



# Participant Handbook



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Sector  
**Electronics**

Sub - Sector  
**Consumer Electronics & IT Hardware**

Occupation  
**After sales service**

Reference ID : **ELE/Q4601, Version 2.0**  
**NSQF Level 4**



**Field Technician  
Computing and  
Peripherals**





**Shri Narendra Modi**  
Prime Minister of India

“ Skilling is building a better India.  
If we have to move India towards  
development then Skill Development  
should be our mission. ”



**COMPLIANCE TO  
QUALIFICATION PACK - NATIONAL OCCUPATIONAL  
STANDARDS**

is hereby issued by the

**ELECTRONICS SECTOR SKILLS COUNCIL OF INDIA**

for

**SKILLING CONTENT : PARTICIPANT HANDBOOK**

Complying to National Occupational Standards of

Job Role/Qualification Pack: "Field Technician - Computing & Peripherals"  
QP No. "ELE/4601, NSQF Level 4"

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## Acknowledgements

The need for having a standard curriculum for the Job Role based Qualification Packs under the National Skills Qualification Framework was felt necessary for achieving a uniform skill based training manual in the form of a participant handbook.

I would like to take the opportunity to thank everyone who contributed in developing this handbook for the QP Field Technician Computing and Peripherals.

The handbook is the result of tireless pursuit to develop an effective tool for imparting the Skill Based training in the most effective manner.

I would like to thank the SME and the team at the ESSCI along with the industry partners for the tireless effort in bringing the handbook in the current format.

CEO

Electronics Sector Skills Council of India

## About this Book

This Participant Handbook is designed to enable training for the specific Qualification Pack (QP). Each National Occupational (NOS) is covered across Unit/s.

Key Learning Objectives for the specific NOS mark the beginning of the Unit/s for that NOS.

**Field Technician:** Also called ‘Service Technician’, the Field Technician provides after sale support services to customers, typically, at their premises.

**Brief Job Description:** The individual at work is responsible for attending to customer complaints, installing newly purchased products, troubleshooting system problems and, configuring peripherals such as printers, scanners and network devices.

**Personal Attributes:** The job requires the individual to have: ability to build interpersonal relationships and critical thinking. The individual must be willing to travel to client premises in order to attend to calls at different locations.

**Role Description:** Installing the system and configuring the peripherals, and attending to field calls from customer and complaints for system trouble shooting and repairs.

The symbols used in this book are described below.

## Symbols Used



Key Learning  
Outcomes



Steps



Role Play



Tips



Notes



Unit  
Objectives



Activity

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# 1. Introduction to Computers and its Peripherals

Unit 1.1 – Basics of Computers

Unit 1.2 – Computer Peripherals

Unit 1.3 – Operating Hardware System and Peripherals



## Key Learning Outcomes



**At the end of this module, you will be able to:**

1. Outline the history of computers
2. Explain the basics of computers
3. Identify computer peripherals and their applications
4. Explain the operation of hardware system and peripherals

## UNIT 1.1: Basics of Computers

### Unit Objectives

**At the end of this unit, you will be able to:**

1. Outline the history of computers
2. Define computer and its types
3. Identify computer hardware and software and its applications
4. List the different types of computer equipment assembled in a pack



### 1.1.1 History of Computers

Computer has become an indispensable and multipurpose device. It has become a basic necessity of life and it is difficult to imagine life without it. Computer is, basically, an electronic device for performing arithmetic and logical operations, or it can be said that “Computer is a device, or a flexible machine used to process data and convert it into information.” For many people, computer is just a device used for calculation or computation, but actually it is much more than that.

#### Development of Computers

Computation has been done since earlier times with the aid of devices, when generally there was interaction at one-to-one level utilizing fingers. A form of tally stick was possibly the first counting device. Later, people in the Fertile Crescent region began record keeping by using calculi with aids such as clay spheres and cones. These aids were, possibly, representations of items such as livestock or containers of grains. Counting rods and stones were used with passing of time. People, gradually, began to follow certain steps to calculate with stones, giving birth to digital counting devices. These proved to be the predecessor of the first device invented for calculation, called as the ABACUS.

#### The ABACUS

Abacus was used to do quick additions and subtractions mechanically. Although it was initially developed in the 10th century by the Egyptians, it was the Chinese who gave it its proper shape in the 12th century. It comprised of a wooden frame with rods fitted from one end to the other. The rods had round beads slid onto them, which represented different numbers according to their position. The abacus had an upper section called Heaven and a lower section called Earth.

**NAPIER'S BONES**

Napier Bones was invented by John Napier of Scotland in the year 1617. This device had bone rods with numbers printed on them and enabled easy calculations.

**PASCAL'S CALCULATOR**

Pascal's calculator was invented by Blaise Pascal of France in the year 1642. It was an adding machine which had gears on it to represent the position of the digits.

**LEIBNZ CALCULATOR**

Leibnz calculator was a modification of the Pascal's calculator and could do multiplication and division operations. It was devised by Gottfried Leibniz of Germany in the year 1671.

**ANALYTICAL ENGINE**

Sir Charles Babbage of England, also called father of the computer, invented the Analytical engine in the year 1833. It is considered as the first mechanical computer, which could safeguard data. Charles Babbage added such features in it which are similar to the present day computer language.

**The Von Neumann model**

The architecture of computer has been modified many times over the last 20 years according to new developments. The way the algorithms are mapped to the hardware of a computer has been modernized and the quantity of circuits which can be added to the silicon wafers too has changed. However, the basic concept of computer design has remained unchanged. Von Neumann devised the computer architecture in such a way so as to enable it to store the program instructions and data in its memory.

Earlier, every computing device was made for a single, specific purpose. The programming entailed the circuits to be rewired manually and snags were difficult to detect or rectify.

Von Neumann's architecture had the computer with three main components:

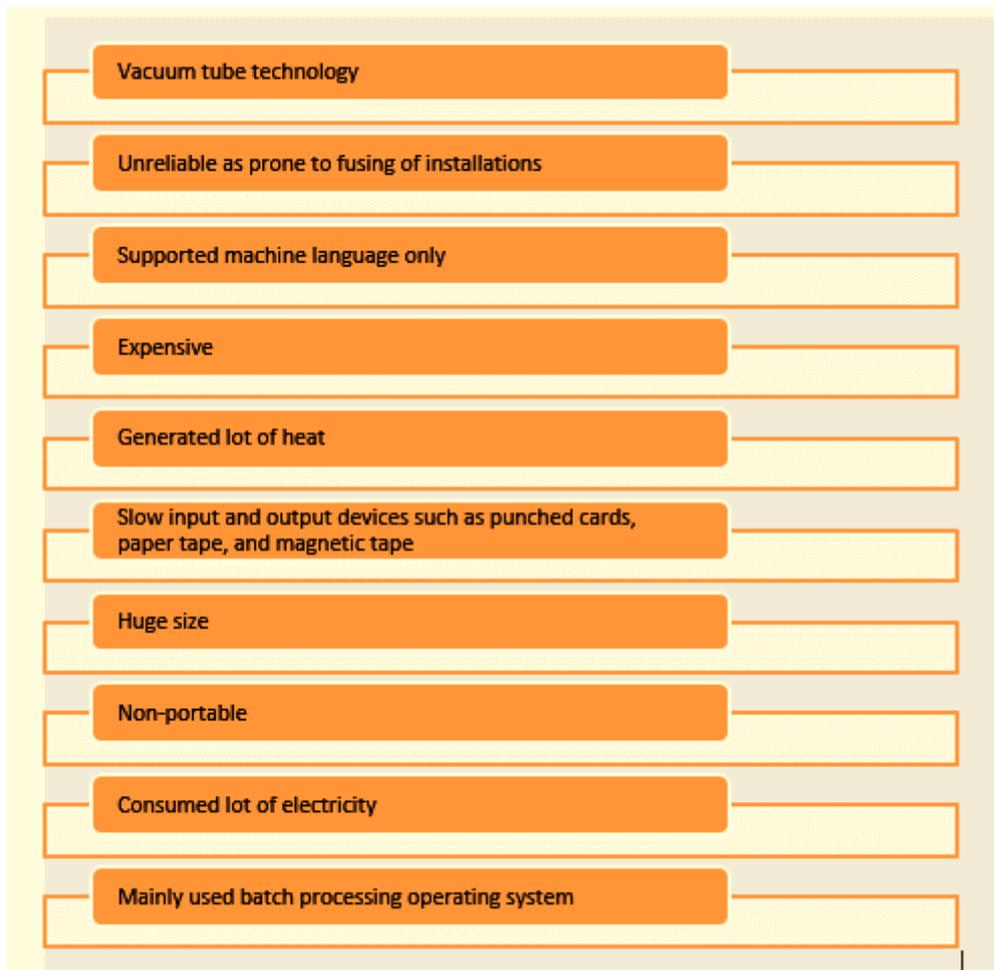
- A central processing unit (CPU)
- Memory
- Input/output (I/O) interfaces.

Generation is a term used in connection with the changes or developments in the computer's hardware and software technology over a period of time. There are mainly five computer generations commonly accepted till date.

**First Generation**

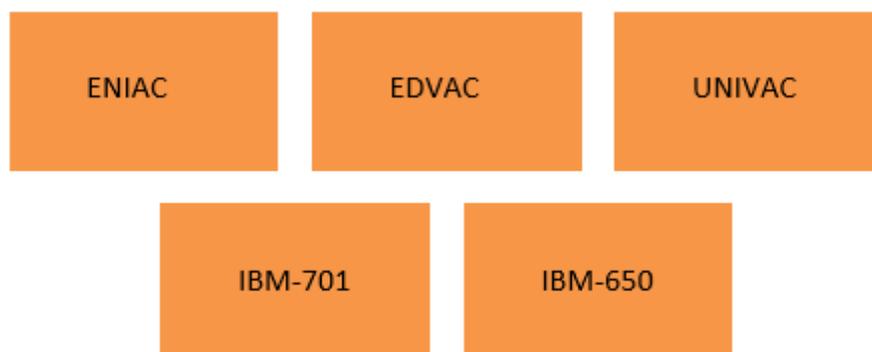
The computers used in the period 1946-1959 are considered as first-generation computers.

The main features of this generation are:



*Fig. 1.1.1: Features of first generation*

Some examples of computers of this generation are:

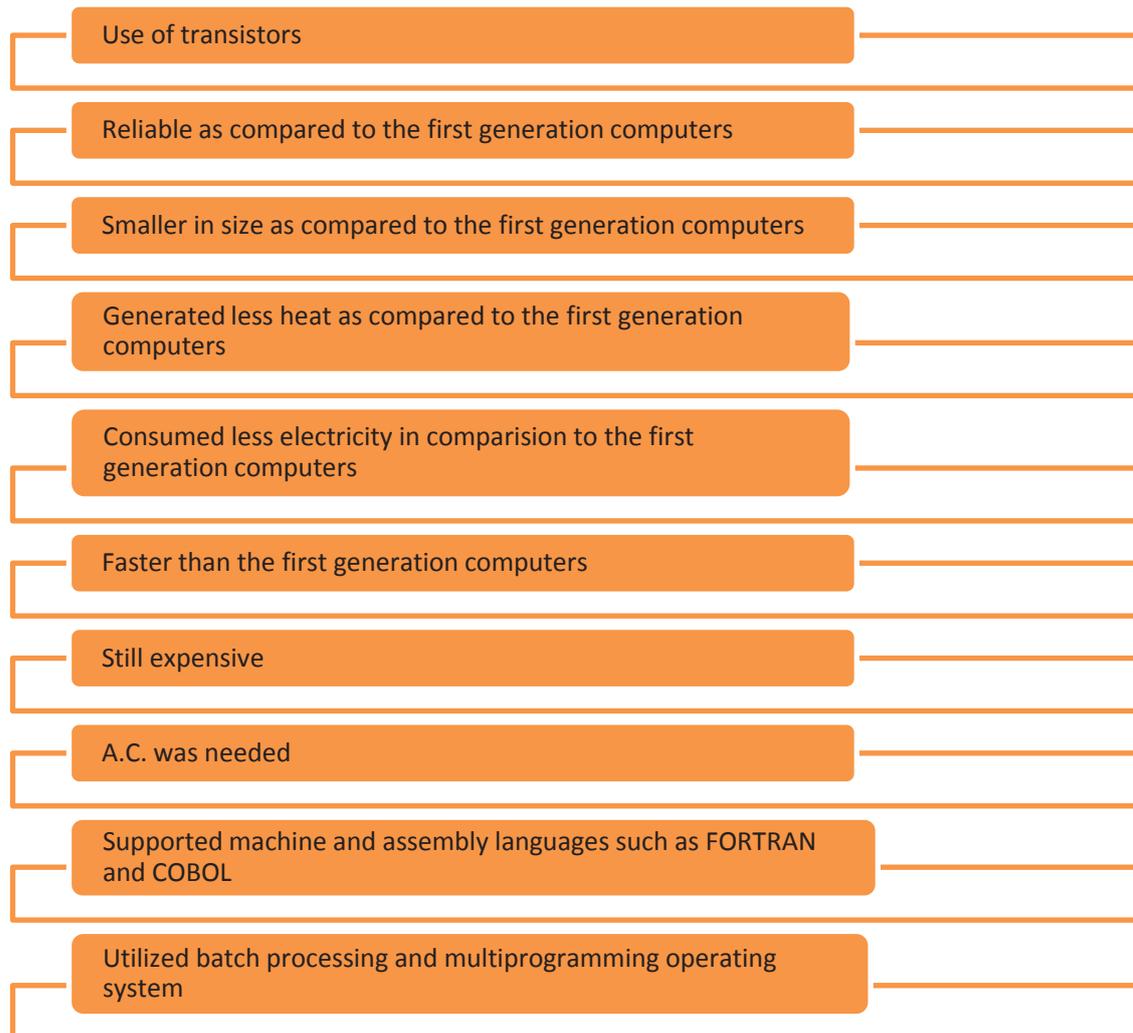


*Fig. 1.1.2: Examples of first generation of computer*

**Second Generation:**

The computers used in the period 1959-1965 are considered as second-generation computers. In these computers, magnetic cores served as primary memory and magnetic tapes and disks as devices for secondary memory.

