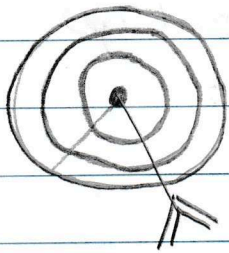


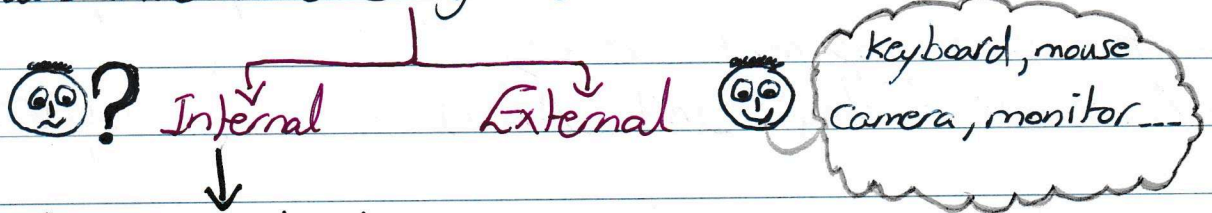
Chapter One $\Rightarrow$ Types & components of Computer Systems

Objectives:



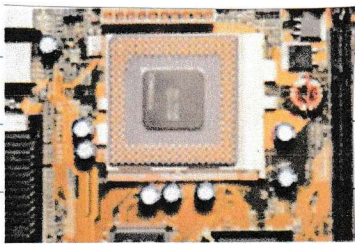
- * Difference between Hardware & Software
- * Analogue & Digital Data
- * Difference between RAM & ROM
- * Central Processing Unit - CPU -
- * Operating Systems
- * Types of Computer
- * Emerging Technologies

Hardware $\rightarrow$ Physical components that make up a computer
It falls into two categories



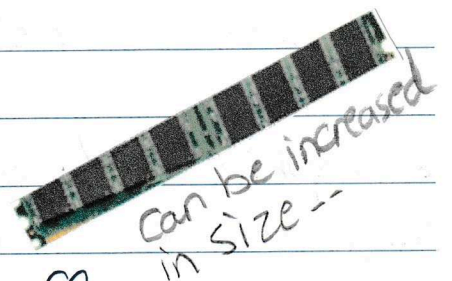
Let's have a look ---

- **Motherboard** :- is a printed circuit board found in all computers & allows the processor & other hardware to function & communicate with each other.



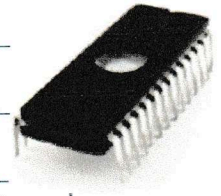
- **Random Access Memory - RAM** :-

- data is temporarily stored
- can be written to and read from
- contents are lost when power is turned off
- volatile memory
- store data, files, programs & part of operating systems currently in use.



• Read Only Memory - ROM :-

- Store information that needs to be permanent.
- Cannot be altered, only read from
- Information stored is not lost
- Non-volatile memory
- Used to store BIOS & other data needed to start up.



↳ Basic input/output system
also known as Boot-File

It is a code that tells the computer what to do when it starts up

• Central Processing Unit - CPU :- it is an electronic circuit board that executes instructions from a computer program.

The two main components are ⇒

* Arithmetic & Logic Unit (ALU)

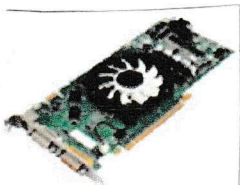
where arithmetic & logical operations are carried out

* Control Unit (CU)

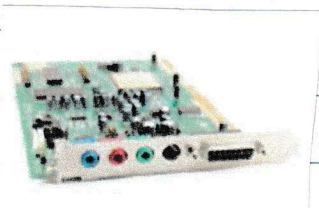
which takes instructions then decodes & executes the instructions

• Network Interface Card - NIC :- allows a computer or any other device to be connected to a network, it can be wired or wireless

• Graphics Card :- allows the computer to send graphical information to a video display device such as a monitor



• Sound Card:- provides a computer with the ability to produce sounds & to record sound.

