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1.1.2 Physical parts of a computer

A typical computer, commonly referred to as a **Personal Computer** (PC) or a **desktop computer**, consists of system unit and peripheral devices.

- **System unit:** The part that houses the brain of the computer (the central processing unit), motherboard, main memory and drives.
- **Peripheral devices:** Devices connected via ports to the CPU of a computer e.g. drives, input and output device.

Figure 1.1 shows two types of personal computers commonly used today.

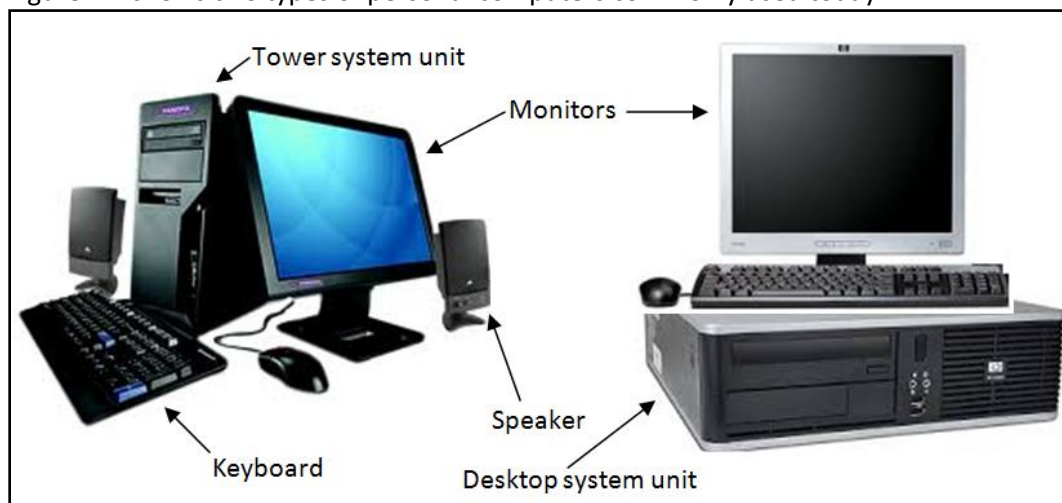


Fig. 1.1: Desktop Personal Computers

1.2 Classification of computers

Computers can be classified in many ways. However, the three most common methods of classification are by:

- Physical size and processing power.
- Purpose
- Functionality

(a) Classification according to size and processing power

When classified by physical size and processing power, computers can either be supercomputers, mainframe computers or microcomputers.

Supercomputers

Supercomputers (fig. 1.2) have the following characteristics:

- The largest in physical size.
- Greatest processing power.
- Fastest processor speed.
- Largest memory capacity.



Fig. 1.2: Supercomputers

1	2	3	4	5	6	7	8	9
2	4	6	8	10	12	14	16	18
3	6	9	12	15	18	21	24	27
4	8	12	16	20	24	28	32	36
5	10	15	20	25	30	35	40	45
6	12	18	24	30	36	42	48	54
7	14	21	28	35	42	49	56	63
8	16	24	32	40	48	56	64	72
9	18	27	36	45	54	63	72	81
10	20	30	40	50	60	70	80	90

Fig. 1.9 Napier's bones

1.3.3 Slide rule

A slide rule, invented by William Oughtred in 17th century, is a tool that can be used to perform arithmetic operations. Fig. 1.10 shows Oughtred's slide rule.

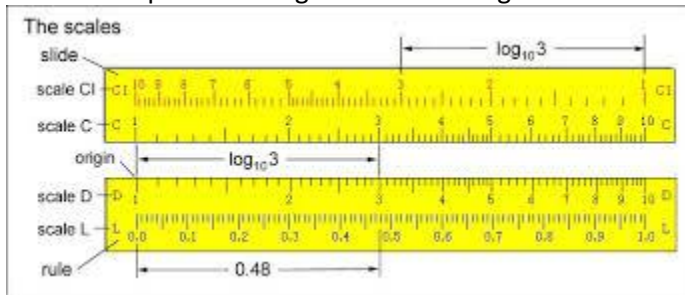


Fig. 1.10 Slide Rule

1.3.4 La Pascaline machine

La Pascaline counting machine (Fig. 1.11) was made by Blaise Pascal in the 17th century. The machine could add and subtract numbers.