The main features of this generation are:



*Fig. 1.1.3: Features of second generation*

Some examples of computers of this generation are as shown in figure:

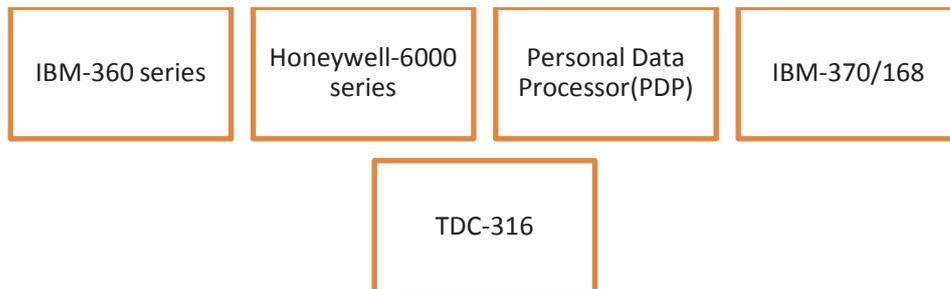


*Fig. 1.1.4: Examples of second generation of computer*

### **Third Generation:**

The computers used in the period 1965-1971 are considered as third generation computers. Jack Kilby had invented integrated circuits (IC's) which replaced transistors. An IC comprised of multiple transistors and capacitors connected to the associated circuitry. The computers were faster, smaller in size, more dependable and efficient. They generated less heat, required lesser maintenance, consumed less electricity but were still expensive and needed alternating current (AC). High-level languages such as FORTRAN-II TO IV, COBOL, PASCAL PL/1, BASIC and ALGOL-68 were used. The operating system had features such as, time sharing, multi-programming and remote processing.

Some examples of computers of this generation are as shown in figure:

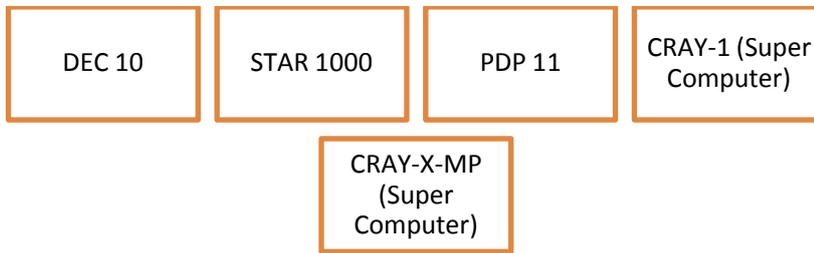


*Fig. 1.1.5: Examples of third generation of computer*

### **Fourth Generation:**

The computers used in the period 1971-1980 are considered as fourth generation computers. They used Very Large Scale Integrated (VLSI) technology which involved around 5000 transistors and all other circuit elements along with their linked circuits placed on a single chip. The computers were portable, reliable, powerful, easily available and economical. They did not require AC to function. Their distributed operating system had features such as pipeline processing, real time, networks and time sharing. The high-level languages such as C, C++, DBASE and so on were used in these computers. The concept of personal computers (PCs) was brought to the fore and internet was introduced. There was major progress in the field of networks.

Some examples of computers of this generation are as shown in figure:

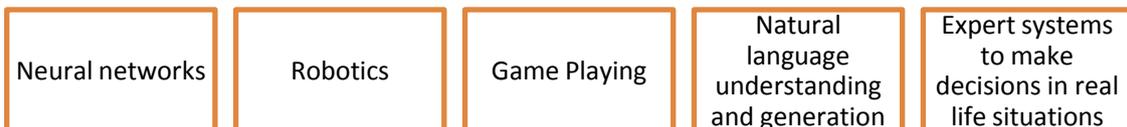


*Fig. 1.1.6: Examples of fourth generation of computer*

### **Fifth Generation:**

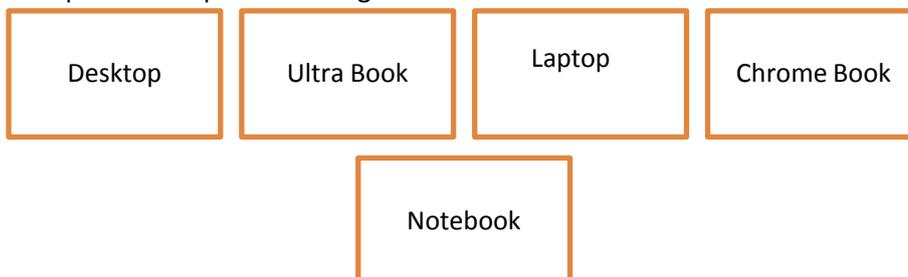
The computers used in the period 1971-1980 are considered as fourth generation computers. They used Very Large Scale Integrated (VLSI) technology involving microprocessor chips which comprised of ten million electronic components. High-level languages such as C and C++, Java and .Net were utilized in this generation. The multimedia features of the computers had user friendly interfaces. The computers were powerful, compact and economical. The main features of these computers also included progress in parallel processing hardware, progress in superconductor technology and development of true artificial intelligence (AI) as well as of natural language processing. AI is an upcoming branch of computer science which interprets procedures of enabling computers to think like humans.

The following figure shows the features of fifth generation of computer:



*Fig. 1.1.7: Features of fifth generation of computer*

Some examples of computer of this generation are:



*Fig. 1.1.8: Examples of fifth generation of computer*



## 1.1.2 Computer and its Types

A computer is an electronic device which transforms data into meaningful information. The following image shows a computer:



Fig. 1.1.9: A Computer

The basic functionality of computers, irrespective of its size or make, is shown in the following figure:

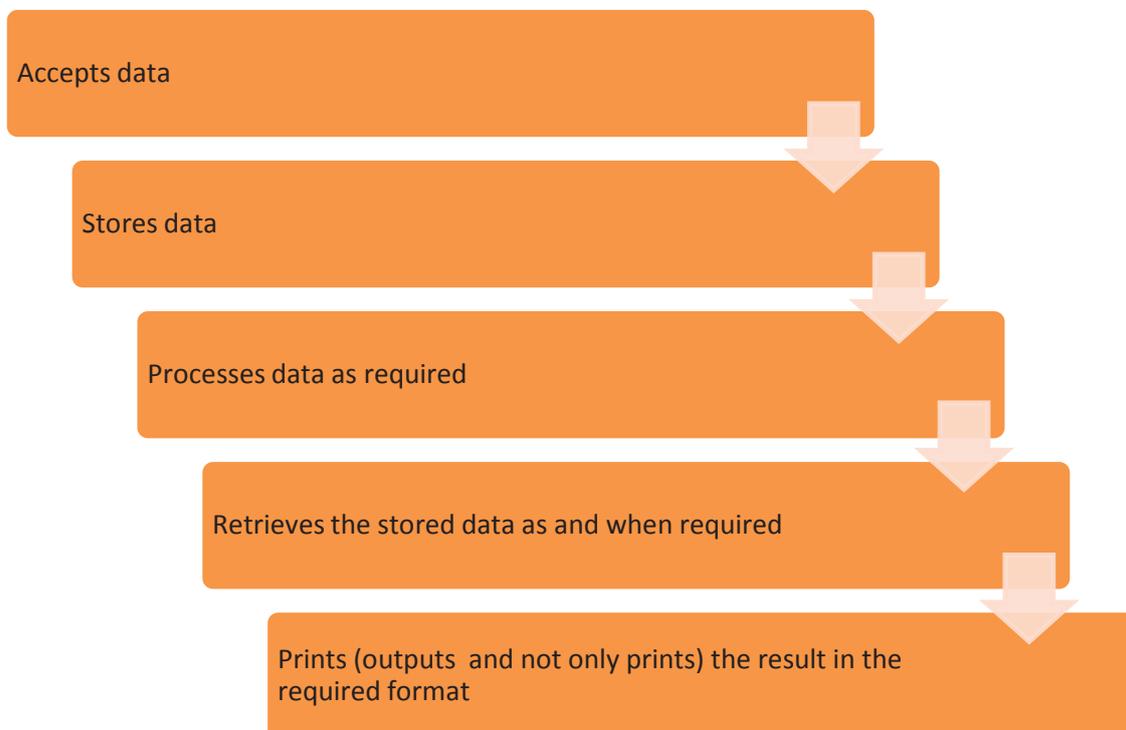


Fig. 1.1.10: Functions of a computer

Some characteristics that have made usage of computers almost a necessity in life are they are fast, accurate, diligent, and adaptable and have good storage capacity.

A computer consists of various units or parts that enables it to perform its functions. The following figure shows a block diagram of the functional units of a computer:

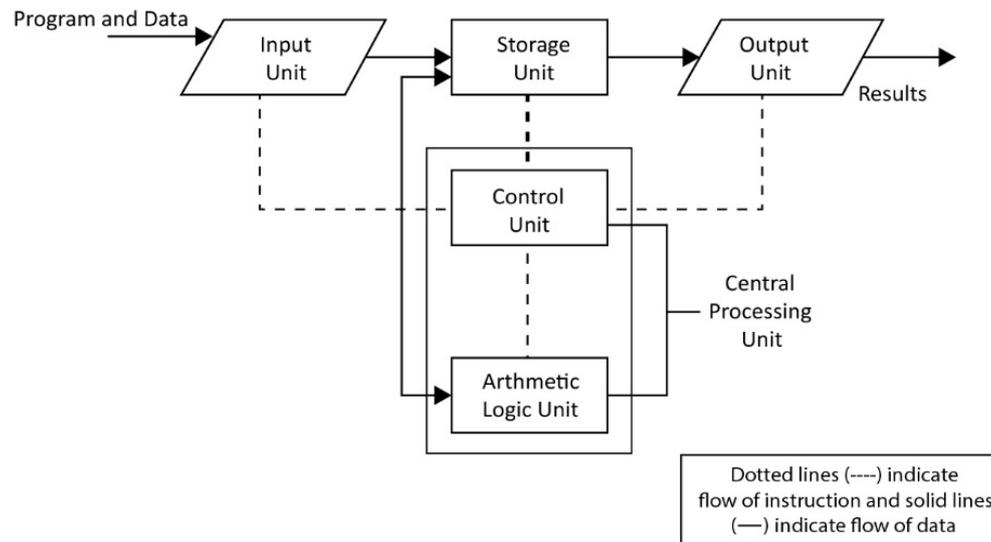


Fig. 1.1.11: Functional units of a computer

The four main functional units in a computer are described in the following figure:

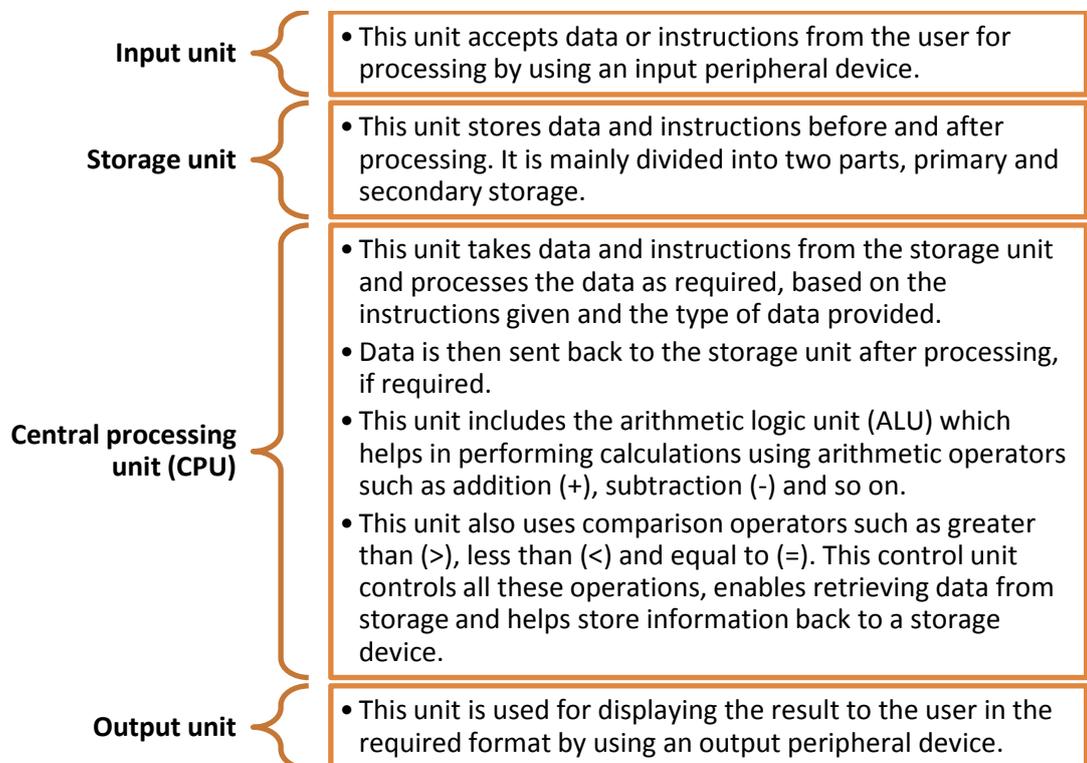


Fig. 1.1.12: Functional units of a computer

### Types of Computers

Computers can be classified based on their size, speed and computing power. The following table lists the different types of computers:

Type	Description	Image
<b>Microcomputer</b>	<p>It is a single user computer system with a single chip and moderately powerful microprocessor. The different types of microcomputers are:</p> <ul style="list-style-type: none"> <li>• Desktop Computer</li> <li>• Laptop Computer</li> <li>• Notebook</li> <li>• Tablet</li> </ul>	
<b>Mini Computer</b>	<p>It is a computer which can support hundreds of users simultaneously and has more powerful processors than a microcomputer. It is also called mid-range computer.</p>	
<b>Main Frame</b>	<p>It is a multi-user system, like a minicomputer but the technology is different than that of a minicomputer. It is used to handle and process large amount of data such as in banks and government offices.</p>	

**Super Computer**

It is the fastest and most expensive computer system. It is used for complex scientific computations and numerical calculations such as weather forecasting, nuclear simulations and astrophysics.



