous *Intel processors.* Since then other players joined in and started manufacturing cheaper alternatives. These include: *Advanced Micro Devices (AMD), Cyrix* and *Motorola* companies

Processor clock speed

The speed at which a processor executes instructions is determined by its clock speed. System clock speed is measured in hertz's. A hertz is a unit of frequency which measures the number of cycles per second in a signal. Quantities of the clock speed can be expressed in;

1. Kilohertz (kHz): Approximately one thousand hertz's.

2. Megahertz (MHz): Approximately one million hertz's.

3. Gigahertz (GHz): Approximately one billion hertz's.

There has been a tremendous growth in the processing capability and clock speed of microprocessors. From a speed lower than 4MHz, modem microcomputers can run at speeds higher 2GHz. Table 2.1 shows a summary of how microprocessors have evolved.

Processor	*Description*	*Clock speed*
Intel 8086	The two are almost identical and were used	4.7 MHz-I0
and 8088	with the first IBMPCs 8086 was an	MHz
	improvement of 8088.	
Intel	Provided increased performance	6 MHz-20

80286	over 8086.	
	This was the processor that opened up the PCs	MHz
	to many users.	
80386SX	Apart from Intel s 80286, AMD produced	33 MHz-40
and	their versions with copied greatly the Intel s.	MHz
80368DX	These were the first entry in the processor market.	
80486SX	Provided over 100% better performance than	25 MHz-50
and	80386 and were the first upgradeable	MHz
80486DX	processors. AMD and Cyrix produced their version too.	
Pentiums	Since 1992, Intel decided to coin their fifth	60 MHz-
(586) and	generation with the name Pentium instead of	presently
above	80586. *Pent* is a Latin word that means five.	Pentium IV
	Intel chose the word in order to distinguish its	with over 2.8

	80586 and above processors from AMD and	GHz
	Cyrix versions i.e. 5x86 and AMDK5	
	respectively. Examples of Intel Pentium	
	processor are Pentium Pro, Pentium MMX,	
	Pentium II and currently Pentium IV at the	
	time of writing this book.	

Output devices

Output devices are peripheral devices that a computer uses to give out informat produced after the processing operations. There are two types of output devi namely the *softcopy* and the *hardcopy* output devices. Softcopy refers to *intangible* output mainly displayed on the screen or through other output devi such as speakers. A hardcopy is a *tangible* output produced mostly on papers devices such as printers.

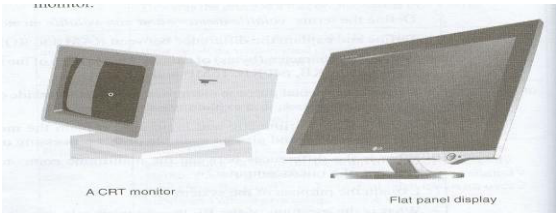
Softcopy output devices.

Some of the softcopy output devices are;

Monitors

A monitor or a video display unit (VDU) is the most common output device. It displ information on its screen thus helping the user to monitor operations carried out b the computer.

For a long time, monitors have been designed using a long tube called the *cath ray tube (CRT at* emits light. The screen of a cathode ray tube is curved sligh outward forming a convex shape. However, new flat displays have come which do use CRT technology. Flat display are more comfortable to use, portable and do consume a lot of power compared to CRT. Figure 2.9 shows a CRT monitor and panel display monitor.



The sharpness or clarity of an image on the screen depends on the type of mon being used. Monitors that display sharp clear images are said to have high *resoluti* The images on the screen are formed by small dots called *picture elements (pixe* The higher the number of pixels per square centimeter the higher the resolut hence the clarity.

There are two types of monitors namely *monochrome* and *colour monit* Monochrome monitors display images and text in only one colour mostly black a white. Colour monitors can display images and text in multiple colours. For a mon to display information it must be connected to a separate piece of circuit boa plugged into the motherboard called the *video card* or *graphics adapter.* Howev some motherboards have onboard video capability therefore there is no need fo video card.

Examples of graphic adapters are:

Monochrome display adapter (MDA): This was the first video card that was used in early computers. MDA displayed text only in one colour.

Hercules graphics card (HGC): One weakness of the original MDA display was tha could not support images of any kind. Hercule graphic card supports monochro images in addition to text.

Color graphics adapter (CGA): This can display text and images using up to colours.

Enhanced graphics adapter (EGA): This is an improvement over colour grap adapter but also displayed text and images using 16 colours.

Video graphics array (VGA): This offers at most 256 colours.

Super video graphics array (SVGA): This is an enhancement of video graphic ar capabilities offering over 256 colours.

Small portable laptops, notebooks and even desktop PCs use flat-panel disp Common types of this display are:

Liquid crystal display (LCD): Liquid crystal displays do not display by emitting light their own. Instead they have tiny liquid crystals that reflect light falling on them fr the environment. Liquid crystal displays are widely used in watches, calculators, phones and digital cameras.

Electro luminescent (EL): These displays are an improvement on LCDs. Elec luminescent emits light when electrically charged. This makes them clear, shar and easier to read.

Gas-plasma: These use a gas that emits light in the presence of electric current.

Thin film transistor (TFT): This is the latest technological advancement in displays provides high quality output than all the others.

Sound output

Speakers are used to output sound from a computer. Sound may be in form of mus warning, video, interactive communication with a computer etc.

Light-emitting diodes (LED)

These are light emitting components that display light when an electric curren passed through them. A good example is the red or green light displayed by system unit to help the user know whether it is on or off. Mostly LEDs are used give warnings the same way a motorist would use signals to indicate when he/sh overtaking or taking a turn.

LCD projectors project the output from the computer to a white board or wall.

Hardcopy output devices

The most common hard copy output devices are printers and plotters.

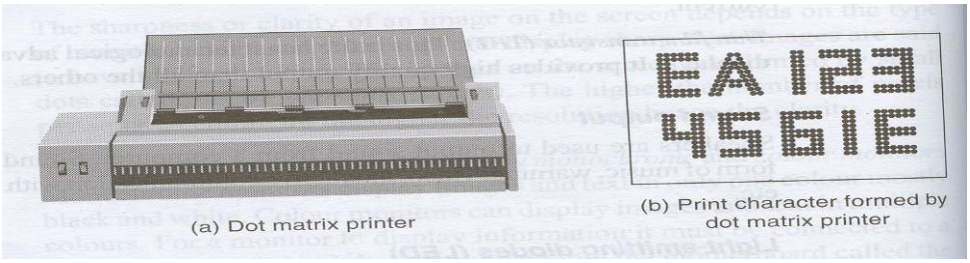
Printers

Printers produce a hard copy of information on papers. The quality of the hardcopy depends the printer s printing mechanism. There are two types of printers namely *impact* and *non-impact printers.*

Impact printers

The mechanism of impact printers is almost similar to that of an ordinary typewr i.e. they produce characters by using *special light hammers* with characters or p held on the printing head. To print, a paper is placed behind an ink ribbon. When hammer strikes on the head, character mark is stamped. These printers are noisy a are mostly used to produce rough copies. The two widely used impact printers *dot matrix* and *daisy-wheel printers.*

Dot matrix printers produce a hardcopy by arranging patterns of dots on the pa using pins held in the printing head. Figure 2.10 (a) shows an example of an imp printer. Figure 2.10 (b) shows print characters formed by a dot matrix prin



(a) Dot matrix printer

(b) Print character formed by dot matrix printer

a daisy-wheel printer has a wheel with petals on which characters are mounted. I so called because it resembles a daisy flower. When printing, the wheel rota allowing the petals to hit a ribbon with different characters as they are received fr the computer.

Non-impact printers

These printers do not use the striking mechanism to produce characters on a piece paper. They do not hammer the ribbon hence they are much quieter. The major n impact printers are inkjet, thermal transfer and laser printers.

Inkjet printers

Inkjet printers form characters by spraying ink from tiny nozzles through an electric field that arranges the charged ink particles into characters. Inkjets are cheap to bu but expensive to run because of the high cost of ink cartridges. Figure 2.12 shows inkjet printer.

Thermal printers

Thermal printers use heat to transfer characters onto a piece of paper i.e. they bon characters onto a piece of paper by using hot pins which presses against a special ribbon. They are inexpensive alternative to inkjets.

Laser printers

Laser printers prints by passing a laser beam back and forth over a rotating dru

The laser beam draws the image on the drum by static electricity. An example o laser printer is shown in Figure 2.13. The charged areas pick up the ink toner fron cartridge, and press it onto the paper. Although these printers are more expensive buy, they are faster, and cheaper to run than the inkjets.

Plotters

A as shown in Figure 2.14, a plotter resembles a printer but specialises in produc big charts such as maps, pictures and drawings. They are mostly used for print geographical, architectural and engineering drawings e.g. maps, advertisem posters to be placed on billboards, machine parts etc.

2.5. Secondary (auxiliary) storage devices and media

There is need to have an alternative long-term storage location for data a information other than the main memory. These alternative storage devices that not part of the main memory are called *secondary or auxiliary storage devices.* The devices are not directly accessible by the cpu. Secondary storage devices that are housed inside the system unit and hence can be carried around to be used w another computer are called *removable storage devices and media.* In order to re or store data from a storage media, a device called *a drive* is required.

Secondary storage devices can be classified according to the technology used record data. The technology could be magnetic or optical. The data and instructio held in these devices must first be moved into RAM before processing.

Removable storage devices

Magnetic tapes

A magnetic tape is a ribbon of *Mylar* (plastic-like) material coated with a thin layer o iron oxide. The tape resembles the music cassette used in home tape recorders.

In order to read/write data records on the tape, the tape must be inserted in a *ta drive* that rotates the tape allowing a read/write head to perform

5.1. the operation. Most computers today don t has tape drives because of the adv of better storage devices. Examples of magnetic tapes include: reel to reel tap cassette tapes and cartridge tapes.

Disadvantages of using magnetic tapes

1. Magnetic tapes are slow because of the linear storage of data records on the tap This means that you have to access the proceeding records before you get the required.

2. There is a space between successive data records called *inter-record gap (IRG),* which results in wastage of storage space.

Magnetic disks

They have a magnetic disk platter that stores data. Examples of magnetic disks are floppy disks (diskettes), zip disks and jaz disk.

Floppy disks "

A floppy disk or simply a diskette is made up of a small flexible round disk coa with iron oxide. This disk is covered with a plastic protective case. Floppy disks portable thus making them the most widely used type of secondary storage device

Floppy disks are inserted in a floppy drive, which has a *read-write* head that runs o the magnetised spots that contain data. Floppy disks come in different sizes w different storage capacities. Initial floppy disks were large in size but with sma storage capacities than the presently available 3t-inch which has a maximum stora capacity of about 1.44MB. Figures. 2.15 (a) shows a typical 3t-floppy diskette wh

Figure 2.15 (b) shows parts of floppy disk.