Fig. 1.11 Pascaline machine

1.3.5 Weaving loom

In early 19th century, Joseph Jacquard built a weaving loom which could be programmed using punched cards to pick out threads and weave them into patterns. This idea of using punched cards to control patterns helped later inventors to develop calculating machines that could follow simple instruction. Fig. 1.12 shows an illustration of a weaving loom.

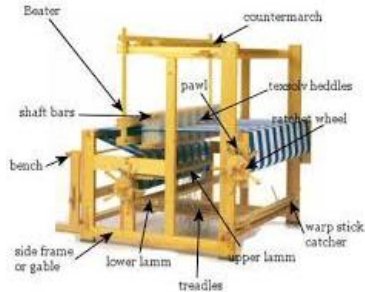


Fig. 1.12 The first Weaving loom

1.3.6 The Analytical engine

Charles Babbage, an English mathematician designed a machine that could calculate a long series of numbers and print the outcome. He called it the **difference engine**. Later in 1832, he improved the design of the machine by incorporating the idea of programming using punched cards. He called the machine **analytical engine**. However, the analytical engine was never constructed. The analytical engine

(ii) Plotters

A plotter (Fig. 2.32) is used for printing wide format printouts mainly photographs, maps and architectural designs.



Fig. 2.32: A Plotter

2.1.4 Secondary storage

Secondary storage, also referred to as auxiliary storage device, is so called because unlike primary storage, it is not directly accessible by the CPU. However, it offers long term storage for data and information. Secondary storage devices can be classified into two ways by:

- Portability as **removable** and **fixed**
- Technology used to store and retrieve data (**magnetic**, **optical**, **magneto-optical** and **solid state**.)

(a) Removable magnetic storage

Magnetic storage media use magnetic technology to store data. The process involves organizing minute atomic level magnets called **dipoles** to represent data on the medium. Data is read and written into the media using a device known as **drive**. Examples of removable magnetic media include: **magnetic tapes** and **floppy disk**.

Magnetic tapes

A Magnetic tape is made using a thin ribbon of Mylar (plastic) coated with a thin layer of magnetic material composed of iron oxide. The tape may be housed inside a plastic (Fig. 2.33) as a cassette or coiled around an open wheel.



Fig. 2.33: Magnetic tape

Floppy disks

A floppy disk is so called because of its flexible disk platter. An outer jacket protects the Mylar coated with iron oxide that stores data. The floppy disk is inserted inside a floppy drive which has a read/write that runs over the magnetized spots. Fig. 2.34 (a) showed the front of a floppy disk. A floppy disk has concentric circles called tracks in which data is written. The tracks are further divided into units called sectors as shown in Fig. 2.34 (b).

- V. **Video port:** A video port is where monitor is connected to LCD projectors. It is shaped like a letter D with 15 pins and colour coded in blue.
- VI. **Firewire port:** Firewire or IEEE 1394 has the same features as the USB but transmits data faster than USB. It is mostly used for streaming video from a digital video camera.
- VII. **Infrared and Bluetooth:** These are both wireless connectivity. Infrared, also referred to as infrared data association (IrDA), uses the infrared waves to transmit data. Infrared (IR) is light that is beyond red in the colour spectrum. While the light is not visible to the human eye, infrared transmitters and receivers (infrared devices) can send and receive infrared signals (communicate using infrared light). Infrared-enabled devices must be at a line of sight of infrared rays in order to transmit data.
- Bluetooth, on the other hand, broadcast a radio signal within the surrounding. Any Bluetooth-enabled device when turned on will be detected.

2.2 Computer Software

As mentioned earlier, the term **computer software** refers to a set of instructions that direct a computer on what to do. Software can be classified into two broad categories namely **system Software** and **application software**.