Fig. 1.1.13: Type of computers

Computers are commonly classified as:

- Laptop
- Desktop
- Server

**Laptop**

Laptop is a battery or alternate current (AC)-powered, portable, wireless personal computer (PC), generally smaller than the size of a briefcase. It is a small personal computer with a "clamshell" form factor, a thin Liquid Crystal Display (LCD) or Light Emitting Diode (LED) computer screen on the upper portion and a keyboard on the lower part of the "clamshell". Laptops have a similar display as desktops. The main difference in both are the displays; the laptop's display is attached to it, whereas the desktop's display is a separate piece of hardware, the monitor. The following figure shows the basic types of laptop displays:

LCD

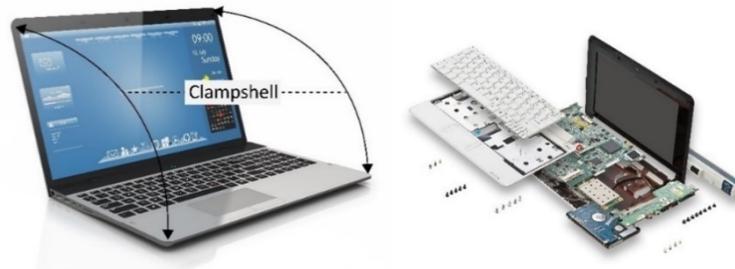
- The LCD displays of the laptops work like a regular LCD display. However, the laptop LCD display need an inverter to supply the power to the CCFL backlight, while stand-alone monitors do not require an inverter.

LED

- These are LCD monitors which use LEDs as their backlights. Because the LEDs do not require AC voltages, the LED monitors do not require an inverter.

Fig. 1.1.14: Types of laptop displays

The following image shows a laptop and the internal view of the laptop:



*Fig. 1.1.15: Exterior and interior of a laptop computer*

Few common laptop features are as follows:

- **Unique Function Keys:** Keyboards generally have function keys, marked from F1 to F12 that can be used when working. For instance, if the F1 key is pressed then it will open help. Similarly, the F5 key can be used to refresh a document or a website.

On laptops, the function keys have more than one purpose, which can be accessed by pressing the **Fn** key, and after that pressing the desired function key. The 'a' key can be pressed to get a lowercase a, or the Shift key can be pressed with the 'a' key to get a capitalized A. Some features of function keys are:

- **Dual Displays:** The dual-display key is useful when there is a second monitor connected to the laptop or when the laptop is connected to a projector during a presentation. If this key is pressed, four choices will be seen, with one selected. If it is pressed again the next choice will be selected. The four choices are as follows:
  1. Computer Only
  2. Duplicate
  3. Extend
  4. Projector Only
- **Screen Brightness:** Keyboards have some keys to increase or decrease the screen brightness. For example, F4 is used to decrease the brightness and F5 is used to increase it. The screen brightness controls commonly use a circular icon which resembles the sun, with a plus "+" and "-" sign to increase and decrease the brightness respectively.
- **Bluetooth:** Laptops have a special key to turn the Bluetooth on and off. It is usually indicated by an icon resembling an uppercase B.

### Desktop

A desktop is a PC that is made to be used on or near a desk or a table, and is not portable. A desktop PC has a mouse, a keyboard and a base unit which includes the computer's components. Some newer models have the base unit within the monitor to save space.

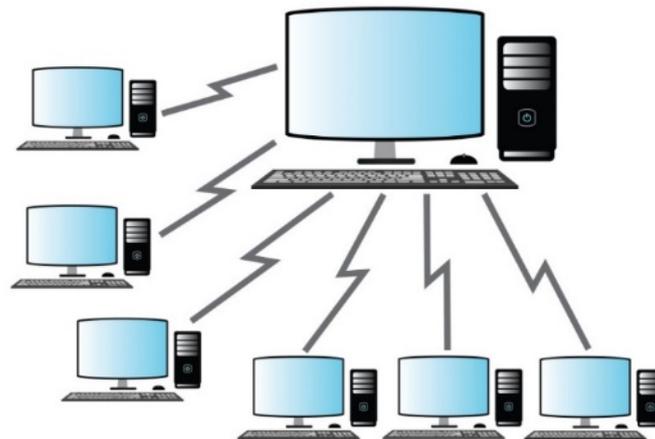
The following image shows a desktop computer along with its system unit or CPU and peripherals:



*Fig. 1.1.16: A desktop computer along with its CPU and peripherals*

### **Server**

A server computer is a central computer, which comprises of collection of data and programs. It is also known as a network server as it allows all the connected systems to share and store data and applications. File servers and application servers are the two main types of servers. The following image shows a server computer connected to various other computers:



*Fig. 1.1.17: A server computer linked to other computers*



## 1.1.2 Computer Hardware and Software

Computer hardware refers to the physical parts of a computer, outside and inside the system unit. The internal parts of a system are known as components, while external parts are typically called peripherals such as the keyboard, mouse, speakers and printers. The following image shows the basic components of computer hardware:

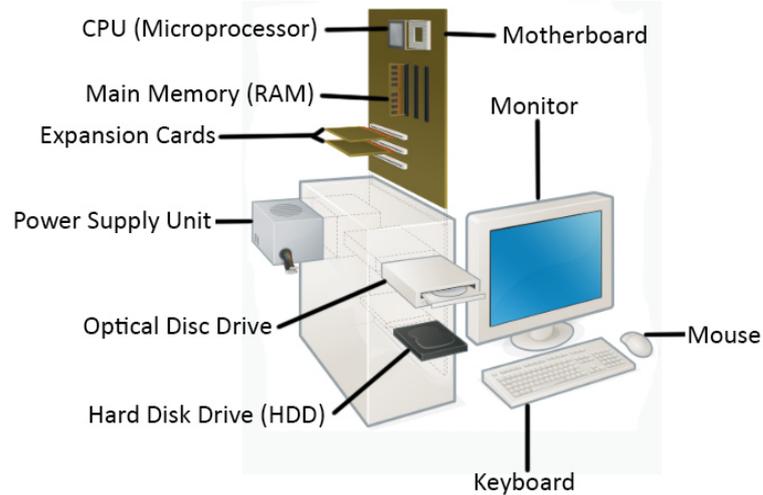


Fig. 1.1.18: Basic components of computer hardware

When a new desktop is bought, some hardware components and devices, shown in the following figure, come along with it:

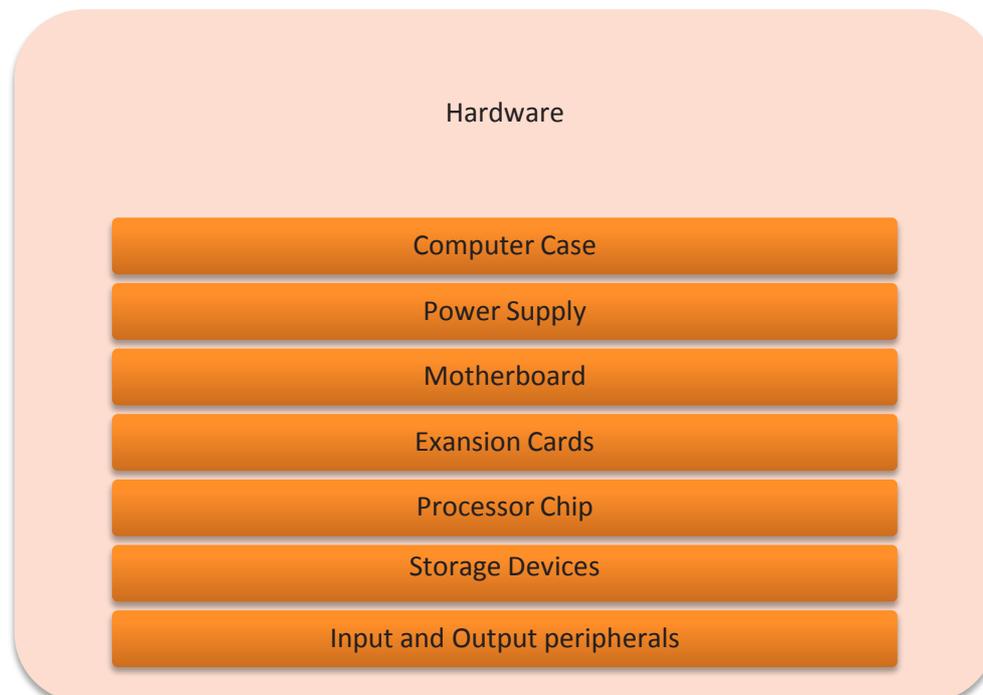


Fig. 1.1.19: Components and devices of a computer hardware

### Computer Case

A computer case is a steel, aluminium or plastic enclosure which contains most of the components of a computer. It is also known as a tower, cabinet, system unit or base unit. It is available in different sizes and shapes. It has points, slots and screws for various components to be fit into. A typical tower is shown in the following figure:



*Fig. 1.1.20: A typical tower*

### Motherboard

The main printed circuit board, or PCB, in a computer that holds the microprocessor, provides sockets and slots to connect/hold the other peripherals/parts of the computer and connects the power supply to various other electronic parts. It is also called as a system board or main board, and allows the components to communicate with each other, making it a complete working unit. It also has a provision for initial set up of computer after power is turned on, which is the Basic Input/output System (BIOS) or boot firmware. The motherboard also contains slots and provision for expansion cards. Sometimes, another board, called a daughter board, is connected to the main motherboard for providing further expandability.

The following image shows a labelled motherboard:

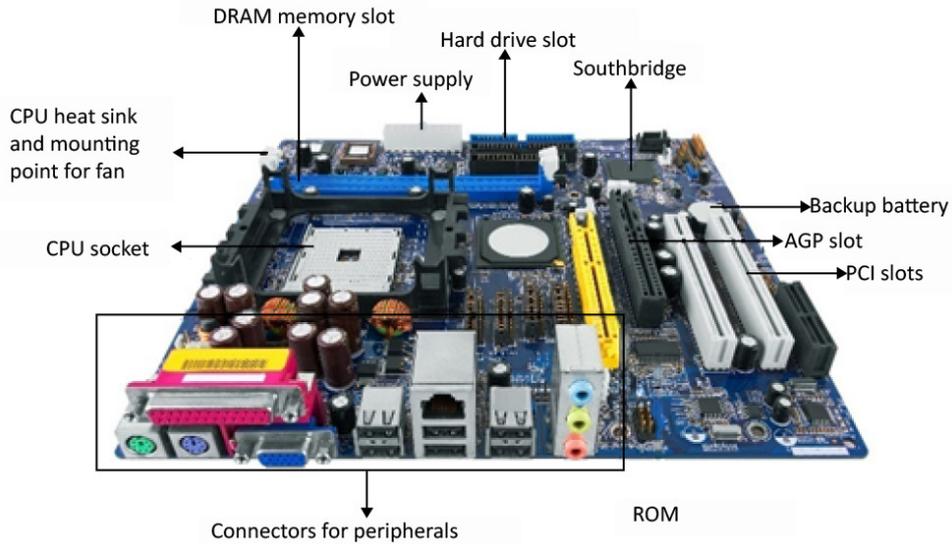


Fig. 1.1.21: Motherboard

**Types of Motherboard**

Following are the main types of motherboard:

- **Integrated Motherboard:** It has various components integrated into the board itself. These may include the CPU, video card, sound card, and various controller cards.
- **Non-integrated Motherboard:** It uses various instable components and expansion cards. For example, a non-integrated system board may enable upgrading the video card by evacuating the old one and introducing another one.