The structure of a floppy disk platter

If the protective plastic casing of a floppy disk is removed, a circular flexible d coated with magnetic material will be revealed. The surface of the disk is divided i tiny invisible concentric circles called *tracks* that store data. The tracks are furt divided into units called *sectors* as shown in Figure 2.16.

Zip disks

These are high capacity disks that resemble the floppy disks. They are, howe slightly larger and thicker in size. A zip disk can hold as much as 250 MB. Zip di mostly come with separate-portable external zip drive.

Jaz disks

These are small portable disks with high storage capacity of about 1 GB to 2GB. T are used for storing data that require large storage. Like jaz disk comes wit portable jaz drive. Figure 2.17 below shows jaz and zip disks and their drives.

Care of magnetic storage media

To care for magnetic media the following rules are to be observed.

1. Do not expose them to strong magnetic fields. This would erase the magnetic recorded data on the disk. Hence do not carry magnets to the computer room.

2. Keep magnetic media away from excessive heat because heat energy

   weakens magnetic media s ability to store data.

3. Do not drop the disk on the ground.

Optical (laser) disks

These are disks on which data is recorded using a *laser beam.* A laser beam is a v strong concentrated light. The beam bums very tiny holes (pits) into a thin sh surface to record data. Likewise a laser beam in the optical drive is also used to re record data on the disk. The advantages of optical storage media are:

1. They store very large volumes of data.

2. Data stored in them is more stable and more permanent than the

   magnetic media.

Examples of optical storage disks include: LS-120 super disks (SD), compact disks (CDs), digital versatile disks (DVD), optical card and optical tape.

LS-120 super disk

This is a diskette that resembles the 3 ½-inch floppy disk but uses optical technol instead of magnetic technology to record data. It has greater capacity of storage a greater speed of data retrieval. The LS-120 drive can read and write both the 3 ½-in 1.44 MB floppy disk and the 120MB super disk. (Figure 2.18).

Fig. 2.18 Super disk and drive

Compact disks (CD)

Compact disks hold large quantities of data and information. One disk can hold much as 700MB. They are mostly used to store data and information that require lot of space such as video clips, software, sounds etc. Figure 2.19 shows a comp disk.

Currently compact disks are available in three forms namely:

Compact disk-read only memory (CD-ROM): These are the type of compact di which, when data is recorded on Them, one can neither change them, nor a

anything on them. They are mostly used to store music recordings.

Compact disk-recordable (CD-R): These compact disks are initially blank but wit drive called *CD- Writer,* the user can record data, programs or information on However, once data has been written on it, one can only read but not change it.

Compact disk-rewritable (CD-RW): Unlike the CD-Rs, these types of compact di allows the user to record, erase and rewrite new information just as one would w floppy disks.

NB: Both CD-ROMs and CD-Rs are referred to as WORM (Write Once Read Ma because they allow the user to record data on them once but read the data as of as necessary.

Digital versatile disks (DVD's)

Digital versatile disks also known as digital video disks resemble compact disks every aspect but the only difference is that they have higher storage capacity of up 17GB which is equivalent to approximately twenty six 640MB CDs. They are suita for recording motion pictures such as video because they offer better sound a picture quality than the CDs.

Optical card

An optical card resembles the magnetic-ink character recognition card but instead having a magnetic stripe, it has an optically recordable stripe that stores informati These types of cards are mostly used in banking and other business organisations record customer details.

Optical tape

This is similar to a magnetic tape only that data is stored on it by using optical technology.

Current and emerging trends in laser technology

The advances in optical storage, digital video clips, voice and sound synthesis ha formed the basis for modem *multimedia technology* exploited to develop *multime computers.* A multimedia computer does not only display text but can also allow user to have sound playback and watch videos and pictures. A typical multime computer must have the following minimum requirements:

1. A video graphic array or higher super video graphic array (SVGA)

   graphics card and monitor.

2. A sound card.

3. Compact disk or digital video disk drives.

4. 32 MB RAM or higher. Lower memory is bottleneck to performance.

Today computers can be used to tune to any of the favorite FM or TV channels long as an FM/TV card is installed in the computer.

Fixed storage media

These are the storage devices that are housed inside the personal compute system unit. An example is the *hard disk.* However it is important to note that so hard disks especially those used in small computers such as laptops are *removabl*

The hard disk

The hard disk, also known as the *Winchester* disk is a sealed unit in which is sh rigid magnetic disks or platters that are arranged vertically on a common axis

shown in Figure 2.20.

How the hard disk stores data

Each disk has two read/write heads that read/record data on both sides. T surfaces of each disk are divided into tracks and sectors like those of a floppy d Tracks along the common axis forms an imaginary cylinder. Therefore the te cylinder is sometimes used to indicate the number of *tracks* on one surface o platter. For example if you say that a hard disk has ten cylinders then each disk h ten tracks on one surface. If the disk has ten platters then one cylinder will ha twenty tracks:

As the disk rotates, the read/write head moves in and out over the surface to rec or read data.

Hard disks have gained widespread popularity because:

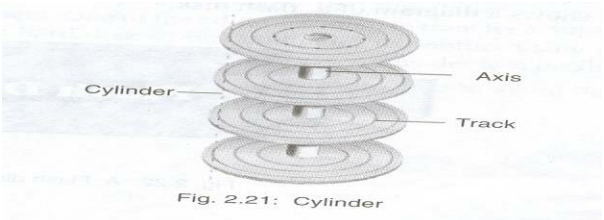


Fig. 2.21: Cylinder

1. They provide permanent, cheap and large storage capacity that is rewritable. For example computer can have one hard disk of 40 GB storage space.
2. They are very fast compared to other secondary s rage devices in terms of data transfer.

Care of the hard disk

Because of the high rotational speed of the disks, it is important to observe the

following precautions to avoid permanent destruction to the hard disk also called *c*
crash.

1. Keep the disk away from smoke and dust. Dust and smoke particles can cause damage to the surface of the disk by scratching it as the head attempts to read dat

2. Switch off the computer using the correct procedure. This allows the read/write head to move off the disk surface before power is switched off. Improper procedur would risk heads crashing on rotating disks hence scratching them.

Emerging trends in storage devices

Because of need for vast storage prompted by today s massive data process applications and need to carry a lot of information in easily portable storage devic more advanced and reliable storage media are emerging. C good example is a storage device called the *flash disk* t is small in size (about 5 x 2 cm) but has capacity to store o 600MB (equivalent to approximately 400 flo disks! !). Figure 2.22 shows a diagram of a flash disk

Fig. 2.22: A Flash disk

2.6

Power and interface cables

Power cables

Inside the system unit is a special *power supply unit* that supplies power to the

motherboard and other internal devices. In order to connect the computer to the mains power outlet, you need *power cables* that link the power supply unit to the outlet.

Interface cables

All peripheral devices are connected to the motherboard hence to the CPU by special cables called *interface cables.* An interface cable is connected to the device on one end, and to the motherboard via *ports* on the other end.

The difference between the power cables and the interface cables is that the power cable supplies power to a component while interface cables transmit data signals.

There are different types of cables and parts namely;

Parallel cables and ports

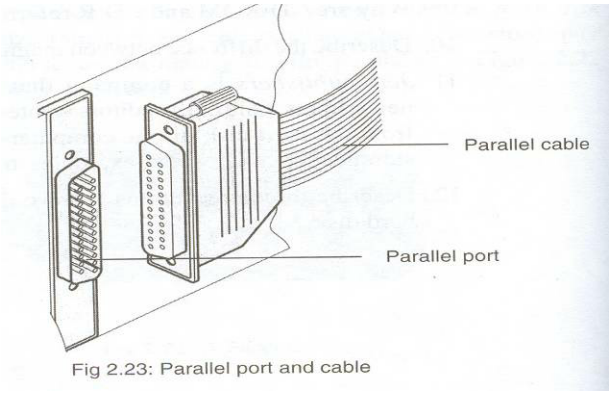
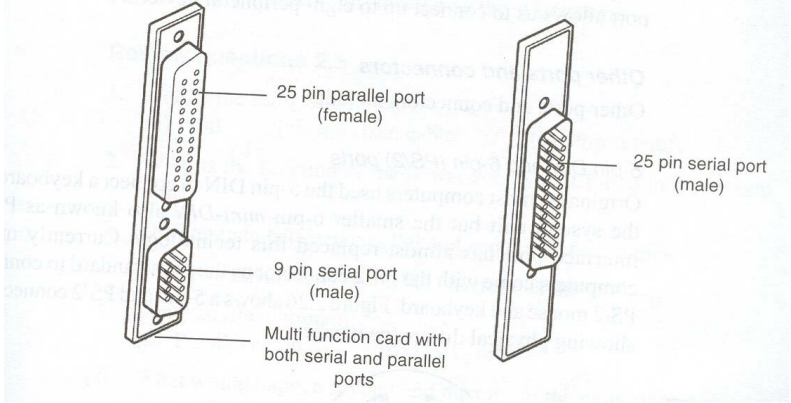


Fig 2.23: Parallel port and cable

Parallel cables transmit information simultaneously using a set of many conductors (wires). For example if a cable uses 8 conductors to transmit data at the same time, it is said to be an 8-bit parallel cable. The advantage of using such cables is that they transmit data faster over a short distance. These cables are mostly used to connect printers and removable storage drives like the zip drive. Figure 2.23 shows an illustration of a parallel port and cable.

Serial cables and ports



Unlike the parallel cables, serial cables transmit one bit at a time. Although they are slow, they are much more reliable than the parallel ports and therefore, their connector cables can be as long as 15 m. Serial cables are generally used to connect devices such as the mouse and some serial printers. Figure 2.24 shows a 9 and a 25 pin serial ports.

Universal serial bus (USS) cable and port

Universal serial bus is a new standard serial interface that is set to replace the conventional parallel and serial cables and ports. Currently most peripheral devices are coming with universal serial bus ports and interface cable. Although it transmits only I-bit at a time, it provides very high-speed and quality data transmission over distances of approximately 5 metres. USB supports a wide range of peripheral devices ranging from external storage drives to digital cameras. Figure 2.25 shows a USB port and its interface cable.

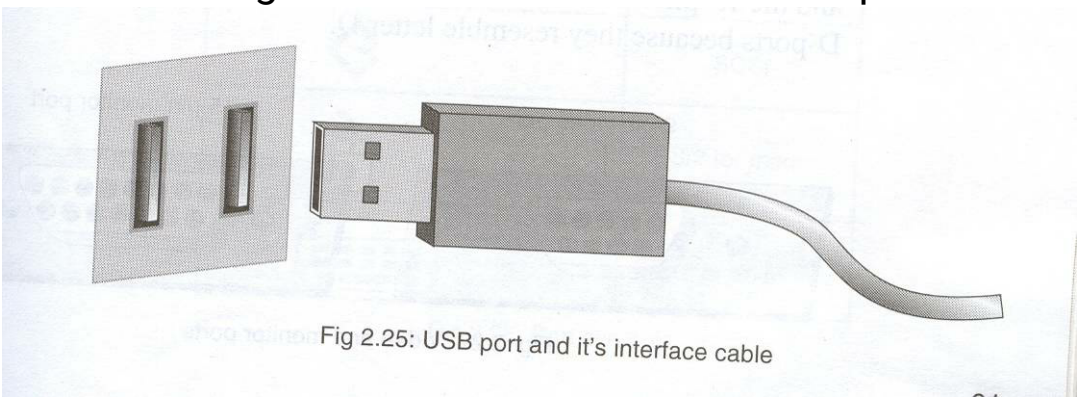


Fig 2.25: USB port and it's interface cable

If a computer does not have a universal serial bus port, it can be bought and fitted on the motherboard.