2.2.1 System software

System software performs the fundamental operations that avail the computers resources to user applications. There are four types of system software namely operating systems, utility programs, networking software and firmware.

(a) Operating systems

An operating system is a program that manages the computer hardware resources and controls the execution of application programs. Some examples of operating systems include Microsoft windows, Linux and MacOS.

(b) Utility programs

Utility software, also called service programs, are special programs used to enhance performance of the system. System level utilities optimise system performance while application level utilities help in the smooth running of application software. For example, the zebugger program automatically launches to try and help an application to recover from an exception.

(c) Networking software

Networking software enables computer and other peripheral devices connected on a network to communicate and share resources.

2.2.2 Application Software

These are programs that are designed to meet user-specific needs. Application software can be classified according to *purpose and acquisition*.

(a) Classification according to purpose

Classified according to purpose, an application software can be either a **general purpose or special-purpose software**. General purpose software such as word processors, spreadsheets, database and presentation software are packaged and made available for general use.

On the other hand, special – purpose applications such as desktop publishing, video editing and photo editing software are used to carry out specialized tasks.

Chapter 3

Outline	3.0	Introduction
	3.1	Features, Objectives and Characteristics of an operating system
	3.2	Role, structure, resources and function of an operating system
	3.3	Types of operating systems
	3.4	How an operating system organizes information
	3.5	Managing files and folders using windows
	3.6	Managing storage devices using windows
	3.7	Installation and configuration of an operating system
	3.8	Troubleshooting and fixing problems

3.0 Introduction

As mentioned earlier, an operating system is the main program that controls and manages the computer's hardware and software resources. Some examples of operating systems include Microsoft windows, Macintosh operating system (MacOS), Linux, FreeBSD, Sun Solaris, VSE/ESA, zOS and those embedded on PDAs and cell phones.

3.1 Features, Objectives and Characteristics of an operating system

3.1.1 Operating System is a program with following features:

- *An operating system is a program that acts as an interface between the software and the computer hardware.*
- *It is an integration set of specialised programs that are used to manage overall resources and operations of the computer.*
- *It is specialised software that controls and monitors the execution of all other programs that reside in the computer, including application programs and other system software.*

3.1.2 Objectives of Operating system:

- *Making a computer system convenient to use in an efficient manner*
- *To hide the details of the hardware resources from the users*
- *To provide users a convenient interface to use the computer system.*
- *To act as an intermediary between the hardware and its users and making it easier for the users to access and use other resources.*
- *Manage the resources of a computer system.*
- *Keep track of who is using which resource, granting resource requests, according for resource using and mediating conflicting requests from different programs and users.*
- *The efficient and fair sharing of resources among users and programs*

3.1.3 Characteristics of Operating System

- **Memory Management** -- *It keeps tracks of primary memory i.e. what part of it are in use by whom, what part are not in use etc. Allocates the memory when the process or program requests it.*
- **Processor Management** -- *Allocate the processor (CPU) to a process. Deallocate processor when processor is no longer required.*
- **Device Management** -- *Keep tracks of all devices. This is also called I/O controller. Decides which process gets the device when and for how much time.*
- **File Management** -- *Allocates the resources. De-allocates the resource. Decides who gets the resources.*
- **Security** -- *By means of passwords & similar other techniques, preventing unauthorized access to programs & data.*
- **Job accounting** -- *Keeping track of time & resources used by various jobs and/or users.*



Fig. 3.3: Pocket PC running on Windows CE

(b) Desktop and network operating system

Some operating systems are meant for home users and are cheaper and easier to use. Such operating systems are generally referred to as **desktop** or **stand-alone operating systems**. Examples are Windows XP, Windows 7 and Windows 8.

On the other hand, network operating systems (NOS) are used on servers and client computers. Examples of NOS include Windows 2000, XP and Vista, Novell Netware, UNIX and Linux etc. Fig 3.4 shows seven clients connected to a server.