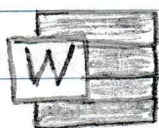


• Hard Disk Drive / Solid State Drive will be discussed in details in Ch3

Software → programs that control the computer system and process data. It falls into two categories:-
Applications Software & System Software

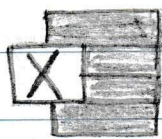
⇒ Applications Software:- Programs that allow the user to do specific tasks such as:-

- Word Processing - Creating, editing, saving & manipulating text



- Copy & Paste Functions
- Spell Checkers
- Import images
- Translation into foreign language

- Spreadsheet



- Calculations
- Produce graphs
- Modelling & What-if Analysis

- Database



- Ability to carry out queries
- Produce reports
- Add, delete & modify data in a table

- Apps & Applets

- Applets are small applications that perform a single task on a device.
- Apps software which can run on a smartphone and could be downloaded from an 'app store'

- Computer-aided design (CAD) software:-

software used to help in the creation, manipulation, modification and analysis of a drawing/design.

It can be used to produce 2D or 3D diagrams.

- Audio editing software:-

allows a user to edit, manipulate & generate audio data on a computer.

- Video editing software:-

allows a user the ability to manipulate videos to produce a new video.

- Graphics editing software:-

allows bitmap (images made up of pixels) and vector (images do not use pixels) to be changed.

⇒ System Software:- programs that allow the hardware to run properly & allow the user to communicate with the computer. Such as:-

- Compiler:- a program that translates a program written in a high-level language - source code - into machine language - object code. that is understood by a computer to perform a required task.

- Linkers:- a program that takes one or more object files produced by a compiler & combines them into a single program that can be run on a computer.

• **Device Driver**:- software that enables one or more hardware devices to communicate with the computer's operating system.

• **Operating System**:- software running in the background of a computer system. It manages many of the basic functions

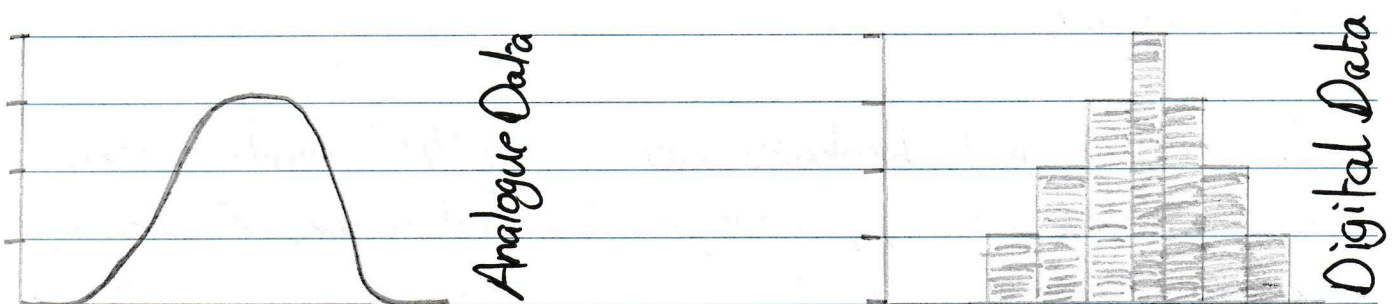
- Input/Output & backing storage devices operations.
- Allowing communication between the user & the computer.
- Dealing with errors.
- Supervising the loading, running & storage of programs.
- Managing of security.
- Maintaining a computer log.

• **Utilities**:- software that carry out specific tasks such as antivirus, anti-spyware, backup of files ---

* Analogue & Digital data

Computers can only understand data which is in a binary format $\Rightarrow$ **Digital Data**