Small computer systems interface (SCSI) cables and port

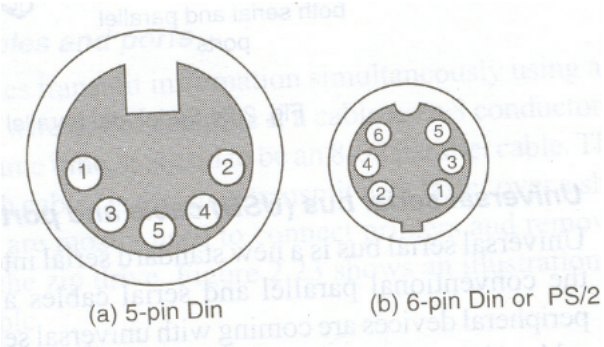
This port and interface cables transmit data in parallel but are faster than the parallel cables. Another advantage of the SCSI port is that one SCSI port allows

us to connect up to eight peripheral devices.

Other ports and connectors. Other ports and connectors include;

5-pin DIN and 6-pin (PS/2) ports

Originally, most computers used the 5-pin DIN to connect a keyboard to the system unit but the smaller 6-pin *mini-DIN* also known as PS/2 interface port has almost replaced this technology. Currently most computers come with the PS/2 connector as the new standard to connect PS/2 mouse and keyboard. Figure 2.26 shows a 5-pin and PS/2 connectors showing physical difference in size. I

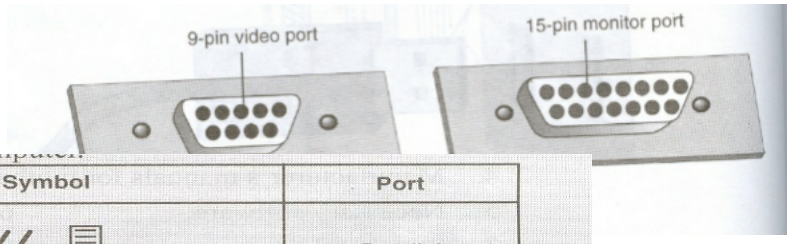


Monitor ports

The two most common connectors used for monitors are the 9- Pin *D* and the I5-pin *Hi-D* connector as shown in Figure 2.27. They are called D-ports because they resemble letter D.

(Audio connectors

These are jack plugs found on a sound interface adapter used to connect speakers, microphone and other portable audio equipment.



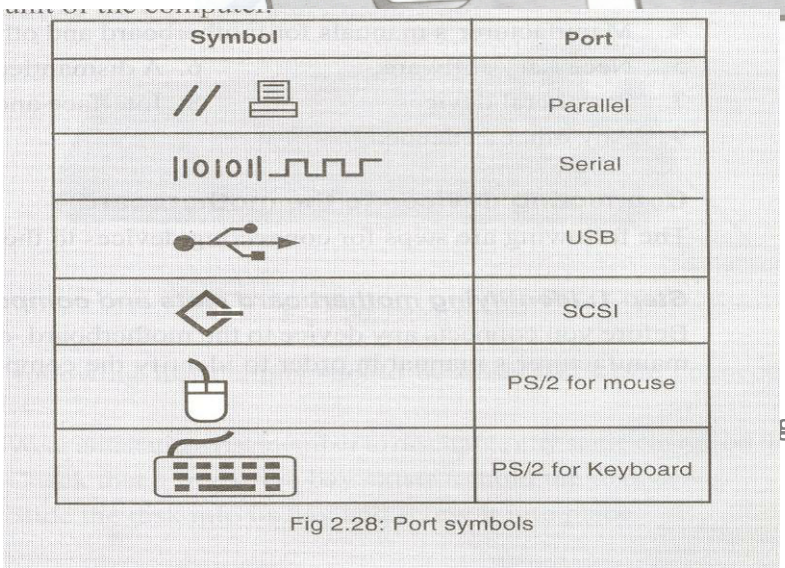


Fig 2.28: Port symbols

2.7`

Basic computer setup and cabling

Having learnt about various devices and how they function, it is important to familiarise ourselves on how to setup a computer.

Before attempting to carry out any setup activity, observe the following precautions should be observed.

1. Disconnect all devices from power source before starting to work on them.

2. Do not work on any peripheral device without the guidance of the teacher.

3. Never work alone because you may need help in case of an emergency.

4. Discharge any static electricity that might have built up on the hands by touching an earthed metallic object and then wearing an anti-static *wrist member.* This is because your body can hold as much as 200 volts of static charge that can damage sensitive components on the motherboard.

Tools and other requirements

The tools and requirements include;

1. Different sizes and shapes of screwdrivers.

2. Anti-static wrist member.

3. Pliers with narrow nose.
4. Manufacturer s manuals for motherboard and other components.
5. Necessary software.
6. A dismantled system unit.
7. Peripheral devices.
8. Interface and power cables.
9. Any other as needed.

Connecting devices to the motherboard

The following are steps for connecting devices to the motherboard.

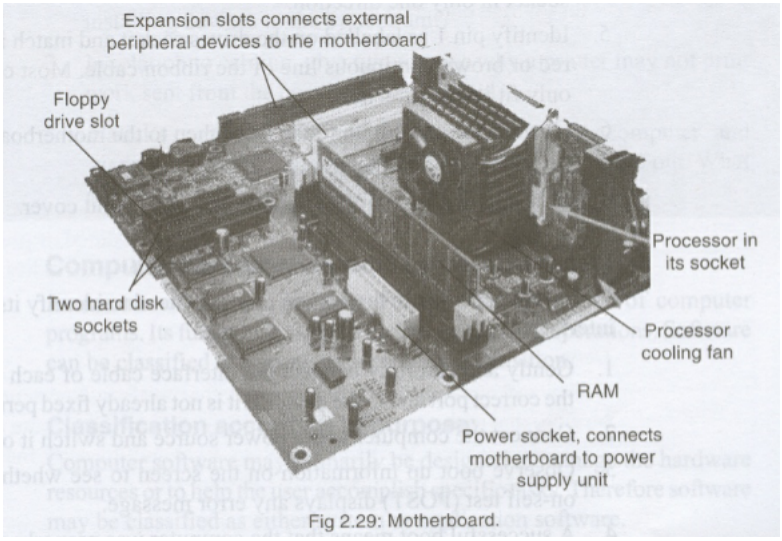


Fig 2.29: Motherboard.

Step 1: ***Identifying motherboard slots and components.*** Before you connect any device to the motherboard, carefully study the manufacturer s manual in order to identify the components labeled in

Step 2: ***Connecting the hard disk, floppy drive and optical drive.*** These devices are connected to the motherboard using special ribbon cables like the one shown in Figure 2.30.

The following instructions should be observed while connecting the devices:

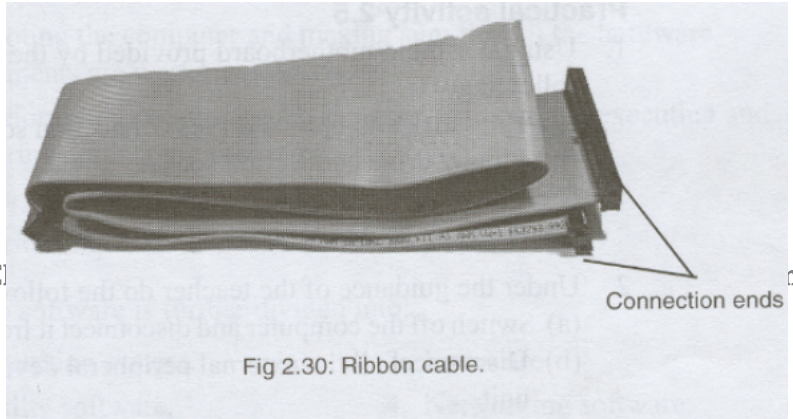


Fig 2.30: Ribbon cable.

1. Wear antistatic wrist member to discharge any static charge on the body.
2. Check that a free drive bay exists to hold the disk drive.
3. Slide the disk into its bay and screw it into place.
4. Ensure that there is a free power connector from the power supply unit and connect it to the drive. Notice that it is designed to fit in its socket in only one direction.
5. Identify pin 1 as labeled on the drives socket and match it with the red or brown continuous line of the ribbon cable. Most cables will only fit in one direction.
6. Connect the cable both to the drive then to the motherboard.
7. Repeat this for all the drives.
8. If installation is complete replace the system unit cover.

Step 3: *Connecting other peripheral devices*

To connect a device to the system unit, you need to identify its port and interface cable.

1. Gently and carefully connect the interface cable of each device to the correct port and to the device if it is not already fixed permanently.
2. Connect the computer to the power source and switch it on.
3. Observe boot up information on the screen to see whether power on-self test (POST) displays any error message.
4. A successful boot means that the computer was properly setup.

NB: If the computer is completely new, programs have to be copied (installed) on the hard disk.

2.8 Computer software

As mentioned earlier, the term software refers to a set of computer programs. Its function is to guide the computer in its operations. Software can be classified according to purpose or acquisition.

Classification according to purpose:

Computer software may primarily be designed to manage the hardware resources or to help the user accomplish specific tasks. Therefore software may be classified as either system or application software.

System software

System software performs a variety of fundamental operations that avails computer resources to the user. These functions include:

1. Booting the computer and making sure that all the hardware elements are working properly.

2. Performing operations such as retrieving, loading, executing and storing application programs.

3. Storing and retrieving files.

4. Performing a variety of system utility functions.

System software is further divided into:

1. Operating system.
2. Firmware.
3. Utility software.
4. Networking software.

The operating system

This is a set of complex programs that work together to control execution of user programs called *applications* and acts as a go between (interfaces)

between the applications of the computer hardware. It manages input/output and storage operations in a computer. Examples of common operating systems are Microsoft Windows 95/98/2000/XP, UNIX, Linux, Macintosh (Mac OS) and OS/2. *What type of operating system software do you use in the computer laboratory?*

Therefore the operating system is the main program on the computer system.

Firmware

Firmware, also referred to as *stored logic* is a combination of both the software and hardware recorded permanently on electronic chips. Usually, a firmware is a read-only memory chip that is mounted or plugged into the motherboard. Firmware may hold an operating system, utility programs, language processors etc.