**Form Factor**

The form factor of the motherboard determines the physical organization, general shape, the sorts of cases and the power supply usage of the PCB. It also specifies the physical layout, order of the board and the arrangement of mounting holes in the PCB. For example, a company can manufacture two motherboards with the same functionality but having a different form factor. The real differences lie in the physical layout and the position of the components on the board. On the basis of the form factor, following are a few types of motherboards:

Form Factor	Originated	Max. Size
XT	IBM 1983	8.5 × 11 in
AT (Advanced Technology)	IBM 1984	12 × 11–13 in
Baby-AT	IBM 1985	8.5 × 10–13 in

ATX	Intel 1996	12 × 9.6 in
SSI EEB	SSI	12 × 13 in
BTX (Balanced Technology Extended)	Intel 2004	12.8 × 10.5 in
DTX	AMD 2007	200 × 244 mm max.
ETX	Kontron	95 × 114 mm
LPX	Unknown	9 × 11–13 in
PC/104	PC/104 Consortium 1992	3.8 × 3.6 in
NLX	Intel 1999	8–9 × 10–13.6 in
UTX	TQ-Components 2001	88 × 108 mm
WTX	Intel 1998	14 × 16.75 in
SWTX	Unknown	16.48 × 13 in
HPTX	EVGA 2008	13.6 × 15 in
XTX	2005	95 × 114 mm

Fig. 1.1.22: Functional units of a computer

### Chipset

A chipset is a motherboard component that includes the CPU and other chips that support basic functions of the computer.

The two main chips in the chipset are:

- **Northbridge:** Northbridge is the part of the computer chipset that provides a network between the CPU and the other interfaces of the computer. These interfaces may include memory, Accelerated Graphics Port (AGP) port and Peripheral Component Interconnect (PCI) bus. It is also linked to the Southbridge.
- **Southbridge:** Southbridge is the portion of the computer chipset that provides a network between the north bridge and the slower speed interfaces and further connects the interfaces to the CPU. These interfaces may include parallel ports, serial ports, Universal Serial Bus (USB) ports and PS/2 ports.

The south bridge controls the slower I/O components like the Serial ports, USB ports and the integrated development environment (IDE).

The following image shows the connection of South Bridge and North Bridge in a PCB:

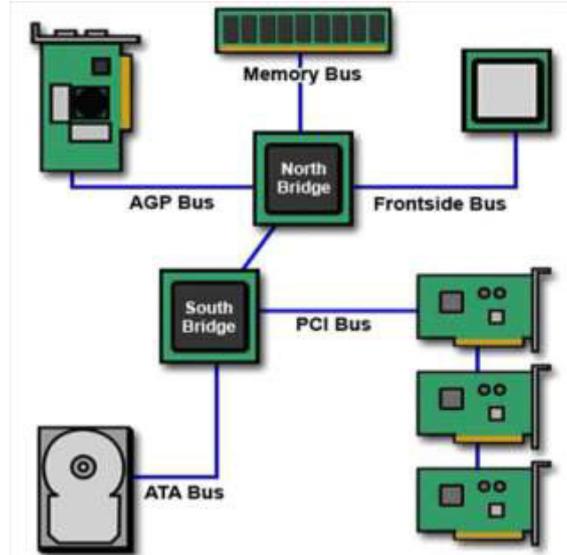


Fig 1.1.23: Connection of South Bridge and North Bridge in a PCB

There are several types of chips found on a motherboard of a CPU as shown in the following table:

CPU chip	Input	Processing Unit	Output
8088 CPU	Inputs 8 bits of data	Processes 8 bits of data	Outputs 8 bits of data
80286 CPU	Inputs 16 bits of data	Processes 16 bits of data	Outputs 16 bits of data
80386SX CPU	Inputs 16 bits of data	Processes 32 bits of data	Outputs 16 bits of data
80386DX CPU	Inputs 32 bits of data	Processes 32 bits of data	Outputs 32 bits of data
80486SX CPU	Inputs 32 bits of data	Processes 32 bits of data	Outputs 32 bits of data
80486DX CPU	Inputs 32 bits of data	Processes 32 bits of data	Outputs 32 bits of data
586 CPU	Inputs 32 bits of data	Processes 32 bits of data	Outputs 32 bits of data

Pentium/P6/K5 CPU	Inputs 64 bits of data	Processes 64 bits of data	Outputs 64 bits of data
Pentium Pro CPU	Inputs 64 bits of data	Processes 64 bits of data	Outputs 64 bits of data

Fig 1.1.24: Type of CPU chips

### Slots (or Expansion Slots)

An expansion slot is a slot in the motherboard used to add an expansion card (or additional circuit board). The extra expansion card provides extra features to a computer such as video, sound, advanced graphics, Ethernet or memory.

The number of expansion slots that a system can have depends on the physical arrangement of the case and motherboard. Some of such slots are:

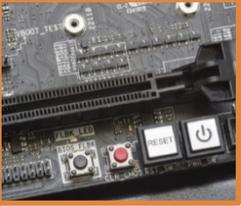
<p>CPU Slot</p>	<p>RAM Slot</p>	<p>Peripheral Component Interconnect (PCI) Slot</p>	<p>PCI Express Slot</p>
			
<ul style="list-style-type: none"> <li>• Also known as a CPU socket</li> <li>• Is where the processor or the CPU chips are inserted on a computer's motherboard.</li> </ul>	<ul style="list-style-type: none"> <li>• Provide slots or placement for inserting RAM chips.</li> <li>• These can be easily removed and replaced.</li> </ul>	<p>Used for expansion devices such as modems, network cards, television tuners, radio tuners, video cards and sound cards.</p>	<ul style="list-style-type: none"> <li>• Used for expansion cards.</li> <li>• However, PCI express slot is used for higher transfer speeds and is typically used for graphics cards.</li> </ul>

Fig. 1.1.25: Types of expansion slots

### Expansion Cards

The circuit boards which are inserted in the slots are called expansion cards. These expansion cards allow a computer system to connect and communicate with its peripherals.

The following image lists few of the expansion cards:

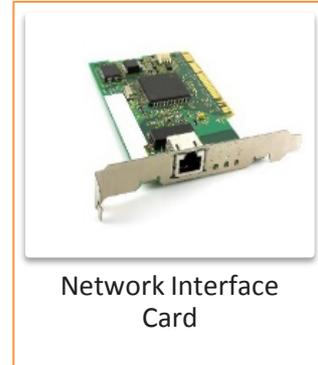
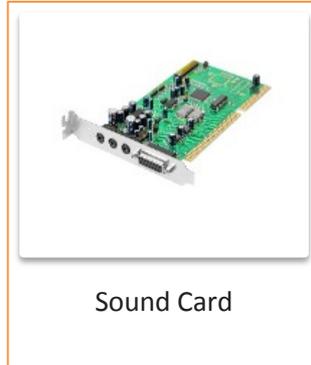
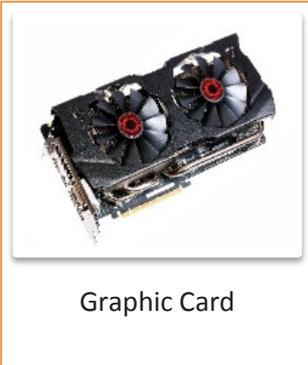


Fig. 1.1.26: Types of expansion cards

### Ports

A port serves as an interface between the computer and other computers or peripheral devices. The ports vary depending on the kind of equipment that will be connected to the ports such as to connect a monitor, webcam, speakers the ports sizes are different, as shown in the following image:



Fig. 1.1.27: Types of ports

The usage of the ports is as follows:

- **Serial Port:** This port is used with a 9-pin connector. It is no longer in use, because these are replaced by interfaces such as Ethernet, FireWire and USB.
- **PS/2 Port:** This port was earlier used to connect keyboards and mouse. These were round ports for six pin connectors. They have now been replaced with Universal Serial Bus (USB) ports.
- **Parallel Port:** A common parallel port is used for 25 pins connector. These ports are similar to serial ports and were used to connect printers and joysticks. They are no longer in use and have also been replaced by USB ports.
- **Video Graphics Array (VGA) Port:** A VGA port is used to connect video display devices such as monitors and projectors to a computer. It has three rows for a 15 pin connector.
- **USB Port:** The USB port is nowadays the most popular type of port on a computer which is used to connect mouse, keyboard, printer, and external storage devices such as DVD-RW drive and flash drive to a computer.
- **TRS: Tip, ring and sleeve (TRS) ports,** or mini-jacks or audio jacks, are commonly used to connect audio devices such as headphones and microphones to computers.
- **Ethernet:** This port is used for network connections. They use fast transmission and category 5 (CAT5) network cable for network connections.
- **HDMI:** A HDMI (High Definition Multimedia Interface) port is that port where a device can be connected such as a DVD or a Blue ray player, a stereo speaker or a flat-screen TV. HDMI enables excellent image and sound reproduction over the connected hardware.
- **RJ11 connector:** Registered Jack-11 is a telephone interface that uses a cable of twisted pairs of wire and a modular jack with two, four or six contacts. RJ-11 is the common connector for plugging a telephone into a wall and a handset into a telephone.

In addition, the motherboard contains a number of other contacts. These include:

- The big connector which supplies the motherboard with power from the power supply
- Other connectors for the diskette drive, hard disk, CD-ROM drive and so on.
- Jumpers, which are used on some motherboards to configure voltage, various operating speeds and so on.
- A number of pins used to connect the reset button, LED for hard disk activity, built-in speaker and so on.

### Connectors

Motherboards commonly have connectors that are used to run wires to the front panel. There are several front panel connectors on the motherboard. Wires are plugged into these connectors with the other ends going to the appropriate connection on the front panel. For example, power drive, power button, reset button and so on.

### Jumpers

Motherboards have a variety of different pins that can be connected with jumpers for different purposes. The most common reason to access a jumper is to reset the BIOS password. It is possible for a user to set the password for the BIOS so that only that user can access the BIOS settings. If the user forgets the password, it can be cleared with a jumper to manage the BIOS.

### RAM Chips

RAM is the short-term memory used to store information which is being processed. It is available as a RAM chip, which is an integrated circuit (IC) soldered on the motherboard. The two types of RAM are static RAM (SRAM) and dynamic RAM (DRAM). SRAM is expensive to produce, but faster and requires less dynamic power than DRAM. SRAM is typically used as a cache memory for the CPU.

The following images shows different types of RAM:



*Fig. 1.1.28: Types of RAM chips*

Memory modules come in several form factors, such as:

- Single inline memory module (SIMM) – SIMM has a single row of 30 or 72 edge connectors on the bottom of the module. Single refers to both sides of the module having the same pin out.
- Dual inline memory module (DIMM) – DIMM are available in 168-pin, 184-pin, and 240-pin versions. Dual refers to each side of the module having a different input.
- Small Outline DIMM (SODIMM) – SODIMM are a compact version of the standard DIMM module, available in various pin out for use in notebook computers and laser/LED printers.
- Rambus inline memory module (RIMM)

### ROM Chips

Read-only memory (ROM) is a non-volatile memory. It is available as a ROM chip, which is also an IC soldered on the motherboard. The five basic types of ROM are:

- ROM - Read Only Memory
- PROM - Programmable Read Only Memory
- EPROM - Erasable Programmable Read Only Memory
- EEPROM - Electrically Erasable Programmable Read Only Memory
- Flash EEPROM memory

The following image shows a ROM chip for a DVD (CD-ROM):



*Fig. 1.1.29: A ROM chip*

### System Resources

System resources are not actual physical devices; they cannot be touched by reaching into the machine. But, they are very important for two reasons. First, they dictate how the PC organizes its access to various memory areas and devices. Second, they are one of the most common areas where people have problems with the setup of their PCs: also called resource conflicts. The following are the four types of resources that the various parts of a computer can sometimes decide to fight over:

- **Interrupts (IRQs):** As described in the example in the chapter on how the PC works, a device requests time from the processor using these interrupt requests. Under traditional designs, each device has a different IRQ number. If two try to use the same one, a conflict can result. Newer technologies can allow multiple devices to share an IRQ channel.
- **Direct Memory Access (DMA) Channels:** Some devices have the ability to read and write directly from the system memory, instead of asking the processor to do it for them. Cutting the "middle man" out in this manner improves the efficiency of the system. Each device that does this, needs its own DMA channel.
- **Input/Output (I/O) Addresses:** Devices exchange information with the system by putting data into certain specific memory addresses. For example, when the letter "M" was pressed in the example mentioned above, the keypress was stored in a certain memory address until it was time for the processor to deal with it. Any time some information goes into or out of the machine, to the modem or the hard drive or the printer, for example, it uses these I/O addresses. Again, each device needs its own memory area.
- **Memory Addresses:** Similar to I/O addresses, many devices use blocks of memory as part of their normal functioning. For example, they may map hardware programs (BIOS code) into memory, or use a memory area to hold temporary data they are using.
- **Jumpers:** Motherboards have a variety of different pins that can be connected with jumpers for different purposes. The most common reason to access a jumper is to reset the BIOS password. It is possible for a user to set the password for the BIOS so that only that user can access the BIOS settings. If the user forgets the password, it can be cleared with a jumper so that the BIOS can be managed.