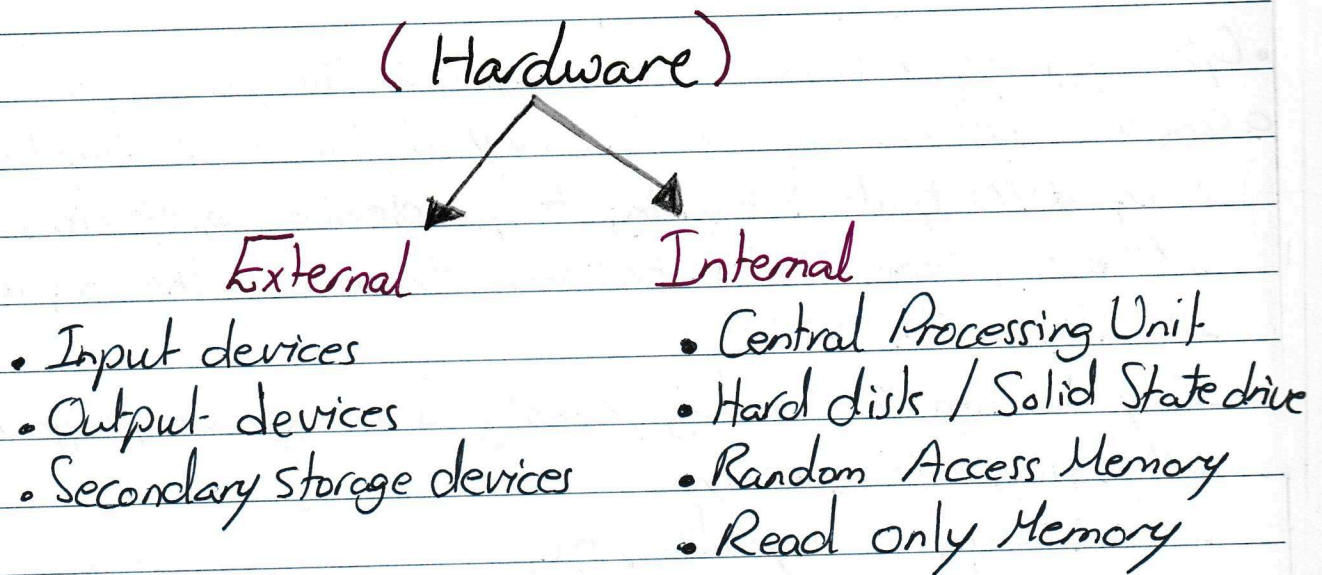
Physical data that changes smoothly from one value to the next and is used in the real world $\Rightarrow$ **Analogue Data**



If analogue data is being sent to a computer, it must first be converted into digital data using **Analogue to Digital Converter**. The digital output from the computer needs to be converted into analogue form using **Digital to Analogue Converter**.

* Main Components of Computer systems:-

Typical computer system is made up of **Hardware & Software**



* User Interfaces ⇒

[1] **Command Line Interface (CLI)**:- requires a user to type in instructions to choose options from menus, open software ---

[2] **Graphical User Interface (GUI)**:- allows the user to interact with a computer using pictures or symbols - icons - rather than typing the commands. Selecting this icon automatically execute all the commands.

GUIs use various technologies such as **WIMP** (Windows icons menu & pointing device), a mouse to control a cursor, icons to open/run windows.

Touch screens use **post-WIMP** allowing actions such as **Pinching** and **Rotating**.

Interface	Advantages	Disadvantages	Who uses it?
CLI	• Direct communication with the computer. • User is not restricted to pre-determined options • Possible to alter computer configuration settings.	• User needs to learn a number of commands • All commands need to be typed in "error-prone" • Each command must be typed in correct format, spelling & so on	• Analyst • Programmer • Technician
	• No need to learn any commands. • More user friendly. • Pointing devices are used to click the icons	• uses more computer memory • User is limited to the icons provided. • Needs more complex operating system "can be slower to execute".	• End-user
GUI			

[3] Dialogue-based User Interface:- uses the human voice to give commands to a computer system.

An example of its use is in some modern cars

Voice activation is used to control devices by speaking certain commands, the system allows natural speech to enable the driver to interact with the car. The satellite navigation system will direct the driver to their chosen destination.

[4] Gesture-based Interface:- rely on human interaction by the moving of hands, head or even the feet. This type of interface uses techniques known as Computer Vision & Image Processing.

Interface	Advantages	Disadvantages
Dialogue-based interface	• In cars, no need for a driver to use his/her hands • In home, very useful for people with disabilities. • Possible to use as a security feature.	• Still unreliable as many commands may not be recognized or need to be repeated. • Can be complex to set up • User needs to know which command to use
Gesture-based interface	• Replaces mechanical input devices. • No physical contact required. • Very natural interface. • No training needed.	• Possible for unintentional movement - to be picked up • Only works near to the camera or sensor. • May only accept a limited number of movements.

Types of Computer :-

I Desktop Computers



Advantages ⇒

- * Lower cost as spare parts & connections tend to be standardized
- * Easier & less expensive to upgrade or expand
- * Tends to have a better specification for a given price
- * Less damaged or stolen because they are fixed in one location.

- * Power consumption is not critical because they plug straight into a wall socket.
- * Internet access can be more stable because they have a wired internet connection.