Utility software

Utility software is a special program that performs commonly used services that make certain aspects of computing to go on more smoothly. Such services include sorting, copying, file handling, disk management etc. The two basic types of utility software are:

1. *System-level utility software:* These help the user to work with the operating system and its functions. For example, a utility software tells the user when he/she enters a wrong command and gives suggestions how the error can be corrected.
2. *Application utility software:* These make the use of an application program smoother and efficient. These utility programs are commonly purchased separately or may be part of an operating system.

Networking software

This type of software is mostly used to establish communication between two or more computers by linking them using a communication channel like cables to create a *computer network.* Networking software enables the exchange of data in a network as well as providing data security. Network software may come as independent software or integrated in an operating system. An example of networking software is *novel Netware.*

Application software

Application software, also called *application packages* are programs that are designed to help the user accomplish specific tasks.

.Table 2.2 gives examples and uses of common application packages

Software	*Uses*	*Examples*
Word processor	Typing documents like	Ms Word, Lotus
	letters.	WordPro, WordStar.
Spreadsheets	Manipulation of numeric data e.g. calculating budgets.	Ms Excel, Lotus 1 2 3
Desktop	Designing publications	Adobe PageMaker,
Publisher	like newspapers, books.	Ms publisher.
Computer	Technical	AutoCAD.

aided	drawing.	
Design		
Databases	Keeping records and	Ms Access, Dbase.
	files.	
Graphics software	Creating and	Corel Draw,' Adobe
	manipulating pictures.	Photoshop.

Table 2.2: **Application packages**

Classification according to acquisition

Generally computer programs can be classified according to how they are obtained as in-house developed software and standard software (Vendor off-the-shelf software).

In-house developed programs

These are programs that are uniquely designed and tailored to meet a particular user s needs. For example, a bank may decide to manage its banking operations using a unique program developed by hired programmers. These programs are not available in the shops and once developed for one company or user may not address the needs of other users.

Standard software (Vendor off-the-shelf software)

These programs are developed by software engineers, packaged and then made available for purchase through a vendor, a distributor or directly from the developer. A developer may bundle more than one but closely related software into one package to form a *suite* or *integrated software* as opposed to *single-purpose software.* Examples of suites are *Lotus*

Suite, Microsoft-Office and Corel WordPerfect while those of single purpose are *QuickBooks* and *Sage Line 50.*

The word *package* is sometimes used to refer to these types of software that are packaged and sold by vendors.

Advantages of standard software over the in-house developed programs are:

1. They can easily be installed and run.

2. They are less expensive to acquire than the cost of developing in-house software.

3. They are readily available for almost any task.

4. Since they are thoroughly tested before they are released, chances of errors in them are rare.

5. They can easily be modified (customised) to meet specific user's needs without involving expert programmers

Criteria for selecting a computer system

The task of determining a suitable computer system for an individual or organisation is not easy. A good computer system must meet all the requirements of the user. Therefore, before selecting the computer system to

implement, it is advisable to do an analysis of all the requirements necessary in order to avoid acquiring a system that may disappoint the users.

Requirements analysis *for* selecting a computer system should cover the following:

1. Identifying all user requirements.

2. Evaluating hardware requirements that will meet the users needs.

3. Evaluating software requirements that will meet the users needs. The computer hardware and software *to* be acquired should therefore be able *to* meet all needs of the data processing environment that, they are intended *for* effectively.

Hardware considerations

Some factors considered when selecting computer hardware are;

Processor speed

The processing power and speed of a computer mainly depends on the processor speed. A good computer must have high processor speed. For example a few years ago, processors used *to* have speeds of less than 100 MHz. However, today s Pentium processors are operating at very high clock speeds of over 4 GHz.

Scientists and engineers are aiming at producing a processor that operates at terahertz (trillion hertz). However, it is important *to* buy a processor that suits ones need not necessarily the fastest.

Memory capacity

As earlier mentioned, primary memory, mainly random access memory (RAM) is measured in megabytes (MB). *For* example, a computer may have 32MB of RAM. Although, a computer may have a very fast processor, it may not perform

as expected if it has low memory capacity. Because of the current *multimedia* driven applications, a good computer should have sufficient memory *to* handle the heavy applications that require a lot of memory space in order *to* run. A computer with at least 128 MB of RAM is recommended *for* most contemporary applications.

RAM is packaged as either dual in-line memory Module. (DIMM) or single in-line memory module (SIMM).

Therefore, before one buys a memory module *for* the computer the following factors have *to* be considered:

1. The type of module supported by the computer s motherboard.

2. Does the motherboard have an empty memory slot?

3. Will the module work well (be compatible) with the other existing modules on the motherboard?

4. What is the capacity of the module?

Warranty

A warranty is an agreement between the buyer and the seller that spells out terms and conditions of, after selling a product in case of failure or malfunction.

The most important consideration to make is whether the seller is ready to actually provide after sales services. On top of the actual cost of the item, most manufacturers and suppliers include a certain percentage charge to cover the warranty.

A good warranty should cover the following points:

1. Scope of cover for example six months, one year etc.

2. Callout response and liability agreement. For example how long should the supplier take to repair a fault or replace the product, and if he/she delays who bears the cost.

3. Preventive maintenance for example regularity of service, at intervals etc.

Cost

The cost of a computer system depends on:

1. Its processing capability.

2. Whether it is branded or a clone. Branded computers are more expensive than their equivalent clones. This is because of their reliability and good after sale services.

3. Its size. Portable computers are more expensive than their desktop equivalents because of the superior technology involved in manufacturing smaller components without losing performance abilities.

It is important to do a market survey from magazines, newspapers, and electronic media or visit a number of vendors to compare prices before purchasing a computer. Computer information and technology exhibitions also enlighten a buyer on current trends and costs.

Upgradeability and compatibility

When buying a computer, the best option would be to get one that can easily be upgraded to accommodate emergent technologies. For example some older computers cannot support large hard disks available in the market today hence, difficulty in upgrading them because smaller hard disks are no longer in

circulation.

Portability

The size of electronic devices including computers has become a major consideration because smaller devices enhance mobility.

User needs

When selecting computer hardware, consider the unique needs of the user. For example if the users have special disability like inability to use their hands, consider buying input devices that capture data through voice input.

The user needs also determine the type of data that will be processed hence, the choice of the type of hardware most appropriate to satisfy the needs. For example in a supermarket a special computerized devise called a *point of sale* (POS) terminal is most suitable to record transactions.

Other considerations

Other considerations for selecting computer hardware are;

Monitor

Depending on preference, your choice for a monitor may depend on size, resolution and the technology used to make it. Currently flat panel displays have become a new market standard quickly replacing the cathode ray tube (CRT).

Multimedia capability

This is the combination of video, audio, text and images to provide an interactive, creative and effective way of producing and communicating information. A multimedia system should have speakers, CD/DVD drive, sounds card and a SVGA monitor. It should also have software that supports multimedia capability.

Software considerations

Although one may have a good computer with the best hardware, the actual real determinant of a computer s value to the user is the software in it that can run to solve the day to day data and information processing needs.

The following factors should be considered when selecting software:

Authenticity

The term authenticity refers to genuineness, validity and or legitimacy of an item. When you acquire software from the vendor, make sure it is an original copy that is accompanied by the developer s *license and certificate of authenticity.* This is because some people illegally produce pirated copies which is an offence.

Documentation

It refers to the manuals prepared by the developer having details on how to install, use and maintain the software. These include installation guide, maintenance guide and a user guide. This documentation enables the user to work with the software with minimum guidance.

User needs

The needs of the user determines the type of operating system and application programs that should be considered for acquisition. For example, if the user needs to type documents most often he/she would go for a word-processor.

People with special disability will require software that recognizes other forms of input like voice and natural sound. A good example is software used in mobile phones to store voice and allow the user to make a call by just calling a name instead of keying in the number.

Reliability and security

People are more comfortable with software that offers good security to confidential and private information.

User friendliness

One of the most important features normally considered when using a computer program is its *user-friendliness.* This is a measure of how easily the users can be able to operate the computer. Some programs are more user-friendlier than others. A lot of research and effort has been dedicated in trying to come up with more user-friendly software. The ease of use of a program will most likely influence whether the user will prefer it or not.

Cost

The cost of software is perhaps one of the most controversial issues that must be considered carefully. One cannot just go for software because it is cheap. Many other factors may force a person to buy far much more expensive software even with cheaper alternatives available. However it is illogical to buy expensive software if there is a reliable cheaper alternative that will meet ones needs.

In case the off- the-shelf software does not fit the needs of the users it would

be advisable to develop in-house software solutions even though they may be a bit more expensive.

Compatibility and system configuration

Software compatibility refers to the ability of the computer to run the software depending on the system setup (configuration). For example some software may only run on a computer that has 32MB of RAM and above. Any computer with lower than this, will be said to be incompatible. It is important that one reads the installation guide and system requirements that comes with the software in order to avoid disappointment.

Portability

Portability in this aspect refers to whether a program can be copied or installed in more than one computer. Although, most software in the market today are portable some developers produce software which can be installed on one machine only. This means that if one has twenty computers, one should buy a license for each.

3.1 OPERATING SYSTEMS (OS)

Chapter outline

3.1 *Introduction*

3.2 *Resources under operating systems control* 3.3 *Functions of an operating system*

3.4 *Types of operating systems*

3.5 *Factors to consider when choosing an operating system*

3.6 *How Windows organizes information*

3.7 *Managing files and folders*

3.8 *Disk management using Windows*

3.9 *Installing Windows operating system*

Introduction

As mentioned earlier, an operating system is the main program that controls the execution of user applications and enables the user to access the hardware and software *resources* of the computer. In a data processing environment, the user sees a computer as a group of application programs that enables him/her to accomplish specific tasks. Application programs do not directly utilize the hardware devices. They send messages through the operating system which has the capability to give instructions to the hardware to perform a particular task. An operating system therefore, supervises all the other programs in the computer and manages access to the hardware as shown in Figure 3.1.

3.2

Resources under operating systems control

A computer is composed of a set of software-controlled resources that enable movement, storage and processing of data and information. The resources or devices under the operating system control include: the processor, the main memory (RAM), input and output device and parts, secondary storage devices and communication devices.

The processor

The processor is a scarce resource. It executes tasks called *processes.* At anyone time several tasks may require processing hence creating competition. The operating system arranges the tasks according to priority and has the ability to stop a particular task to allow the processor to service another one.

Main memory (RAM)

At anyone given time so many tasks may require the memory so that they can be accessed and processed by the computer. However, because memory is also a scarce resource, the operating system determines which task will remain in memory awaiting for execution and which one will be sent back to secondary storage to wait.

Because the operating system is large and very important, it is usually installed on the hard disk but *must be loaded to RAM* during the booting process. Not all the operating system can fit in RAM so a small special part that contains the most necessary commands and procedures called the *kernel* is the one that is loaded.