Fig. 3.4: Client/ Server network

(c) Operating systems used on large computers

There are some specialized operating systems used on mainframes and supercomputers. For example, IBM VSE/ESA and zOS are used on mainframe computers. Fig 3.5 shows IBM zSeries 900 computer that runs on VSE/ESA and zOS.



Fig. 3.5: IBM zSeries 900

3.4 How an operating system organizes information

Although most operating systems differ in terms of user-interface, they basically handle information the same way. The factors that dictate how information is to be organized are:

1. **Rapid access:** The organization method should allow quick access to store data.
2. **Ease of update:** The organization method should allow ease of update and the operating system must be able to keep a record of the date of modification.
3. **Economy of storage:** The organization method should use the least storage possible because memory is a scarce resource.
4. **Simplicity of maintenance:** The organization method should enable quick navigation through the file system and make it easy for it to be maintained.
5. **Reliability:** The file organization method must be reliable.

Most operating systems organize information in a three-tier hierarchy:

- **Drive**
- **Folders and subfolders,**
- **Files.**

Fig. 3.10 shows how information is organized by a GUI operating system on drive C:



Fig. 3.10. How an operating system organises information

3.4.1 Folders

A folder or directory is a named storage location where related files can be stored. All folders or directories originate from a special directory called the root directory or folder. The root directory is represented by a back slash. A folder may be subdivided into smaller units called subfolders.

3.4.2 Drives

The operating system views storage media or devices as drives. The user can access either a physical or logical drive to store their data. Drives may be given labels as letters A–Z to identify them. Table 3.1 gives a summary of how Microsoft operating systems identify drives.

Storage location	Drive	Remarks
Floppy drive	A and B	If a computer has two floppy drives, one will be assigned letter A and the other B
Hard disk	C, D, E, F	If a computer has 4 hard drives, they will be assigned letters C – F
Optical drives	D, E, F, G	If a computer has one hard disk and three or more CD/DVD drives, they will take up any letters between D and Z
Other removable	D, E, ..., Z	If a computer does not have an optical drive, any removable drive attached to the computer can take any letter between D and Z
Network drive	Logical drives D – Z	In a networked environment, network drives can take up letters D to Z depending on the number of physical drives installed or attached

Table 3.1

Clean installation

To perform clean installation, the computer BIOS should be setup so that the computer boots from a CD/DVD. During POST, press the key(s) that display BIOS set-up. In the BIOS setup, change the boot sequence so that the computer boots from CD/DVD first.

To start the installation process:

1. Insert the CD/DVD ROM into the CD/DVD drive.
2. Turn on the computer. The installation process proceeds from the booting steps to the CD/DVD initialization phase.
3. Partition and format the drive into either NTFS file system.
4. Windows XP copies all the file into the hard disk.
5. Windows XP will reboot and take you through the installation process
6. Accept the end user license agreement (EULA) then product key. Invalid key activation may display unauthorized product key message.
7. Configure network settings if the computer is on a network. Windows XP will successfully be installed and you may be required to setup user accounts and connect to the Internet for updates.

3.8 Troubleshooting and fixing problems

Windows operating systems may fail to boot or function properly due to hardware, malware, improper installation or missing system files. Some of the causes of boot or runtime errors include:

3.8.1 Invalid system disk

Invalid system disk error may occur if the drive configured as the active partition no longer contains essential systems files required to load the operating system. Make sure the active partitions are selected as the startup drive or reinstall the operating system.

3.8.2 Missing operating system

Missing system files such as CONFIG.SYS, HIMEM.SYS and autoexec.bat may result in boot failure. If the files have been deleted, reinstall the operating system or start up the computer using a startup or rescue disk and try to copy the files into the system sub folder or Windows folder.

3.8.3 Corrupted system registry

Registry is the Windows database that keeps details about all system and application programs installed in the computer. If the registry is corrupted, the computer may fail to boot. Repair the registry using emergency repair disk or restore the registry backup if you created one. If all these fail, reinstall the operating system.