Disadvantages ⇒

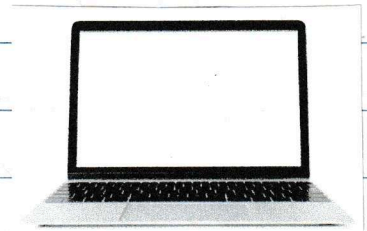
- * They are not portable because they are made up of separate components.
- * More complicated because all the components need to be hooked up by wiring
- * It is necessary to copy files when you want to do some work elsewhere

Uses ⇒

- * Office & business work
- * Educational use
- * Use as gaming device
- * General entertainment

[2] Mobile Computers

→ Laptop or Notebook



Features ⇒

- * Lightweight
- * Low heat output
- * Low power consumption

Advantages ⇒

- * Portable, can be taken anywhere
- * No trailing wires because everything is in one single unit.
- * They take up much less room on a desk

- * Their portability allows them to take full advantage of Wi-Fi
- * They can link into any multimedia system.

Disadvantages ⇒

- * They are easy to steal because they are portable.
- * They have limited battery life.
- * Keyboards & pointing devices can sometimes be more awkward to use.
- * It is not always possible to upgrade them.

Uses ⇒ In addition to the uses of the desktop computer they can be used in control & monitoring

→ **Smartphones** "Same uses as laptops & more such as phone calls



Features ⇒ & sending e-mails..."

- * High-definition, anti-glare display
- * Front & back-facing cameras
- * Lower weight & longer battery life than laptops
- * Use Bluetooth for connection to printers & other devices
- * Use of flash memory & cloud storage to back up data
- * They use a number of sensors to carry out different functions

Advantages ⇒

- * They are very easy to carry as they are very small in size
- * You can use them to make phone calls & connect to the internet
- * They use Wi-Fi & mobile phone networks
- * They have apps which make use of sensor data
- * They have reasonable battery life.

Disadvantages ⇒

- * Small screens & keyboards make pages difficult to read.
- * More difficult & slower when typing things in
- * Web browsing & photography can quickly drain the battery
- * Memory size is not very large
- * Not all website features are compatible with smart-phones
- * It is much easier to lose because of their small size
- * The data transfer rating using mobile phone networks can be slower than with Wi-Fi

→ Tablets

"Same features & uses as smartphones"

Advantages ⇒

- * Very fast to switch on
- * Fully portable, so lightweight
- * Touch screen technology
- * Can use several apps
- * Not much heat
- * Battery life of a tablet is a lot longer
- * When the power button is pressed, it goes into standby mode



Disadvantages ⇒

- * Expensive when compared to laptops (but this will be changed)
- * They have limited memory or storage.
- * They can be expensive to run when using mobile networks.
- * Typing on touch screen can be slow & error-prone.
- * Transferring files has to be done through an application
- * Tablets don't support many types of file format.

Emerging Technologies:-

1] Artificial Intelligence $\Rightarrow$ is a machine or application which carries out a task that requires some degree of intelligence.

- The use of language
- Recognizing a person's face
- The ability to operate machinery such as a car
- Analyzing data to predict the outcome of a future event.

The impact of AI on everyday life:-

AI goes way beyond robotics & covers many areas such as:-

- An autonomous (driveless) vehicle
- Robotic research is leading to improvements in technology to help amputees & people with disabilities.
- Robots are used to help people carry out dangerous tasks

* Negative impacts of AI:-

- Could lead to many job losses in a number of areas, many jobs could be lost in manufacturing, but other roles are likely to be affected.
- Dependency on technology & the inability to carry out tasks done by robots.
- Loss of skills, as humans have been replaced by machines.

[2] Extended Reality $\Rightarrow$ refers to real & virtual combined environments & is a 'catch all' term for all immersive technologies

- $\rightarrow$ Augmented Reality
- $\rightarrow$ Virtual Reality
- $\rightarrow$ Mixed Reality

Augmented Reality:-

- Allow the user to experience the relationship between virtual & real worlds.
- virtual info & objects are overlaid onto real-world situations
- The real world is enhanced with digital details such as images
- The user can experience the AR world through special goggles or via smartphones
- The user is not isolated from the real world

Augmented Reality will have an impact on safety & rescue operations, entertainment, shopping & retail & healthcare.

Virtual Reality:-

- The ability to take the user out of the real-world environment into a virtual (unreal) environment.
- The user is fully immersed in a simulated digital world
- Users must wear a VR headset which allows a 360° view of the virtual world.

Virtual Reality will have an impact on military applications, education, healthcare, entertainment, fashion, business, sport...

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