Input/output devices and ports

In most cases, the operating system controls all data input and information output tasks. Because most input/output devices are slower than the processor, the operating system has to control the flow of data from the time of input to the time the user receives it as information. It ensures that the right data reaches the processor at the right time. The operating system also defines the various input/output *ports* found on the computer e.g. *printer port.*

Secondary storage devices

The operating system manages the storage and retrieval of data on secondary storage devices. It also utilizes the free space on hard disks to enhance the performance of the computer by temporarily holding tasks

on it that were in RAM ready for processing but have to wait for some time.

Communication devices and ports

Communication in this case refers to how the various devices and programs in and out of the computer system send and receive messages from one another and from the processor. The operating system controls the overall communication process between various tasks and computers. External communication can be achieved by connecting an external device to a *communication port* using a communication medium like cables or even wireless communication.

3.3 Functions of an operating system The functions of an operating system are:

Job scheduling

The processor can only handle one task at a time. Therefore, the operating system has to determine which task will be processed first and makes sure that the one that is currently being processed is closely monitored to avoid wasting time in the processor. The criteria for selecting which task will come before the other depends on many factors. For example, the operating system may decide to process smaller tasks before larger ones.

Resource control and allocation

In order for the processor to be able to recognize and priorities the use and requests for resources, it gives each resource a unique identification number called an *interrupt number.* Hence when two tasks request to use a resource at the same time, the one with higher priority interrupt is granted control. This can be compared to the priority given to the presidential motorcade on a busy road.

Secondly, the operating system tries as much as possible to avoid a situation where a particular task holds a needed resource and refuses to release it for use by other tasks. When several tasks do this, an undesirable situation called *deadlock* occurs.

Therefore, resource control and allocation is a core operating system function because it determines which task uses a particular resource and at what time.

Input/output handling

Every computer has many input and output devices (I/O). Like a skilled traffic officer, the operating system coordinates between these various I/O and other peripheral devices such as auxiliary storage devices, making sure that data flows properly between them and sorting out any possible confusion. For example, when printing, the CPU directs its attention to the printing function. The operating system searches for the printer, chooses the correct one,

translates the name for the CPU and finally the CPU sends the document to the printer. This then makes the CPU available for other activities.

Memory management

All data and instructions must be temporarily held in the main memory before and after processing. The operating system may organize the main memory into blocks of sizes called *partitions.* It constantly assigns main memory storage partitions to data and instructions. To access a piece of data or instruction, the operating system knows where to find each piece of data as long as the correct address of the partition is used.

Error handling

The operating system has many ways of alerting the user, of errors he or she makes. Many op rating system usually express what the error is, and where possible make suggestions on how to correct the error. The operating system does this by monitoring the status of the computer system and performing error checks on both hardware and the software.

Job sequencing

The operating system keeps a list of jobs or tasks currently being run and clocks them in and out of the processor. It also arranges them in a particular order to make it easy for the processor to execute them and to know how and when to fetch instructions and data for each task.

Interrupt handling

An interrupt *is a break from the normal sequential processing of instructions in a program.* An external request causes the processor to stop executing the current task, and do something else before returning the control back to the program that was interrupted.

Each hardware device communicates to the processor using a special number called the *interrupt request number (IRQ number).* Fig 3.2 shows the devices assigned to IRQ numbers in Microsoft Windows.

3.4 Types of operating systems

Operating systems can be classified according to:

1. Number of tasks handled concurrently.
2. Number of users.
3. Human computer interface (HCI).

Classification according to tasks handled concurrently

Single program operating system

Single program operating system allows processing of only one user program in the main memory at a time. This means that the user can only run one interactive program at a time. Then the user must exit from the program before loading and running another program. An example of a single user operating system is MS DOS from Microsoft Corporation.

Multi tasking operating system

This type of operating system allows a single CPU to execute what appears to be more than one program at the same time. However, internally only one program is being executed at a time. The CPU switches its attention between programs as it receives requests for processing, executing statements from one program, and then from another using the concept of giving a *time slice* to each application. This switching of attention is so fast that it appears as if the programs are being executed simultaneously.

Classification according to number of users

Single user operating system

A single user operating system is designed for use by only one person. It cannot support more than one person and runs only one user application at a time.

Multi user operating system

Multi user or multi access operating system allows more than one user to interactively use the computer. It can be installed on a computer that is accessed by many people at the same time. Examples of such operating systems are UNIX, Novell and Windows NT/2000, Linux.

Classification according to interface

The term *human computer interface* refers to the method of interaction between the computer and the user and determines how easily the user can operate the computer. The underlying principle in operating system design is to make complex tasks very simple for the user to carry out. This is the reason why a lot of time has been spent by software developers in trying to come up with *user friendly* interfaces.

Currently the three main types of human computer interface are:

Command line Interface

The user interacts with a computer by typing a command at the prompt found on a command line. A computer reads instructions from the command line and executes them. For a command to be more user friendly, the words used

should be descriptive verbs e.g. print, copy etc. Unique abbreviations can also be used e.g. Del Ren Chkdsk etc.

For example, if you are using MS DOS operating system, you can copy a file called Fruits.Dat from *a hard disk* C to *floppy disk A* as follows: COPY C:\Fruits.Dat A:\

NB: The user must press the enter key for the command to be executed.

Examples of command line interface are the early versions of MS DOS, PC DOS, OS/2, and UNIX.

MS DOS Interface

Menu driven interface

This type of interface provides the user with a list of options to choose from. The interface therefore is suitable for beginners who may have difficulties recalling commands.

Some operating systems present the user with simple menus while others have sophisticated menus.

The user makes a selection `by typing any of the letters I, V, E, D or Q to activate a submenu.

A menu driven interface.

Later versions of DOS came with a menu driven interface called the DOS shell or DOS editor

Menu

The DOS shell

The graphical user interface (GUI)

This type of interface represents commands as small pictures on the screen called *Icons.* Icons can be selected to issue a command using a pointing device like a mouse. GUI has become a very common type of interface because of its user friendliness.

Examples of GUI based operating systems are *OS/2* s *Presentation Manager, Microsoft Windows, Linux and Apple Macintosh.*

3.5 Factors to consider when choosing an operating system

When choosing an operating system for a computer, the following factors should be considered:

1. Hardware configuration or provision of the computer e.g. memory size, hard disk capacity, type of processor etc.

2. Basic design of the computer e.g. is it an IBM or IBM-Compatible, or an Apple computer.

3. Applications intended for the computer.

4. User friendliness or human computer interface i.e. is it command line based, menu driven or graphical user interface based.

5. Availability in the market e.g. Microsoft Windows based operating systems are very common.

6. Cost - how expensive is the operating system?

7. Reliability i.e. can it run without *crashing* or *hanging* i.e. stop responding to commands. .

3.6 How Windows organizes information

Introduction

Microsoft Corporation is a software company that specializes in the development of both operating systems and application programs. Some of its popular operating systems include; *Windows* 95, 98, *2000, NT, Millennium (Me) and XP.* These operating systems have gained wide popularity with many PC users because of their friendly graphical user interface.

Other operating systems that rival Microsoft products include *Linux, UNIX, Mac* OS *and OS/2.*

NB: In order to understand how an operating system organizes information, this book cuts across four versions of Windows i.e. Windows 95, 98, *Me* and XP, by giving standardized procedures that are common to all. However because it is hard to cater for the small differences in the four versions, the book provides a common procedure of carrying out Tasks. However, extra details on specific versions are discussed in *appendices L II and III.*

The good thing about all the versions of Windows discussed in this book is that once you acquire basic skills in using one version, you can easily transfer the same to other versions.

Some common features in Windows operating systems:

1. They all have similar user interface

2. Ability to handle long file names. As opposed to *MS DOS* which can handle a maximum of eleven characters, Windows 95 and later versions accept file names of up to 255 characters including spaces.

3. Various versions of Windows operating systems automatically accept a new hardware once it is connected to the computer. This feature is referred to as *plug and play {PnP}.*

4. They all support multiple tasks and multiple users.

Windows manages data and information stored on secondary storage devices by organizing it into easily accessible units called *files* and *folders.*

Files

A file is a collection of related data or information stored in one location and given a unique name that enables the operating system to identify it during storage and retrieval process. Every file has details that indicate the following:

1. A unique name and an optional set of maximum three characters called an *extension* e.g. a file named *JUNE.DOC* has *JUNE* as the name and *DOC* as the extension. The file name and the extension are separated by a period (.). The extension usually suggests the type of information held by the file e.g. *DOC* suggests that it is a document file created in an application program called *Microsoft Word.*

2. Its size and date of creation.

There are two types of files namely; *system file and application files.*

System files

These of files contain information that is critical for the operation of the computer. For example, all hardware devices are tested and made ready (initialised) during boot up by having the computer read information

From special system files. These files in Windows would have name extensions like *.sys, .ini and .dll.* An example of a system file is *system.ini*

Application files

They are also called *program files* because they hold programs or application files. They may have extensions such as *.exe.*

The following list gives some common file name extensions and suggests the type of information that could be held in the file.

Extensions	*Type of information*
DAT	Data files
EXE	Executable file that starts an application
TXT	Text files
DOC	Document file

When naming files, it is important to give meaningful names and extensions that suggest its content. For example when saving a letter written to John, give it a name such as *Johnletter.* The name extension is automatically added by the application being used.

Folders

A folder or a *directory* is a named storage area where the user can store related files to enable easy access. Like with an ordinary file cabinet, a folder is meant to help the user divide a large storage media into small manageable storage locations.

Subfolders

A large folder may be divided into smaller units called *subfolders.* Therefore, a subfolder or subdirectory is folder/directory within another folder/directory.

In Windows, folders and subfolder icons mostly appear in yellow color while file icons are mostly white with a fold at the top right hand corner

Storage media

When saving a file or creating a folder, identify a storage location, which is more reliable and sufficient. For example, if a file or folder requires more than 1.44MB of storage space, you can not use a 1.44MB 3 inch. floppy disk instead use a storage media with larger space.

Windows desktop

Once you switch on the computer, Windows is automatically loaded into the main memory and a mostly empty screen called the *desktop* appears. This shows that the computer is ready for use.

Some versions of Windows e.g. Windows XP, prompt the user to press Ctrl +Alt +Delete to gain access to desktop features through a process called *Log on.*

Desktop features

On the desktop are icons and a long thin bar called the *task bar.* Figure 3.8 shows a Windows Me desktop.

Icons

Icons are mostly manipulated using a pointing device e.g. the mouse. Some of the common icons on the desktop are *My Computer; Recycle bin, Internet Explorer,* and *My Documents.*

The task bar

The taskbar enables the user to easily switch between different programs and documents *(tasks)* that are currently running.

Whenever the user starts a program or opens a file, its button appears on the taskbar and stays there until the user exits from the program see Figure 3.9. You can switch between various programs and documents in Windows by clicking these buttons. This process is called *multi tasking.*

The taskbar has at least three main parts.