### Power Supply Unit (PSU)

PSU converts the AC power to low voltage direct current (DC) power, vital for the internal components of the PC. The following image shows a PSU:



*Fig. 1.1.30: Power supply unit*

### Mouse (Input Device)

The mouse is an input device, used to make selections and move objects on a computer screen. A mouse can be with a laser or a ball, wired or wireless.

Some different types of mouse are shown in the following image:



*Fig. 1.1.31: Types of mouse*

Though the mouse is considered as a peripheral, it is a vital device and essential for using computers.

### BIOS

The Basic Input/output System (BIOS) includes a software code that provides a computer with basic instructions so that it can start. When a computer is turned on, it runs the program within BIOS to do some basic system checks, locate the operating system on a disk, and start.

The program within BIOS is stored in a chip on the computer that can be rewritten. Older computers used an electrically erasable programmable read-only memory chip (EEPROM) for the BIOS. Read-only memory (ROM) has gone through several iterations over the years, from programmable read-only memory (PROM), to erasable read-only memory (EPROM), and then to EEPROM. New computers use a type of flash memory, similar to what is used with USB thumb drives.

The BIOS is often referred to as firmware. It is a hardware chip that can be physically seen and touched, and it includes software that runs code on the computer. The combination of hardware and software is firmware.

**BIOS vs. CMOS**

The term complementary metal oxide semiconductor (CMOS) is used in the study of computers. The difference between BIOS and CMOS needs to be understood.

**BIOS-** This is the firmware. It stores the instructions for starting the computer and includes a program that can be used to change some settings. The firmware can be updated in a procedure referred to as flashing the BIOS.

**CMOS-** This holds only the user-configurable BIOS settings, such as the current time. Users can change these settings by accessing the BIOS application. CMOS is volatile; meaning that the data is lost if the system is turned off. Motherboards include a CMOS battery to retain the CMOS data even if the system is turned off. BIOS is the application while CMOS is the data, and a CMOS battery keeps the CMOS powered to retain the settings. Unfortunately, it's misleading.

Technically, CMOS is a specific type of chip that is rarely found on any motherboard, but there is still a need to store the user-configurable settings. Instead of CMOS, the data can be stored on battery-powered static RAM. Sometimes, it is stored in the same chip as the real-time clock that is keeping time. Just like CMOS, these chips are powered by a battery when the system is turned off to ensure the system keeps these settings. When the BIOS is using newer flash memory, the user-configurable data is often stored on the same chip as the BIOS application. Due to how flash memory stores data, it doesn't even need a battery. However, the real-time clock still needs a battery to keep time when the system is turned off. Even though systems no longer have CMOS, and this battery isn't powering the CMOS, it is still commonly called the CMOS battery. Even the CompTIA objectives refer specifically to CMOS and the CMOS battery.

**BIOS Vendors-** Just as software developed by different vendors can be purchased, motherboard manufacturers can use BIOS developed by different vendors. Two of the most popular BIOS vendors are American Megatrends (AMI) and Phoenix Technologies. Each vendor develops different versions of BIOS to meet the needs of different motherboard manufacturers.

The motherboard vendor chooses the BIOS to include with the motherboard. There are differences between versions, so it is important to realize that one system will look different from another.

**Accessing the BIOS Application**

When a computer is first turned on, one or more screens can be seen flashing onto the screen, providing bits of information. One of these screens gives a message to press a specific key to access the setup options or the setup utility.

The only sure way of knowing what key to press is by reading the screen. For example, if the screen says to press the <F2> key to enter the setup utility, the F2 function key has to be pressed.

Other common keys or key combinations are: F1, F10, Del (delete key), Ctrl+Alt+Esc keys (pressed at the same time), and Ctrl+Alt+Enter keys. On some laptops, the FN+Esc or FN+F1 keys can be pressed. There are a lot of combinations and one needs to read the messages on the screen as the system starts as shown in the figure:



BIOS setup utility.

Fig. 1.1.32: BIOS message on screen

### BIOS Component Information

The BIOS can be used to verify the different components that are installed on a system. This can be useful to ensure that the system is recognizing newly installed hardware. For example, if new RAM is installed but not recognized, the BIOS can sometimes give insight into the problem.

Figure shows a screen from a different BIOS version with the system information page selected.

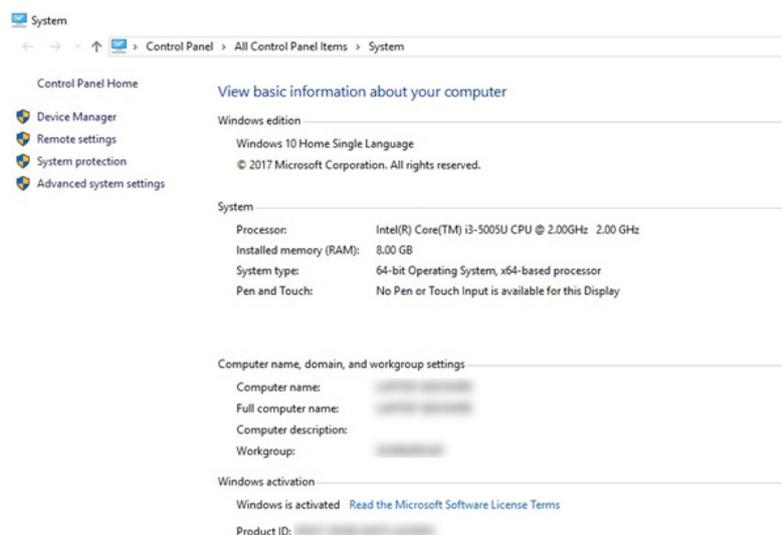


Fig. 1.1.33: System information page

This page shows information about the processor type, processor cache, and memory. It can be seen that the processor is an Intel Core i7, with a 133-MHz clock multiplied by 20, giving a CPU speed of 2.66 GHz.

It can also be seen that the system has 12 GB (12,288 MB) of RAM installed. The RAM has a speed of 1,066 MHz (using a 133-MHz clock multiplied by 8) and is DDR3 SDRAM.

Additionally, most BIOS systems will automatically detect the presence of different drives and report their presence within BIOS. This includes hard disk drives and different types of optical drives, such as DVD drives. Sometimes, these settings are reported in the Standard CMOS Features page, if it exists, and other times the settings are on a dedicated page for the drives.

Drives might be reported as SATA1, SATA2, and so on, if the system is using a SATA interface. If the system is using an EIDE interface, they might be reported as IDE, EIDE, or as hard disk drives. This can be useful if a new drive has been installed but is not recognized after starting. Then, one has to go into BIOS, find the drive settings, and ensure that the new drive is recognized by BIOS. If it's not recognized, the hardware such as the cables or the configuration has to be checked.

### **BIOS Configuration**

There are a few configuration settings that are important to understand. Changes that are made in the configuration will remain in the system even after the system has been powered off.

**Time and Date:** A very basic setting for the BIOS is the time and date. These settings can be seen on the very first page of the BIOS, which is sometimes called the Main page or the Standard CMOS Features page. The computer keeps time with a real-time clock, and the CMOS battery keeps the clock ticking even when the system is turned off. This rarely needs to be changed except when the CMOS battery is failing. If the battery is failing, the real-time clock becomes slow and needs to be reset often. When replacing the battery, make sure that it is replaced with the correct type. Motherboard manufacturers warn the users that a wrong battery could explode. Also, local regulations should be followed when disposing the original battery.

**Boot Sequence:** One of the most important BIOS settings for a technician to understand is the boot sequence. The boot sequence setting tells the computer about the device from which it should try to boot first. If the hard drive does not have a bootable operating system, it will look for a bootable operating system on the CDROM, then on a floppy drive, and then by using PXE. As configured, it will never boot using the CDROM drive, unless the hard drive fails. If the booting has to be done using a bootable CDROM drive, the configuration will have to be changed.

**Clock Speeds:** Motherboards typically include a serial presence detect (SPD) chip that detects and stores the speed of the CPU and the RAM. The BIOS either reads the data from the SPD chip or automatically detects the clock speeds and reports them. Some BIOS utilities allow manipulating these clock speeds by altering the frequency, the multiplier, or the voltage. For example, if a system has a 133-MHz clock and a 20x multiplier, the speed is 2.66 GHz. If the clock is changed from 133 MHz to 148 MHz, the speed is 2.96 GHz. If the multiplier is changed from 20x to 24x, the speed is 3.55 GHz.

Manufacturers commonly warn that modifying these settings can cause additional heat or other damage. It can also cause the CPU or other components to fail, and reduce the system performance. However, for the promise of a quicker PC, many hobbyists are willing to take the risk. The biggest danger of over-clocking is heat. The more quickly a system runs, the hotter it gets. If it gets too hot, it can destroy components.

**Security:** Many BIOS utilities include security settings, and the most common security setting is related to BIOS passwords. Other possible settings are related to a Trusted Platform Module (TPM) and LoJack. Looking again at the given figure, the settings for a supervisor password and a user password can be seen. When set, the supervisor password provides full control over any BIOS settings and is sometimes set by administrators to ensure that they can override any changes made by a user. Depending on the BIOS, the user password provides varied access. It might allow the user to do anything except change the supervisor password, or it might allow the user to change only limited settings such as the date and time. In some systems, it requires a user to enter the password every time the system is started.

**POST and Other Diagnostics:** POST is an in-built diagnostic tool that starts as soon as the processor of a computer starts. POST verifies that the various hardware components of a computer such as the keyboard, random access memory and disk drives are functioning properly. If POST is successful then the computer begins to boot, else the BIOS issues an error message. The error message is in the form of a series of beeps. These beeps may have a pattern of long beeps or short beeps or a combination of the two depending on the nature of the problem. The pattern of beep conveys information about the type of the fault detected. For example, if the POST is unable to detect the processor, it will stop the boot process and convey the message through a code of beeps.

### Out of Service Tests (OST)

POST can only test internal functioning of the card and not the external interface logic of the card. There are two types of test that can test the external interfaces of the card with other boards in the system. These are shown in the following figure:

#### Interface Tests

- The card is labelled as out of service. The neighboring cards are then configured to work in the interface test mode. The card under test is instructed to run the test. The neighboring cards are then restored by bringing them out of test mode.

#### Echo Back Test

- The card is configured in echo back mode. The interface receives the data and echoes it back by transmitting it to the card under test. The card under test receives back the data that it had transmitted.

Fig. 1.1.34: Out of service tests (OST)

The following beep codes are for AMI BIOS:

Beeps and Error	Resolution
1 Beep - Refresh Failure	Reseat/replace memory, troubleshoot motherboard
2 Beeps - Parity Error	Reseat/replace memory and troubleshoot motherboard
3 Beeps - Memory Error (first 64KB)	Reseat/replace memory
4 Beeps - Timer Failure	Troubleshoot motherboard
5 Beeps - Processor Failure	Troubleshoot CPU and motherboard
6 Beeps - Keyboard Controller Failure	Troubleshoot keyboard and motherboard
7 Beeps - Virtual Mode Exception Error	Troubleshoot CPU and motherboard
8 Beeps - Display Memory Failure	Troubleshoot graphics card and motherboard

Fig. 1.1.35: Beep codes

### Keyboard (Input Device)

A keyboard is one of the primary input devices and it looks similar to those found on electric typewriters. The following image shows a keyboard:



Fig. 1.1.36: A keyboard

Keyboards allow users to enter letters, numbers and other symbols into a computer that can serve as commands or be used to type text.

The keys in keyboards can be categorised as shown in the following figure:

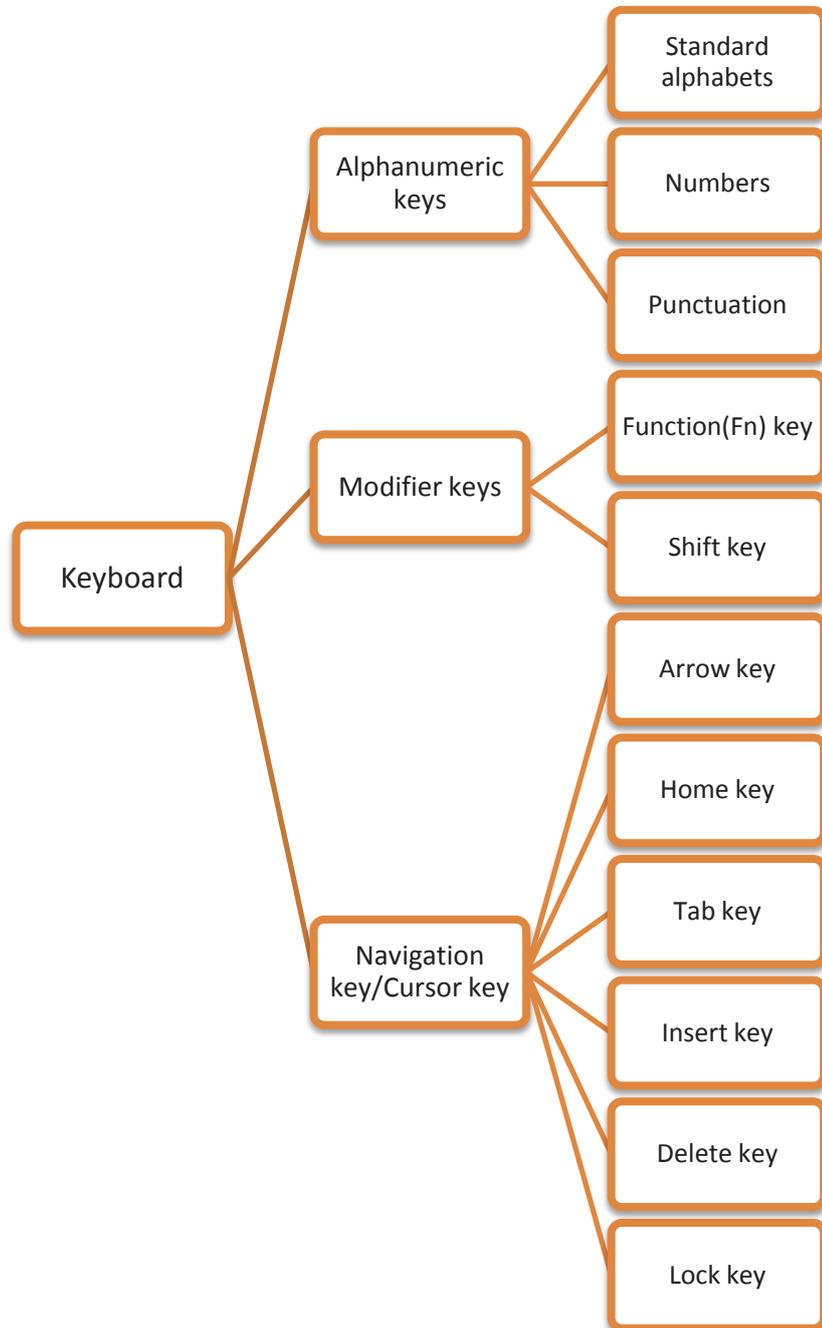


Fig. 1.1.37: Hierarchical structure of keyboard keys

The keys typically found on keyboards can be categorized as follows:

- **Alphanumeric keys:** Are the standard letters and numbers, and also include punctuation keys such as comma, period, semicolon, and similar keys
- **Modifier keys:** Are special keys that modify the normal action of another key, when the two are pressed in combination and are categorised into:

- Fn key
- Shift key
- Alt key
- Ctrl key
- Navigation keys or cursor keys: Includes a variety of keys which move the cursor (a mouse cursor, also called a pointer, is a symbol which is shaped like an arrow or a small hand pointing towards the top of the display device.) to various places on the screen:

### Monitor (Output Device)

The monitor is an output device, also called a visual display unit (VDU) that shows the graphical and textual information of the computer. The following image shows a LCD monitor:



Fig. 1.1.38: Monitor

### Storage Devices

Storage devices, also called storage media, are hardware devices which are used to store data or information. It can store information temporarily or permanently. These devices can be added to computers externally or internally. Storage devices are of two types:

- Magnetic storage: Includes hard disk drive, magnetic tapes, floppy drive and so on.
- Optical storage: Includes CD-R, CD-RW, Blue ray disk, DVD, flash drive and so on. It uses laser ray or light to access data in it.

The following images shows the storage devices:



Fig. 1.1.39: Types of storage

### Hard Disks (Hard Disk Drive HDD)

A hard disk is a device that stores data on a computer permanently (non-volatile). A hard drive is a collection of one or more disks or platters shielded with ferro magnetic material to which data is written with the help of a magnetic head. Hard disks are connected to the motherboard using special cables such as PATA (Parallel ATA), SATA (Serial ATA), USB or SAS (Serial attached SCSI) cables and they are powered by a power supply unit. The following images shows hard disk drives:



Fig. 1.1.40: Hard disk drives

In case of a laptop, the hardware components and devices that come along in the package are same as that of a desktop except a few changes; instead of mouse, laptops have touchpads or track pads and instead of external power source, laptops have an internal battery.

#### Physical components:

- **Platters:** Hard drives have multiple spinning platters, and each platter can be written on both the sides.
- **Read/write head:** A hard drive will have one read/write head for each platter side. This drive has two platters and four read/write heads.
- **Actuator:** The actuator controls the movement of the arm.
- **Actuator arm and axis:** The actuator arm is moved back and forth by pivoting around the actuator axis.

#### Logical components:

- **Tracks:** Each platter is logically divided into multiple tracks, which are circular areas on the disk. When the head is positioned over a track, it can read or write data on the track as the platter spins.
- **Sectors:** Tracks are logically separated into track sectors. A sector can be between 512 bytes and 2 KB in size.
- **Clusters:** A cluster is a group of multiple sectors. Clusters are also known as allocation units and are the smallest element of a drive to which an operating system can write.
- **Files:** Files are written to clusters. If the file is bigger than a single cluster, the file is written to multiple clusters. Ideally, a file will be written to clusters that are next to each other, or

contiguous clusters. However, if other data is already written on an adjoining cluster, the file is fragmented and written to another available cluster.

### **Hard Drive Characteristics**

It is relatively common to replace or add a hard drive to a system. For example, many people store enough data on the original drive that came with their computer and fill up the drive. They can either buy a new computer or buy an additional hard drive; the additional hard drive is much cheaper.

While buying a new hard drive, the following important considerations need to be kept in mind:

1. **Capacity or Size:** The size of the drive is listed as GB or TB; for example, 750 GB or 1 TB. Bigger drives hold more data but are more expensive.
2. **Interface:** A drive can be connected internally or externally.
3. **Rotational speed:** This is stated as rpm, and higher speeds generally result in a faster drive.

### **Hard Drive Speeds**

The rotational speed of the drive helps determine how quick it will be overall. Common speeds are 5,400, 7,200, 10,000, and 15,000 rpm. Drives with 7,200 rpm are used in standard desktop computers.

Other factors also contribute to the speed. For example, seek time refers to the average amount of time it takes to move the read/write head from one track to another track; lower seek times are better. If two drives are of the same size with the same rpm speed but one is significantly cheaper, it might be due to a higher seek time, resulting in overall slower performance.

The interface can also limit the speed. Imagine a drive spinning at 15,000 rpm with a low seek time. It can read and write data to and fro from the hard drive, but how much data can actually be transferred between the hard drive and the other computer components is limited. The following sections describe the common interfaces.

### **Processor**

Processor is a logical circuitry unit which is embedded in a printed main board (or motherboard), which responds to instructions and also helps in running programs like OS, and others such as Windows Office and so on. The processor is commonly known as a central processing unit or CPU; a small silicone chip aimed to perform complex computations. There are many types of processors like AMD (advanced Micro devices), Intel processors and DSP (Digital signal Processing) processors.

There are two primary manufacturers of computers used in computers: Intel and Advanced Micro Devices (AMD).

1. Intel: Intel is the largest seller of CPUs, selling about 80 percent to 85 percent of all CPUs. It manufactures other products as well, including chipsets, motherboards, memory, and SSDs.

2. AMD: AMD is the only significant competition to Intel for CPUs, and it sells about 10 percent to 15 percent of all CPUs. It also manufactures other products, including graphics processors, chipsets, and motherboards.

### Processor Technologies

Processor technologies in the following sections might be used by AMD only, by Intel only, or by both vendors. These technologies are used to help distinguish different processors from each other in terms of performance or features.

Processor technologies can be classified into following types:

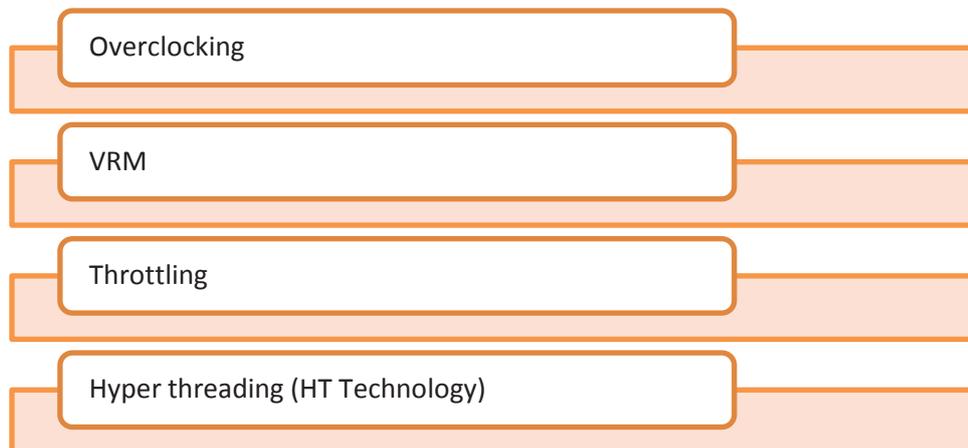


Fig. 1.1.41: Processor technologies

### Multiprocessing, Multiple processors, and multi-core processing

CPU designers have come up with several creative ways of doing more than one thing at a time to improve performance. Three methods are popular: multiprocessing, dual processors, and multi-core processing. Multiprocessing is accomplished when a processor contains more than one ALU. Older processors had only a single ALU. Pentiums, and those processors coming after them, have at least two ALUs. With two ALUs, processors can process two instructions at once and, therefore, are true multiprocessing processors.

A second method of improving performance is installing more than one processor on a motherboard, creating a multiprocessor platform. A motherboard must be designed to support more than one processor by providing more than one processor socket.

The latest advancement in multiple processing is multi-core processing. Using this Technology, the processor housing contains two or more cores that operate at the same frequency, but independent of each other. Each core is a logical processor which contains two ALUs; therefore, each core can process two instructions at once.

## Software

Software is a set of instructions or programs used to instruct a computer to perform specific tasks. The following figure shows classification of software based on their application:

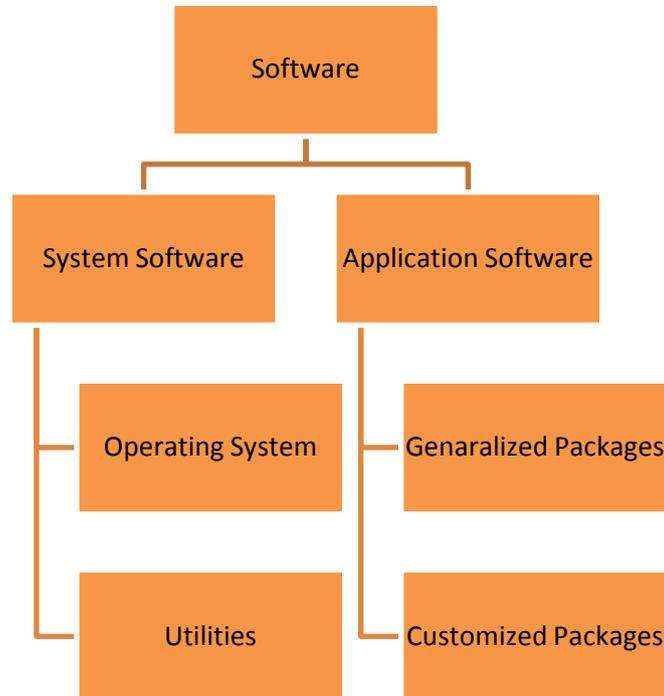


Fig. 1.1.42: Classification of software

System software are a combination of programs, which help in functioning of a computer, including controlling managing the resources such as peripherals and other applications. The system software is classified as follows:

- **Operating System:** It is a system software which acts as an interface between a user and a computer. It helps in managing various hardware devices, maintaining the file systems and functioning of other application programs. Few popularly used operating systems are Windows, Linux and Mac OS.
- **Utilities:** These are the system software which help in analysing, configuring, optimizing or maintaining computer and computer resources such as anti-virus software, zip/unzip files, disk defragmenter and file manager.

Application software is a set of programs used to perform specific tasks, for example, a word processing or spreadsheet software, which is an application software to handle all the processes in a hospital. Application software are classified as follows:

- **Generalized packages:** Are user friendly software such as Word processing software for preparing documents (MS Word), spreadsheets for data analysis (MS Excel).
- **Customized packages:** Are application software that are developed or customized as per a specific requirement such as inventory control or a payroll system.

### Operating System and Other Software

The following figure shows a block diagram of a computer with respect to the operating system:

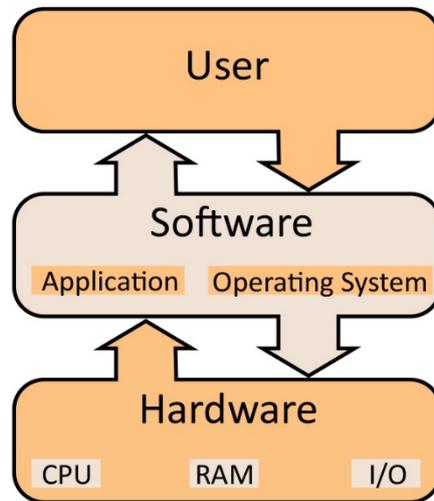


Fig. 1.1.43: Block diagram of a computer with respect to the operating system

The three most commonly used operating systems for personal computers are Microsoft Windows, Mac OS and Linux.

### Microsoft Windows

Windows is an OS owned by Microsoft. It is different from any open source software in the sense that only Microsoft can make changes to the code. It can be installed on different kinds of computers, by various manufacturers, giving a wide range of choice for hardware to the user.

The latest version Windows is 10 which includes touchscreen support. This combines the usability of a touchscreen tablet and the power of a desktop/laptop computer. It also includes the "Play To" and "Remote Media Streaming," features that allow a user to play media from the computer on another device. These features also allow the user to access media when away from the computer.