3.8.4 Failure to load the GUI desktop

Failure to load the GUI may be due to infection by malware, missing or corrupted display drivers. If the system can start in safe mode, scan for viruses or located the malfunctioning device in the device manager and disable it.

3.8.5 Windows protection error

Windows protection error is displayed during startup before the GUI is loaded. It occurs when the 32-bit virtual drive fails to load. Restart the computer in safe mode. If the OS loads properly, use the device manager to reinstall corrupted or missing drivers.

3.8.6 Runtime problems

Run-time problems may be characterized by the system's failure to respond to commands. This behaviour is commonly referred to as "**hanging**." Use the restart keys **Ctrl + Alt + Delete** to display the **Task Manager** and try to close the non-responding applications. If this fails, shutdown the computer and turn it on again.

Note: For more information on troubleshooting and fixing an operating system related problems, read the online help and support utility.

AVERAGE STUDENTS' ATTENDANCE

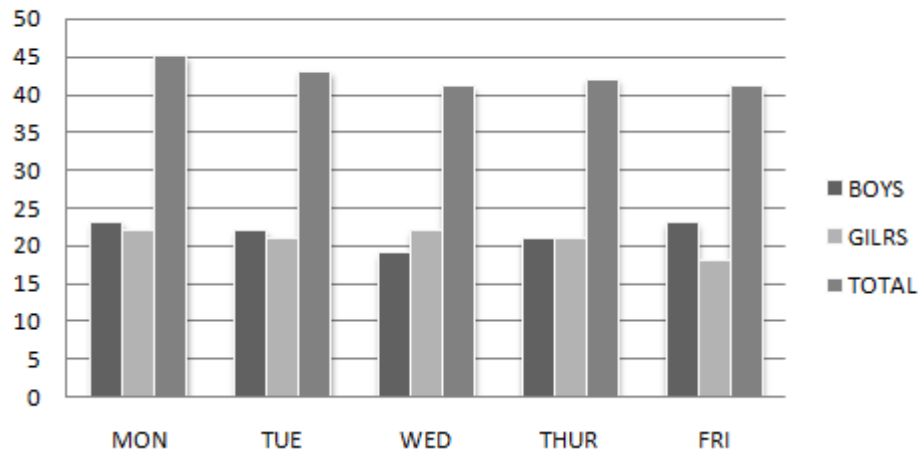


Fig. 5.2: Information

5.2.2 Authentication of Information

Some information is open or free for everyone to access or get like those information in newspapers, magazines, etc. All confidential information which needs a kind of restriction from accessing is called **authentic information**.

There are three different types of information that can be used for authentication:

1. **Something you know:** Examples, PIN number, Password or examination number, etc
2. **Something you have:** Examples, driver license, school/college identity card, bank card, etc
3. **Something you are:** Examples, Palm prints, Finger prints, Retina (eye) scan, etc

5.2.3 Why do we need information?

- **For making budgets and financial control:** You need to have information on requirements, plans, costs and income in order to make budget.
- **To ensure effective and efficient decision making leading to prosperity of the organization.** Information helps for condensing decision making process. In order to make decision on various issues, we need investigation in which we need to get information from different sources, then make experiments, researches and make breakdown of the information gained. You can know weakness areas for resetting the planning, goals, objectives, policy and rules.
- **A way to learn how things are done:** Helps people to get meaning, knowledge, instructions, communication and mental stimulus on various issues.
- **A method of making things better and a means to achieving goals:** Information can give us detailed analysis on various current events, public opinions and immediate coverage of an event

5.2.4 Relationship between Data, Information and Knowledge

Data is the lowest level of abstraction/construct to be followed by information and lastly knowledge as the highest stage.

Data is processed so as to get useful information. A body of information which is well organised within a particular subject/ discipline constitutes knowledge. Knowledge is the collection of meaningful information which one knows as realities and retains as facts.

5.3 Data Processing Cycle

Data processing is the re-structuring or re-ordering of data by people or machine to increase their usefulness and add values for particular purpose. Data processing consists of basic steps input, processing and output. These three steps constitute the data processing cycle.