Start button: The leftmost button on the taskbar that the user clicks to display the *start menu.*

Task manager: This is the plain stripe that displays buttons of all currently running tasks. The task manager of Figure 3.9 shows *OPERATING SYSTE* is the currently running task

System tray: This is at the right most part of the taskbar. It has icons of tasks running in the background put are not displayed on the screen. Examples are the time and calendar, an antivirus program, volume control etc. To display such a task, simply double click its icon.

The start menu

When you click the start button, a list of choices appear called the *start*

menu. The items on the menu may vary depending on the version of Windows you are using. Figure 3.10 (a) and (b) shows Windows Me and Windows XP start menus respectively. From careful study of the figures, you will notice slight variations but most commands on the menu items remain the same.

Programs

This menu displays a list of all programs installed in the computer. The menu has a small solid arrow. When you point at it, another list of menus called a *sidekick menu* will be displayed as shown in Figure 3.10 (a) and (b).

Documents / my *recent documents*

Documents menu in Windows 95, 98 and *me* or *my recent documents in* Windows XP lists the last fifteen recently accessed files. You can open any of the listed files from a storage device by clicking its name provided that the device is accessible.

Settings / *control Panel*

Settings menu in Windows 95,98 and Me or the *control panel* in Windows XP provides tools which the user can use to maintain and make changes to the computer setup. It is important not to tamper with this menu because you may interfere with the computer functionality.

Find / *search*

Find in Windows 95,98,and Me or *Search* in XP helps the user to search for a file or folder in case the user forgets its name or location.

Help / help and support

The *help* command on the start menu, displays detailed information on how to use the operating system and solve some computer related problems in case of the computer fails to function properly.

Run

It enables the user to:

1. Install programs on the hard disk.

2. Open files and folders from a storage location.

3. Run programs from removable media without necessarily installing it on the hard disk.

Log on / log off

Log on is a security measure that restricts unauthorized uses from accessing computer resources. It prompts for a *user name* and *password* in order to gain access. After using the computer, *log off* the computer before leaving.

Shutdown

This menu lets the user shut down, restart the computer, or restart in MS-DOS mode. Windows Me and Windows XP do not have MS-DOS in their shut down dialog box, see appendix II and III.

Every time you finish using the computer you must first shut it down before turning it off. To do this you need to:

1. Click the start button

2. Point and click shutdown a prompt for Windows 98 will appear.

3. If you want to shut down, click the shutdown button

4. Finally, click ok or simply press enter

5. Wait for the computer to display a message, *It is now save to turn off* . Some computers automatically switch themselves off once you click ok.

3.7

Managing files and folders

To manipulate files and folders, you can either use *My Computer* icon from the desktop or *Windows explorer* from the start menu. Each in its own way lets you see how storage devices or locations, files and folders are arranged. These tools also enable the user to manipulate files and folders.

Windows explorer

Windows explorer lets the user display the drives and folders in a hierarchy or *tree structure.* The computer tree is an up side down structure with the highest level being the *root.* The explorer divides the window into two panes. The left pane displays a tree of drives and folders while the right pane displays a list of files and sub folders contained in a particular open drive or folder.

To display the Windows explorer in some versions of Windows like 95/98 carry out the following procedure:

1. Click the start button then
2. Point to the programs menu
3. From the Programs go to the sidekick menu, click windows explorer

An explorer window such as the one shown in Figure 3.12 will be displayed.

NB: In some operating systems, Windows explorer command may not necessarily be located on the program s menu. The other method of displaying the explorer window is to:

1. Right click' my computer icon on the desktop.

2. Point and left click explorer from the shortcut menu.

This method of displaying the explorer window has been adopted as the standard way of displaying the explorer window throughout this book to take care of various versions of Windows operating systems.

In Figure 3.12, the highest item in the tree is the *desktop* then followed by *My Computer.* If you observe keenly, you will notice that some items have a small box on their left with a plus or minus sign inside. If an item has the plus sign on its left, it contains other lower level items e.g. My Documents folder in the above figure, has subfolders inside. To display the subfolders, click the plus sign and the sign will change to minus meaning that all subfolders in that level have been displayed. You can reduce *(collapse)* the tree by clicking minus sign.

Using My computer

Double clicking on my computer icon, gives you a graphical view of what is inside the computer. This includes the drives, the control panel and other resources as shown in Figure 3.13 (a).

To display files and folders from a particular drive proceed as follows:

1. Double click a drive icon. A window appears displaying files and folders stored in the root of the drive in question. The root is considered to be the highest level of the directory tree where all directories/folders start.

2. Double click a folder to display its contents.

3. Double click the hard disk (drive C). Its content will be displayed as shown in Figure 3.13 (b).

4. From this window you can start manipulating your files and folders.

4.

Creating a *new folder*

There will be times when the user would want to create new folders. Say, for instance, when working on a detailed project that has multiple files. It is advisable that all related files be kept together in one folder. To create a new folder proceeds as follows:

1. Using My computer icon display the Explorer window.

2. From the folder tree on the left pane, select the location in which you want to create a new folder.

3. From the File menu, click New then click Folder as shown in Figure 3.14 (a). Anew folder with a temporary name *New folder* appears in the explorer window as shown in Figure 3.14 (b).

4. Type a new name for the folder to replace the temporary name then press Enter key or click the icon once.

NB: To create a subfolder, follow the steps above but select a folder as the location. To open a folder proceeds as follows:

1. Using My computer icon display the Explorer window.

2. From the folder tree on the left pane, click the plus sign against the storage location that contains the file or folder you wish to open.

3. From the folder tree, select the folder. Its contents will be displayed on the right pane.

Creating a new *file* .

Depending on the programs installed in your computer, you can create files of different types such as drawings, text document etc. To create a new text document proceed as follows.

1. Using My computer icon display the Explorer window.

2. From the folder tree on the left pane, select the location in which you want to create a new file.

3. From the *File Menu,* point new

4. Select text document from a list of available applications and an icon with a temporary name appears in the explorer window.

5. Type a new name for the new file to replace the temporary name and press enter key.

NB: In Windows, file names can contain up to 255 characters, including spaces but, with no special symbols such as \ /: *? < > I.

The application Window

In order to enter data in the new file just created above, you have to open it in its application program. This can be done by double clicking the file icon. A rectangular area called an *application window* appears on the screen as shown in Figure 3.15.

Parts of a *Window*

Title bar

This is a bar across the top of the window that displays the name of the current application program or task.

On the right of the title bar are three tiny buttons namely:

Minimize button: It reduces a window by pressing a button which is placed on the taskbar.

The restore/maximize button: It stretches the window to cover the entire desktop or restore it to its original size.

The close button: It is used to exit an application.

Menu bar

Menu bar provides a *list of commands* that can be used to manipulate a task. For example, to save a document, click file and then save.

Too/bars

These are buttons arranged in a row that are shortcuts to menu commands.

Work area

This is the working area where you can create your documents.

Status bar

This is an interactive strip at the bottom of the application window that acts as a communication link between the user and the operating system. Such interactive activities include saving, opening a file, printing, cursor position etc.

Scroll buttons and arrows

Scrolling is the moving up, down, left or right of a document window on the screen if it is too large to fit. Scroll buttons and arrows are horizontal and vertical buttons at the borders of a window used to scroll through long document.

Saving changes to a *file*

After typing the content of the file in the work area, click file and then Click save Otherwise, if the file will be saved with a different name or location then:

1.Click file and then save as

2. From the resulting Save As dialog box, select where the document is to be saved then type its name

3.Click the save button.

Renaming files or folders

Renaming refers to changing the previous name to a new name.

To rename a file or a folder proceed as follows:

1. Using My Computer icon display the Explorer window.

2. From the folder tree on the left pane, select the file or folder to be renamed.

3. From the file menu, click rename

4. Type the new name, and then presenter key.

Deleting files and folders

In Windows, when you delete an item from the hard disk, it is temporarily held in a special folder called the *Recycle bin* from which it can be restored if necessary.

The recycle bin is a default icon on the desktop therefore it cannot be removed.

Warning

1. One should not attempt to delete system and application files from the hard disk.

2. Items deleted from removable storage are not held in the recycle bin and are completely lost.

To delete a file or folder proceed as follows:

1. Using My computer icon display the Explorer window.

2. From the folder tree on the left pane, select the item that is to be deleted.

3. On the File menu, click delete

4. A message appears on the screen asking whether you actually want to delete the item.

5. Confirm by clicking yes

Restoring deleted files and folders

To restore a file or folder from the recycle bin to its original location proceed as follows:

1. Double click the recycle bin icon.

2. Select the deleted item (or items) to be restored.

3. Click file then restore

Emptying the recycle bin

To completely discard files and folders you deleted, you need to empty the Recycle Bin. Deleted items take up the same amount of disk space they occupied before you deleted them. To free up that disk space occupied, you have to empty the bin.

To empty the recycling bin proceed as follows

1. Double-click the recycle bin on desktop.

2. Choose empty recycle bin from the File menu.

3. Click yes when prompted to confirm deletion of the files.

NB: You can also delete selected items in the recycle bin by clicking file then delete

Copying and moving files and folders

Cut or *copy* commands are used to move or create a duplicate of an item respectively. When you *cut* or *copy* an item, it is temporarily held in temporary storage location known as the *clipboard.* To copy a file or folder:

1. Using My computer icon display the Explorer window.

2. On the edit menu, click copy

3. Select the drive or folder where you want the item to be copied.

4. From the edit menu click paste Information or item is pasted to a new location

Copy progress dialog will be displayed on the screen as shown in Figure 3.16 below

To move a file or a folder proceed as follows:

1. Using My computer icon display the Explorer window.

2. On the edit menu click cut.

3. Select the drive or folder where you want the item moved.

4. From the edit menu click paste.

5. Move progress dialog will be displayed on the screen similar to that of copying in Figure 3.16 but with the word *moving* in the title bar.

Sorting files and folder

Sorting means arranging files and folders in a particular order either alphabetically or by size or date of last modification or creation. Widows automatically sorts files and folders into alphabetic order but the user can choose to arrange them otherwise. For example Figure. 3.17 show how to sort by *name.* Notice that a dot appears next to name to show that it is selected.

Manipulate files and folders using the shortcut menu

When you right click an item, a shortcut menu is displayed which provides commands commonly used to manipulate the item.

To *copy, move, delete* or *rename* an item proceed as follows:

1. Right-click the file or folder to display its context sensitive menu.

2. From *the* shortcut menu, *left click the* appropriate command *i.e.*

(a) To copy or move, right *click the destination* location *then click paste*

(b) To delete, *simply* click delete Command.

(c) To rename, type *in* a new file name to replace the old *one.*

Manipulate files and folders by drag and drop

Another easier method of handling files and folders is drag and drop. This is done as follows:

1. To copy a file or folder, hold down the CTRL key while you drag the icon of the file to a new location.

2. To move files from one location to another on the same drive but in a different folder, simply press down the Mouse button and drag the item to the new location.

3. To delete any file or folder drag it into the recycle bin.

4. To copy file or folder from one disk to another, simply drag the item to the destination drive icon e.g. from drive C to 31/2-floppy disk.

5. To move an item, hold down the *Shift* key while you drag it to new location.

Selecting multiple files and folders

If you want to manipulate multiple files or folders at a go, you can select them by clicking each item while you hold down the control *(CTRL)* or *SHIFT* key.

If you want to select all files in an open folder, click *edit* then *select all.* This will highlight all files in the folder. To manipulate the selected items, use the menu bar or the shortcut.

Searching for files and folders

To search for a specific file 'or folder proceed as follows:

1. From the start menu, click find /search Figure 3.18 shows a

   Windows 98 find dialog box.

2. Type the name of the file and the location to look in respectively.

3. click find now button

3.8

Disk management using Windows

Windows operating system provides the user with tools that help him/her to manage storage devices and media. It is important to have a routine check of all the storage devices otherwise one may end up losing very vital data and programs.

Warning: Do not attempt these operations on disks without the guidance of the teacher. It is preferable to use the floppy disk rather than the hard disk to perform these operations because some of them can easily lead to loss of data and information stored on the hard disk.

Formatting disks

Before using a floppy disk, it must be *formatted. Formatting* is the process of preparing a new disk for use by imprinting empty sectors and tracks on the surface of the disk so that the operating system can recognize and be able to access it. Most diskettes today are sold readily formatted. Each operating system has its own special way of formatting a disk that may make the disk not to be read by another operating system. To format a new floppy disk proceed as follows:

1. Put a new unformatted disk into the floppy drive.
2. Double click my computer icon.
3. Right click the icon labeled 3 1/2-floppy (A:) then select: Format.
4. Select the disk capacity e.g. 1.44MB, format type i.e. either quick erase or full
5. Give the diskettes an internal name (label).
6. Click start to begin formatting.
7. Once the process is over, click Close.

Scanning a storage device for problems

Windows has a disk management tool called the *scan disk* that helps the user check up and repair minor storage problems, such as lost storage locations, or damaged surface. To scan a storage device the following is done:

1. Double click my computer icon to display the storage devices installed on the computer.

2. Right click a drive icon e.g. 31/2-floppy disk (A:).

3. From the shortcut menu, click properties then click Tools tab, to display a dialog box

4. Click the check now button

5. A prompt appears requesting the user to specify scandisk options like whether errors found should be corrected automatically.

6. Once scan disk is complete, Windows will give a summary statistics on errors encountered if any.

Using disk defragmenter to rearrange storage media content

Disk defragmenter is a tool that is used to rearrange scattered folders and files on a storage media in order to speed up access to files and folders. This enables the read/write head not to waste time looking for the same item all over the disk. Figure 3.20 shows a disk before and after defragmentation. Notice that the fragmented disk has related data elements spread all over it but the defragmented one has related data consolidated close to each other.

To start disk defragmentation proceed as follows:

1.Double click my computer icon to display the storage devices installed on the

computer.

2. Right click a drive icon e.g. 3 1/2-floppy disk (A:).

3.From the shortcut menu, click properties then click tools tab

4. From the dialog box displayed, defragment now button

5. From the dialog box displayed, click defragment a process status bar is displayed.

6. Wait for the process to complete then close the defragmenter.

Compressing the storage media

Windows provides the user with two compression tools namely, *compression agent* and *DriveSpace.* Compressing storage media contents to fit in smaller space helps to create more free space on the media.

DriveSpace can use the free space on an uncompressed drive to create. a new, empty compressed drive called a *host.* To compress a disk proceed as follows:

1. Double click my computer icon to display the storage devices installed on the computer.

2. Right click a drive icon e.g. 3 1/2-floppy disk (A:)

3.From the shortcut menu, properties If you are using windows XP select the *Compress drive to save disk space,* check box then click ok as shown in Figure 3.21 (a). If using windows 98 click the compression tab then click compress drive button. (Figure 3.21 (b))

4. In confirm attribute changes, select the option, you want

NB: If you are using Windows 95/ 98, click the start button, point to programs,

accessories, then system tools and select compression agent or DriveSpace.

From the compress dialog box, click drive then compress

Scanning for viruses

A *computer virus* is a program written by *malicious* persons aimed at conducting unwanted operations like damaging disks and data. Severe virus attack can result in system failure. There are literally thousands of these evil programs that can get into a computer via infected floppies or even via electronic mail and the Internet.

Cleaning infected storage devices

To guard a computer against virus attack, special programs called *antivirus software* such as *Norton Antivirus, PC-cillin* or *McAfee* should be installed on the computer. These programs can check your system for thousands of known viruses and eradicate them. To scan for viruses the following is done:

1. Double click my computer

2. Right click a drive icon.

3. From the shortcut menu displayed, select the name of the anti-virus program e.g. *Scan with Norton Antivirus.*

4. Follow the instructions displayed by the anti-virus program to start scanning.

Backing up Data

Windows comes with a utility called *backup.* It enables the user to create copies of data and programs (on separate storage device) to avoid losing important data and program files in case the storage device or the computer fails. It is good practice to keep backups away from the computer room to ensure security of the information in case of a calamity such as fire. To create a back up proceed as follows:

1. Click the start-button, point to programs, accessories, system tools then click backup

2. If a welcome to Microsoft Backup dialog box appears, click ok to close it.

3. In the Microsoft Backup dialog box, select the files and/or folders you want to backup by placing checkmarks next to their names. When all the files in a folder are selected, it will appear gray.

4. Follow the on screen instructions to accomplish the operation.

Restoring backed up data

To restore backed up data proceed as follows:

1. In the main backup window, choose there store tab.

2. Select the back up files to restore, choose next step and follow the Instructions on the screen. The backed up data will be restored.

The startup (Boot up) disk

Suppose the hard disk is seriously damaged, and the computer cannot start Windows. The only other option available would be to start the computer using a *startup disk* that has booting instructions. The start up disk is usually a floppy disk that was created using the operating system.

To create a startup disk

1. Double click my computer: icon, then the control panel

2. In the control panel double click add/remove programs.

3. In the Add/Remove programs dialog box, click startup disk, then create disk.

4. The startup disk creation progress will be displayed as shown in Figure 3.22.

To boot up a computer using the start up disk insert it in the floppy drive then switch on the computer. The computer reads the boot up instructions from the diskette then displays a command prompt such as *A:>* - that enables the user to type commands. The commands help the user diagnose the problems that might have led to boot failure.

Partitioning a disk

Partitioning a disk refers to the process of dividing a large physical disk into two or more partitions called *logical drives.* A logical drive is a drive that can be accessed as if it is a separate disk but in actual sense, it is a partition of one large physical disk.

Reasons for partitioning **a** ***disk*** The reasons are:

1. When the user intends to install more than one operating systems on the same disk. Install each on a separate partition.

2. For purposes of backup on the same disk but different partitions so that if one partition fails, the other will still be working.

Partitioning process

To create partitions, you must have a startup or bootab1e diskette and proceed as follows.

1. Before you switch on the computer, insert the system disk into the floppy disk drive.

2. Switch on the computer and let it boot to A: > prompt.

3. Type FDISK command at the prompt and press the enter key.

4. A prompt *Do you wish to enable large disk support (YIN)* appears. Press Y to

enable the computer to support large capacity hard disks of *500MB* and above otherwise press N.

5. From the menu displayed, Choose *1* (Create DOS partition or Logical DOS Drive) as shown in Figure 3.23.

6. From the sub menu displayed:

(a) Choose option 1 to create primary DOS partition that will be treated at the bootab1e disk or drive C.

(b) Choose option 2 to create extended (other) DOS partitions.

(c) Choose option 3 to give your extended DOS partitions drive labels.

Once you finish partitioning the disk, reboot the computer for the changes to be effected then *format* the drives created. If you do not format the drives, the computer will not be able to access the *storage media.*

NB: You can also use the other FDISK options to display partition information or Delete partitions.

3.9 Installing Windows operating system

Installing Windows 98

Because the operating system is the supervisor for all the other computer programs it must be *installed* into the computer s hard disk before installing any other program.

The term *installation* refers to the process of copying program files onto the hard disk. Installation differs from copy paste process in that it is specifically meant to copy executable files in a format that allows the computer to run the program.

To correctly install an operating system, carefully study the manufacturer s documentation (manuals) in order to get the correct information on installation procedures and system requirements. For example to install Windows 98, Microsoft recommends that a computer should have the following minimum requirements:

1. At least 486-66MHz Processor.

2. At least 16 MB of RAM.

3. At least 170MB of free hard disk space.

4. A CD-ROM drive because Windows 98 comes a CD-ROM.

This configuration would work but a *Pentium I and a* machine with

32MB of RAM and above would be much better.

Installation process

In order to install Windows 98 on a computer that does not have an operating system, the user must have a *Windows* 98 *Startup disk.* This disk gives the user options for loading with or without the CD-ROM support.

Because Windows 98 comes on a CD-ROM, you must boot the computer With *CD-ROM support* in order for the computer to recognise the CD-ROM drive.

A successful boot displays the prompt; *A :>* -' Then

1. Type the drive letter that represents the CD-ROM drive at the prompt *e.g. A :\> D:* then press the *enter key.*

The prompt should change to the letter that was typed to represent the CD drive e.g. *D:* \>

This means that the computer is able to read whatever is in the CD-ROM drive.

2. Type *SETUPEXE* e.g. D :\> *SETUP* then press the enter key.

First Setup scans the available disks for errors and if an error is encountered, it is fixed but if it is more serious, the setup process is halted.

After this, the setup program (Wizard) asks you a few questions, gets you accept the license agreement and enter the product key. See Figure 3.24.

The rest of the installation is automated. All you need to do is just relax and let the wizard complete the installation task.

Troubleshooting Windows related problems

The term *troubleshooting* refers to the process of diagnosing and trying to fix (resolve) hardware or software related problems. When using

Windows, you may experience some problems such as;

1. Failure to load the operating system during the booting process. 2. The computer hangs (stops responding) now and then.

3. Abnormal restarting.

4. Displaying a blue screen with a message such as *Fatal exception error has occurred* etc.

These problems may be due to one of the following reasons:

1. There may be hardware conflict or incompatibility caused by *interrupt request (IRQ)* or missing *Widows device drivers* such as

Himem.sys (device drivers in Windows that helps in allocation of main memory)

2. There was a problem in the installation process e.g. missing system files that could not be copied due to a damaged installation disk.

3. There may be a problem with your hard disk boot sector either due to virus infection or damage.

4. Insufficient system memory.

5. Corrupted system *Windows registry. Registry* is a database where Windows stores its configuration information such as system hardware, installed programs, and property settings.

6. Due to interrupt request conflict i.e. if two devices are sharing a common interrupt request number.

To resolve these problems you need to:

1. Study the troubleshooting guide that comes with the operating system

2. During the booting process, hold down the F8 key on the keyboard in order to get the start-up options from which you can choose to start the computer in *safe mode or display the command prompt.*

This will help you to check whether the problem is due to disk failure or corrupted registry. With safe mode, you can establish whether the problem is due to corrupted system registry or failed devices. If the registry has failed, the computer will prompt you to reinstall the registry backup. If the problem is due to disk failure, start the computer using the start-up disk and type *Scandisk* C: at the command prompt. Scandisk will establish whether the failure is due to *bad file or directory structure* or *damaged disk surface.*

3. Use the *device manager* found in *System properties* dialog box to check on the devices that are causing problems. You get system properties dialog box by right clicking my computer then properties

4. Reinstall the operating system if the problems above persist. In case the problem is beyond repair.

APPENDIX I

Beyond basics

Arranging multiple application Windows on the desktop One of the biggest advantages of multitasking is that one can open and work with several applications. One may wish to arrange open Windows either, side by side (Tile) or one on top of another (Cascade).

Tiling windows

Tile horizontally

This arranges all running programs one below the other as shown in Figure AI.I. The program in focus will have its title bar highlighted. To switch to another program, simply click its title bar. To tile horizontally:

1. Right click the task bar

2. Click tile windows horizontally

Fig. A 1.1: Tiling horizontally

Tile vertically

Applications can be arranged down the screen beside each other as shown in Figure AI.2. To tile vertically:

1. Right click the task bar
2. Click tile windows vertically

Undoing tile

You can undo tiling by right clicking the from the shortcut menu.

then click

Cascading

Each window is placed on top of the other with the active program being foremost as shown in Figure A1.3. To cascade:

1. Right click the task bar.
2. Click cascade windows

Undoing Cascade

You can undo cascade by right clicking the taskbar, then click undo cascade from the shortcut menu.

Customising common features in Windows 98

Customising the desktop

Windows lets the user change desktop appearance and display.

To customise the desktop, right click the desktop to display properties dialog box as shown in Figure A.1.4 and make the appropriate changes by clicking each tab.

The background

To set the background

1. Click the back ground tab

2. In Wallpaper list, select a wallpaper pattern.

3. Click on tile to cover entire screen with small wallpaper images or stretch to fill the wallpaper with one large image or center to let the wallpaper occupy only the centre of the desktop.

4. Click apply to see the changes before you close the dialog box,

5. Click ok to effect the changes and close the dialog box.

Setting the screen saver

If the screen saver is set, it starts playing on the screen if the computer is left idle for a set period of time.

To set a screen saver:

1. Click the screen saver tab

2. Select a screen saver style from the screen saver list

3. click apply to see the changes before you close the dialog box,

4. click ok to effect the changes and close the dialog box.

NB: To clear the screen saver press the mouse button or any keyboard key.

Changing the screen appearance

This will change the appearance of Windows items such as icon size, border colours, highlights etc.

To change the screen appearance:

1. Click the appearance tab

2. From the schemes list box, select the color scheme such as rose, storm, Windows standard etc.

3. From the items list box, select the item that the scheme will apply to i.e. icon, desktop, menu bars etc.

4. Click apply to see the changes before you close the dialog box,

5. Click ok to effect the changes and close the dialog box.

Set Windows items effects

With Windows 98, the user can change icon type as well as visual effects of most of items such size of icons, animate windows, and menus among others. To set Windows effects:

Web

With Windows 98 you can customise the desktop by integrating the Web

features on it. You can also turn the Web elements into desktop elements and update them at any time, this is done by:

1. Click the web tab to apply web effects on the desktop.

2. Check view my active desktop as a web

3. Click apply to see the changes before you close the dialog box.

4. Click ok to effect the changes and close the dialog box.

Setting display colours and resolution

The clarity of an object depends on color intensity and resolution of the display unit.

To change color and resolution settings

1. Click the Settings tab.

2. From colours list box, select the calibratione.g. 256 colours.

3. Use the slide button to adjust the screen resolutions e.g. 800 x 600 pixels.

4. Click apply to see the changes before you close the dialog box.

5. Click o.K. to effect the changes and close the dialog box.

Setting date and time

To set date and time:

1. Click the start button, point to settings then click control panel alternatively double click the Clock on the system tray.

2. In the control panel, double-click date/time icon.

3. Adjust date and time accordingly.

Mouse settings

To change the default mouse button, double click speed and the pointer appearance to set a mouse:

1. Click the, Start button, point to Settings then; control panel.

2. In the control panel, double click the mouse icon.

3. Change the mouse properties the click ok.

APPENDIX III

Windows Xp desktop feature

They re some slight changes on how some icons appear and their labeling on the desktop as shown to enhance security, the user has to log on by pressing Ctrl + Alt + Del keys in order to use the computer resources.

The start menu

The start menu layout is slightly different from that of Windows 95, 98 and Me. The start button displays a pane divided into two. The control panel has replaced the settings menu while the shut down and log off commands can be accessed on the start menu as shown in Figure A3.2

Changing desktop properties

To change desktop properties:

1. Right click a blank area on the desktop.

2. From the shortcut menu, click properties to display the desktop properties dialog as shown in Figure A3.3.

3. To change a property, select a tab associated to the property then make the necessary changes. For example *to change the desktop' background, select*

the desktop tab as shown and choose a background.

Shutting down the computer

Simply click the start button to display the shut down dialog box similar to the one shown in FigureA3.4. As with *Windows Me, in XP* one cannot also restart in MS DOS mode. New commands such as *log off Administrator* and *Hibernate* have been introduced.

APPENDIX IV

Glossary

Access time: The length of time needed to write or read data from storage.

Application package: It is a program that is used in processing user specific needs sometimes called off-the-shelf or canned programs.

Arithmetic and Logic Unit (ALU): A part of the central processing unit that performs computations and makes comparisons as instructed.

Artificial intelligence (AI): A field of computer technology in which researchers and electronic product developers concentrate on developing computers that imitates human intelligence.

Bits (binary digits): Since digital computers and computer accessories circuitry represent data as a pattern of *on* and *off* state of electric current, a bit is a *1* or a *0* used to represent the two states respectively.

Byte: A group of bits used to store a single character. A byte usually consists of seven or eight bits, which the computer handles as a unit.

Central processing unit (CPU): This is the *brain* of a computer, which apart from performing processing tasks; it controls all other activities of a computer system.

Computer hardware: The physical computer equipment one can see and touch. Such equipment includes the system unit, input devices, storage devices and output devices.

Computer program: A set of instructions that direct the computer what tasks to perform and how to perform it. These instructions are specially written using a computer programming language.

Computer software: See computer program

Computer system: A computer system refers not only to the physically attached devices to the computer but also to software and the user.

Control unit: The part of the CPU that interprets the instructions and controls all the operations in a computer system. The control unit monitors on the input, storage, the arithmetic and logic operations, and the output operations to have the instructions carried out.

Data: This are the raw facts represented by numeric, alphabetic characters and special symbols that are processed into information by the computer.

Data processing: The varied activities performed to convert data into useful information.

Desktop publishing: The process of designing and creating professional documents such as books, magazines, brochures and cards using specialised software such as PageMaker, which instructs the computer to size, insert, graphics as well as print a document.

Direct access: The ability to go directly to the storage location for the particular data required for processing, without having to search through all the records from the beginning of the file.

Drive: Devices used to read and/or write (store) data on a storage media.

Electronic mail (e-mail): A type of mail system that uses computers and the telecommunication facilities to transmit messages. Messages may be in the form of letters, memos, reports, or graphic displays.

Electronic spreadsheet: Computer software that has rows and columns used for doing a number of calculations and forecasting future trends.

Floppy disk: A floppy disk or simply a diskette is made up of a small flexible disk coated with iron oxide. This disk is covered with a plastic protective case. It is portable thus making it the most common type of storage device used with microcomputers.

Hard copy: Hardcopy refers to the tangible output produced mostly on a piece of paper by devices such as printers and plotters.

Hard disk: Also referred to as a hard drive or a Winchester disk, is a sealed unit in which are shiny, metallic disk platters and read/write heads that reads and records data on the disks.

Information processing cycle: The full set of operations that take place, from collection of input data to the availability of output (information).

Input: A collection of raw data at the start of information processing cycle.

Input/output (I/O) devices: Devices used for entering data to be processed and for reporting the results of processing.

Integrated circuits: Thousands of small circuits etched on a silicon chip. As these circuits are made more and more compact, they are called Large Scale Integrated (LSI) and Very Large Scale integrated (VLSI) circuits.

Menu: A program s list of user choices or possible actions usually shown on the screen. Choices are usually expressed in simple language statements for ease of use.

Microcomputer: The name given to a small, low cost computer system with a microprocessor as its *brain.* A microcomputer can perform input, processing, storage and retrieval, and output operations rapidly, accurately, automatically, and economically despite its relatively small physical size.

Microprocessor: A complete central processing unit of a computer placed on a single Large-Scale Integrated (LSI) circuits chip.

Minicomputer: A computer having a smaller capacity for both primary and secondary storage than medium size and large size mainframe computers.

Networks: Communication systems that connect computers, terminals, and other electronic office equipment for the purpose of efficient communication and sharing of resources.

Operating system: This is a complex program that is responsible for controlling processing operations in a computer system. It handles input, output, storage and running of other user programs. Examples of common Operating Systems are Microsoft Windows *95/9812000/XP,* UNIX and Linux, Apple Mac OS etc.

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Optical disk: These are disks on which data is recorded using a laser beam (a very strong concentrated light). The beam bums the thin shiny reflective surface to record data.

Output: Useful information available at the end of the information processing cycle.

Plotter: One type of graphics printer used to provide hard copy of graphical output. The output appears in such forms as multicolored charts, graphs, diagrams and maps.

Random-Access Memory (RAM): A type of main memory that holds data and information temporarily before and after processing. It is called random access

memory because the data contained in each storage address can be directly retrieved without regard for the sequence in which it was, stored.

Read-Only Memory (ROM): The other type of main memory with data or instructions permanently or semi permanently recorded in it. This means that no new data can be transferred in to ROM during processing. ROM is used to store program instructions that the computer always needs to operate. '

Robotics: The use of robots controlled by computer to perform work ordinarily done by human beings. Robots usually have computer controlled arms and a control camera placed inside that enables it recognise different objects.

Scanner: An input device that captures data from source documents and objects.

Semiconductor: An electronic component consisting of small chips of silicon on which integrated and support circuits are etched. It is used for developing microprocessors, primary and other electronic components.

Storage: The storing of data and information for future us. The length of time the data is stored can vary from less than a second to months or even years.

Supercomputer: The largest, fast, and most expensive type of computer available. They can perform hundreds of millions of complex scientific calculations in a second.

Utility program: A collection of instructions designed to make common processing operations run smoothly.

Volatile memory: The term applied to semi-conductor memory because its content is lost when the electric current is turned off. The content must be stored on an auxiliary storage if it is to be used again.

Word processing: The processing of textual data to produce documents such as letters, reports, manuals, catalogs, newspapers, magazines, books or other documents.

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