A processor running Windows OS has two modes:

- User mode
- Kernel mode

The Windows hardware abstraction layer is an interface between the hardware and the rest of the OS. It hides differences in hardware components and provides a consistent platform for the kernel to run. This layer includes hardware-specific code which controls multiple processors, I/O interfaces and interrupt controllers.

The following figure shows the architecture of Windows OS:

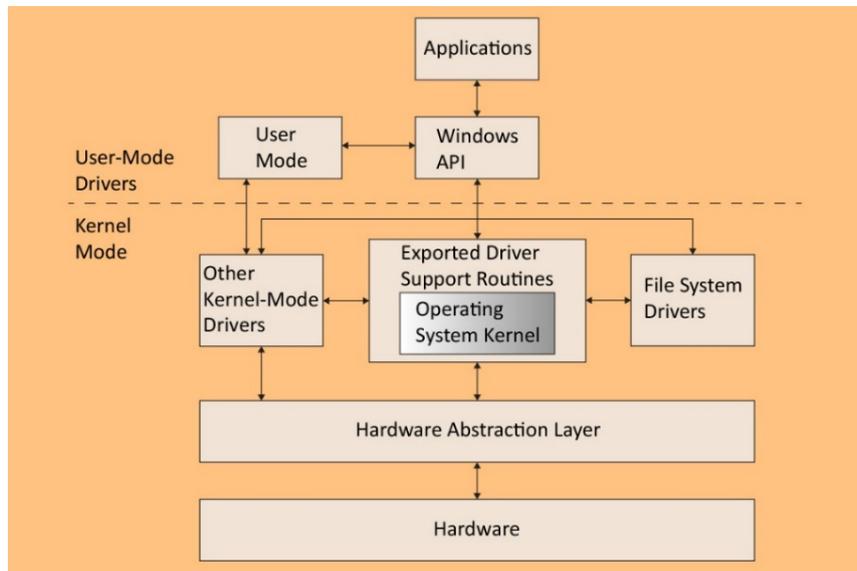


Fig. 1.1.44: Architecture of Windows OS

An operating system has four major functions:

#### Process Management

A process is a functioning program comprising of a code, data, some specific resources assigned to it, and certain levels of execution through its code. The assignment of resources to the processes is controlled by the system OS. The OS also gives system calls to regulate these processes.

#### Memory Management

The OS has to share memory with an application program. It manages the memory management hardware of the computer and decides which memory locations a process may access. It controls the assignment of memories to the processes.

#### File System Management

A large magnitude of information has to be conveyed, processed or saved in a computer. The file system comprises of a systematic set of abstract file system objects. The OS renders the essentials to manage these objects.

#### Device Management

The transfer of information in a computer takes place through the various input and output devices. Processes use the system call interface to access these devices. The OS has to control the devices in such a way that they are properly shared by all the processes needing them. The programming interface made available to the services by the OS is termed as the system call. It is commonly written in C/C++ language.

**Directory Structure**

The root directory in Windows OS is represented as "drive:". For example, the root directory is generally "C:\". The directory separator is a "\" but the OS also recognizes a "/" internally. The following figure shows the folders which appear in the root directory of a Windows OS:

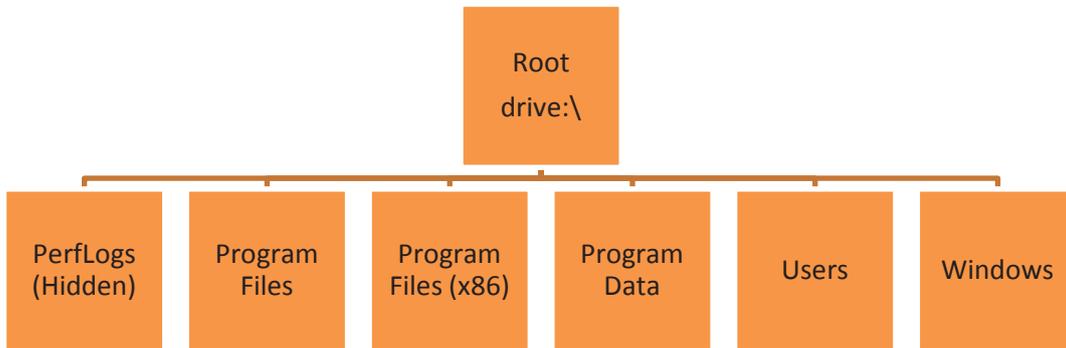


Fig. 1.1.45: Windows directory structure

**Utilities**

Utilities of Windows depends on the version a user is using. The following figure lists some common utilities for Windows as per the different versions of the operating system:

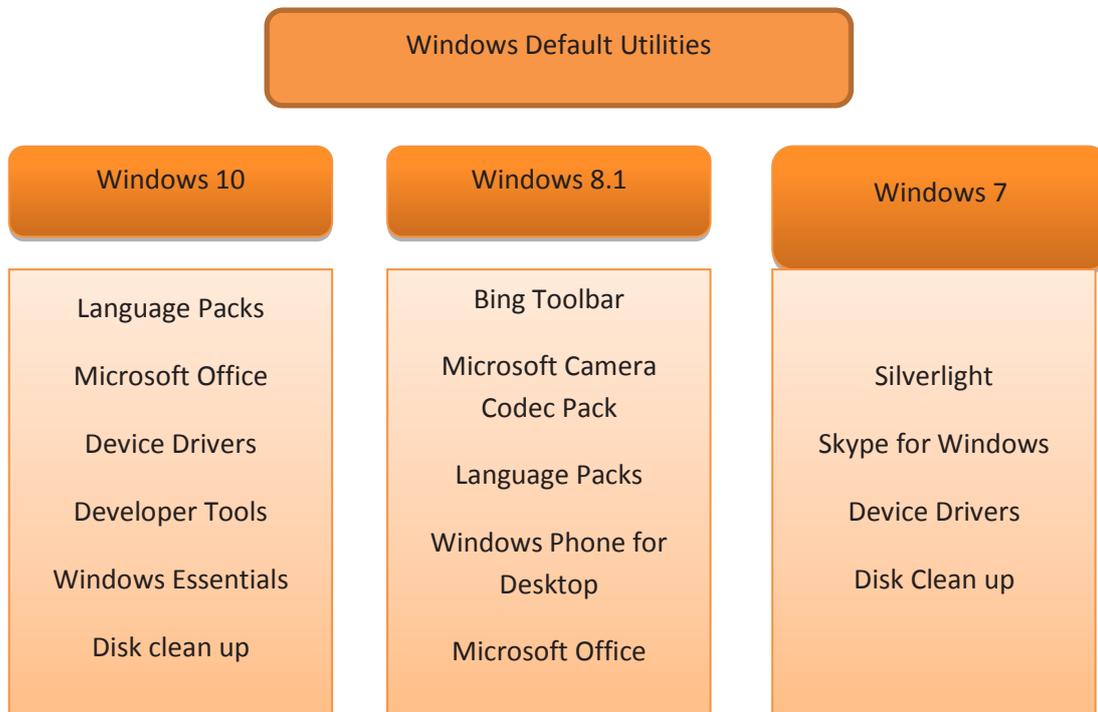


Fig. 1.1.46: Common Windows utilities

### Configuration/Installation

The steps that should be performed in order to install the Windows operating system on a computer are shown in the following figure:

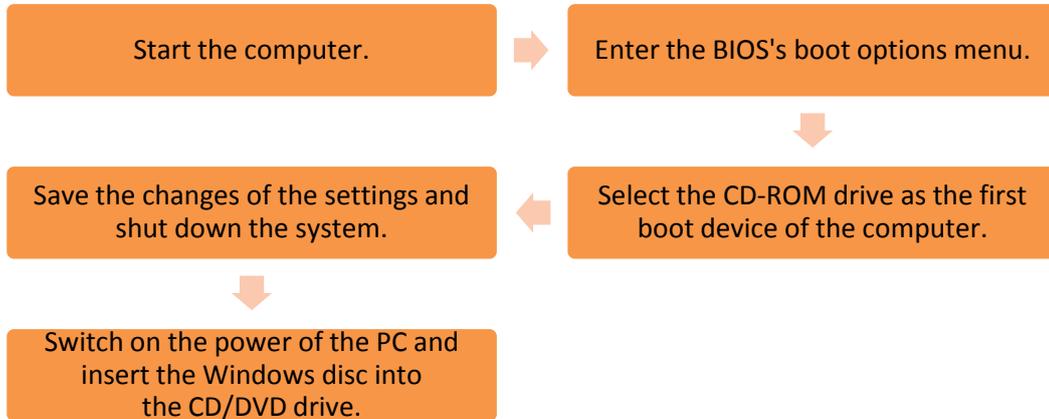


Fig. 1.1.47: Steps to install Windows operating system

### Mac OS

Mac OS which was known as Mac OS X earlier, is a Unix-based graphical OS developed by Apple Inc. and is designed to be run only on Apple's Macintosh computers. After Microsoft Windows, Mac OS is the second most widely used desktop OS. In the earlier years, Mac OS had a negligible number of types of spyware and malware which have affected the Windows users. The share of usage of Mac OS is smaller compared to Windows. Apple regularly releases security updates for Mac OS. The latest version of this is Mac OS 10.12 Sierra.

Functionally, the Mac OS architecture consists of several layers. The base level of the operating system is its Unix core. The next layer is the graphics and media layer, which consists of Core Audio, OpenGL, Core Video, Core Image and QuickTime. Then comes the application framework layer, whose components are, Carbon, Cocoa, and Java. Finally, the top layer is the user interface, which is called Aqua. It provides a working interface to the user.

The following figure shows the architecture of Mac OS:

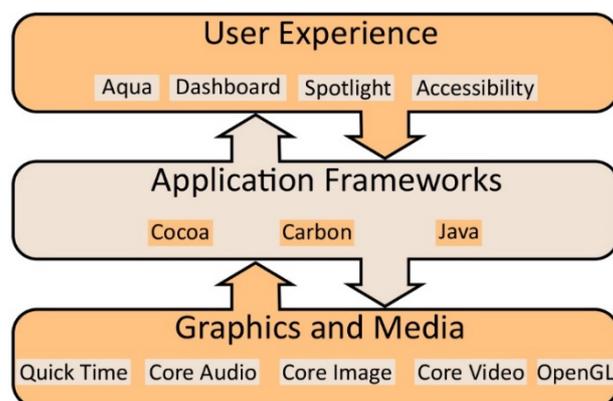


Fig. 1.1.48: Architecture of Mac OS

## Directory Structure

The Mac OS file system also stores the files within folders or directories. The topmost folder is the root directory. Folders located within the root are called subdirectories.

The root directory is referred to as /. Within the root, by default, there are several additional folders. These include the Application folder that stores programs and the Users folder that stores the home folder information for each user account. The following figure lists some directories of Mac OS:

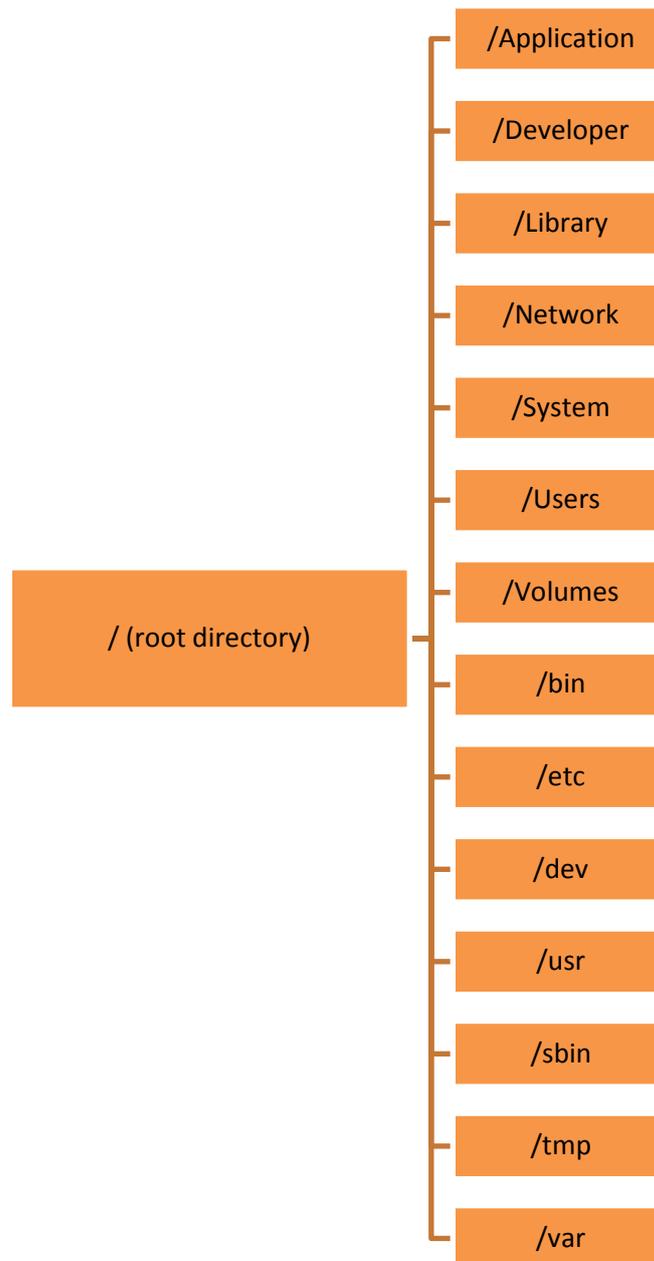


Fig. 1.1.49: Some directories of Mac OS

## Utilities

The following figure shows the list of some common utilities of Mac OS:

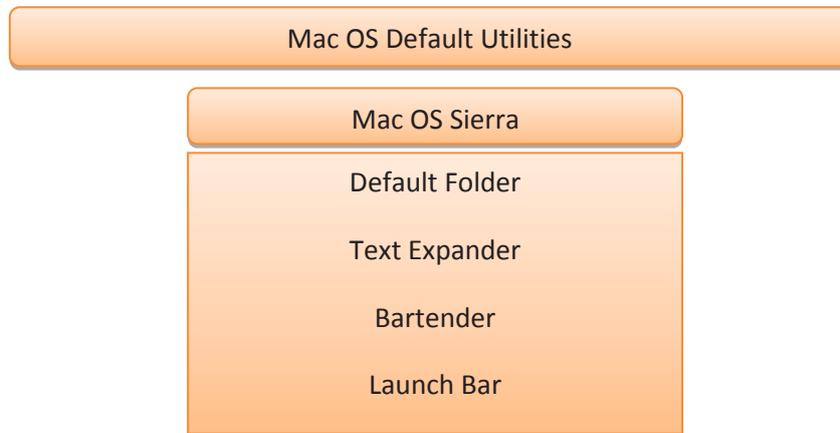


Fig. 1.1.50: Some common utilities of Mac OS

## Configuration/Installation

One can install Mac OS over any earlier version, without removing the data. The following figure lists the steps to reinstall the Mac OS:

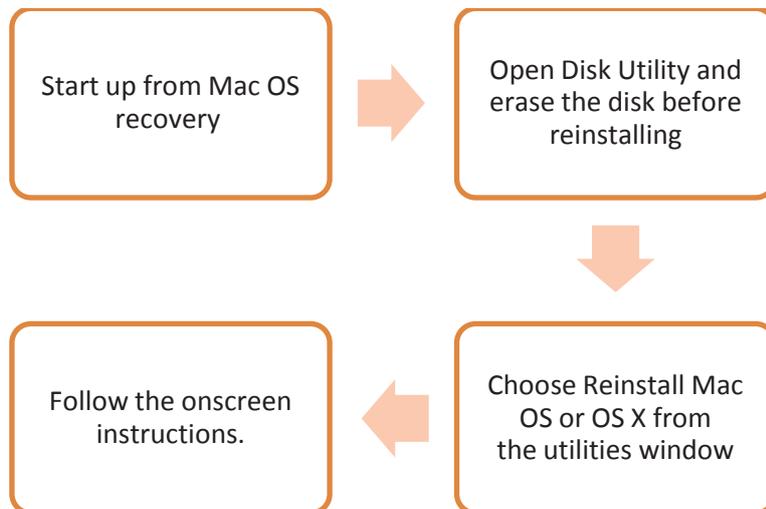


Fig. 1.1.51: Steps to reinstall Mac OS

## Linux

Linux is a free and open-source software. The main component of the Linux OS is the Linux kernel.

The user interface, called shell, may be a command-line interface (CLI) or a GUI. For any desktop system, the default mode is usually GUI. The CLI is also available either through a terminal emulator Windows or an independent virtual console.

Linux OS has three components:

- Kernel is the core of Linux OS. It is responsible for the major activities of the OS. It interacts with the underlying hardware components directly with the help of its various modules. It hides low level hardware details, thus providing required abstraction to the system.
- System libraries are special programs which are used by the system utilities and application programs to access Kernel features.
- System utility programs are mainly concerned with specialized and individual level tasks.

The following figure shows the architecture of the Linux OS:

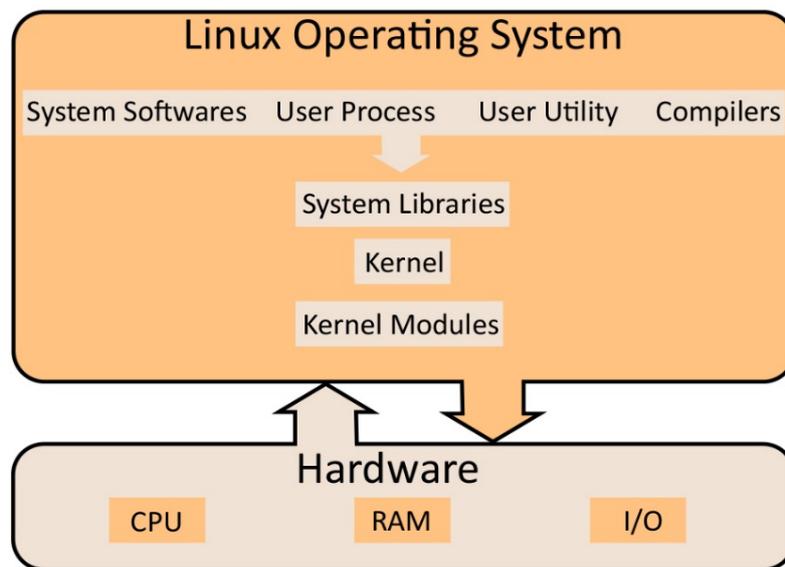


Fig. 1.1.52: Architecture of Linux

### Utilities

The following figure lists some of the common utilities of Linux:

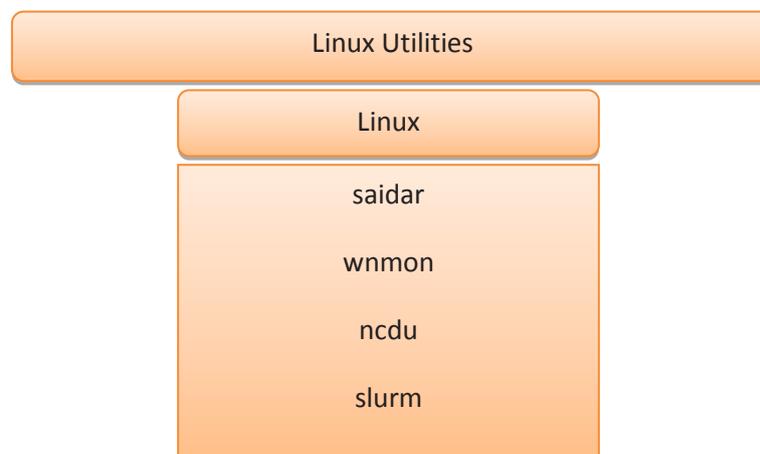


Fig. 1.1.53: Some common utilities of Linux

## Directory Structure

The following figure lists the directories of the Linux OS:

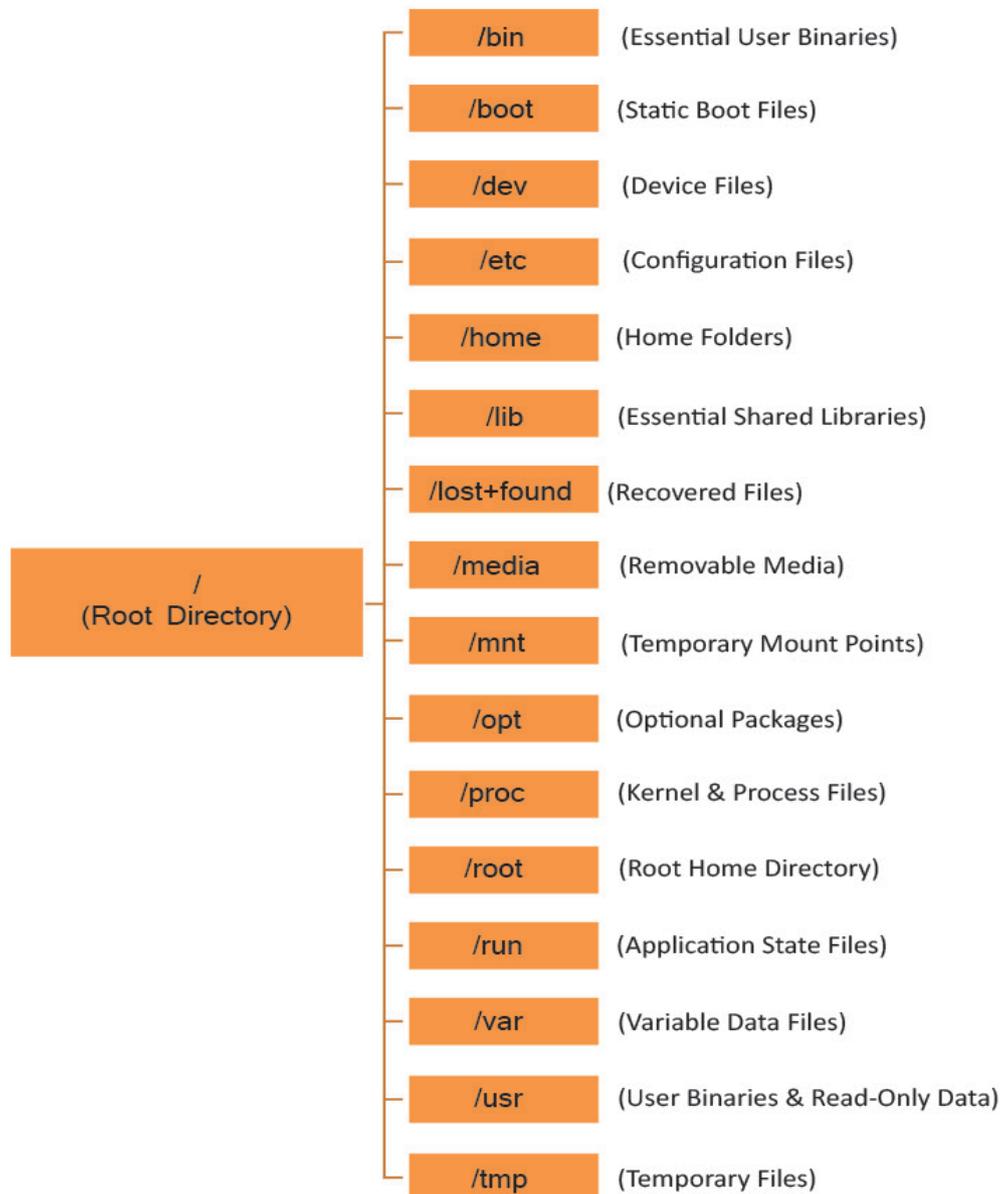


Fig. 1.1.54: Directories of Linux

## Configuration/Installation

To install, update or remove a software in Linux, certain package managers are used such as:

- Synaptic Package Manager
- Package Kit
- Yum Extender

Most of the major Linux distributions contain extensive repositories. Users can:

- download the pre-compiled packages from websites directly,
- install the packages from unofficial repositories or
- compile the source code by themselves.

### Other Software

System software includes the OS and utilities. A field technician should know about the utilities that are compatible with the OS version. The person must be able to search for the utilities that are correct for the user and install them on the system. Moreover, the technician should know the use of software such as:

- Commercial software
- Mail server software
- Remote access software
- Antivirus software

The following figure lists the general steps of installing a software on any operating system:

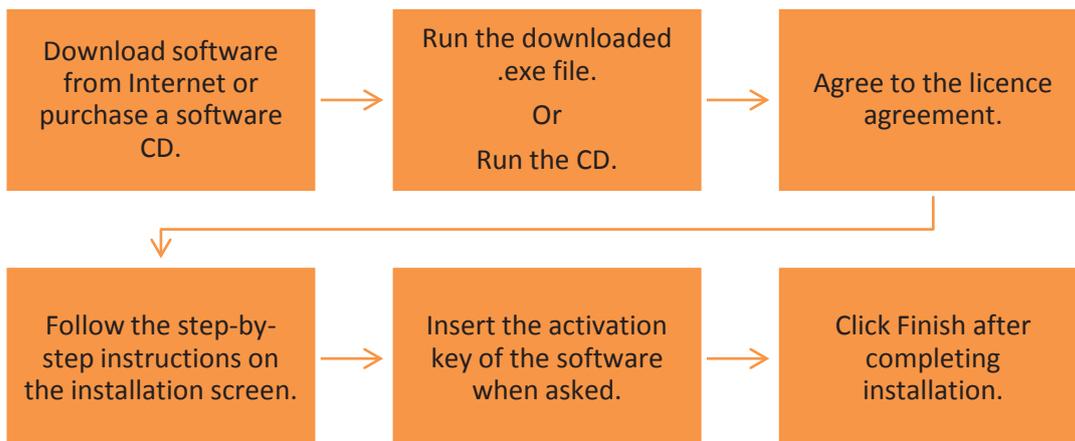


Fig. 1.1.55: General steps for installing a software



### 1.1.3 Packaged Computer Components

A computer package consists of all the necessary hardware and software components in a box that are required to make a system work. In general, a desktop computer consists of components such as a monitor, keyboard, mouse, CPU and so on.

#### Assembling and Installing a Desktop

Installing and assembling a desktop is very simple and can be performed by anyone who can read the instructional manual thoroughly and follow it step by step.

The following figure lists the steps to assemble and install a desktop (note that these steps may not apply to all the desktops, but are the typical steps to be performed):

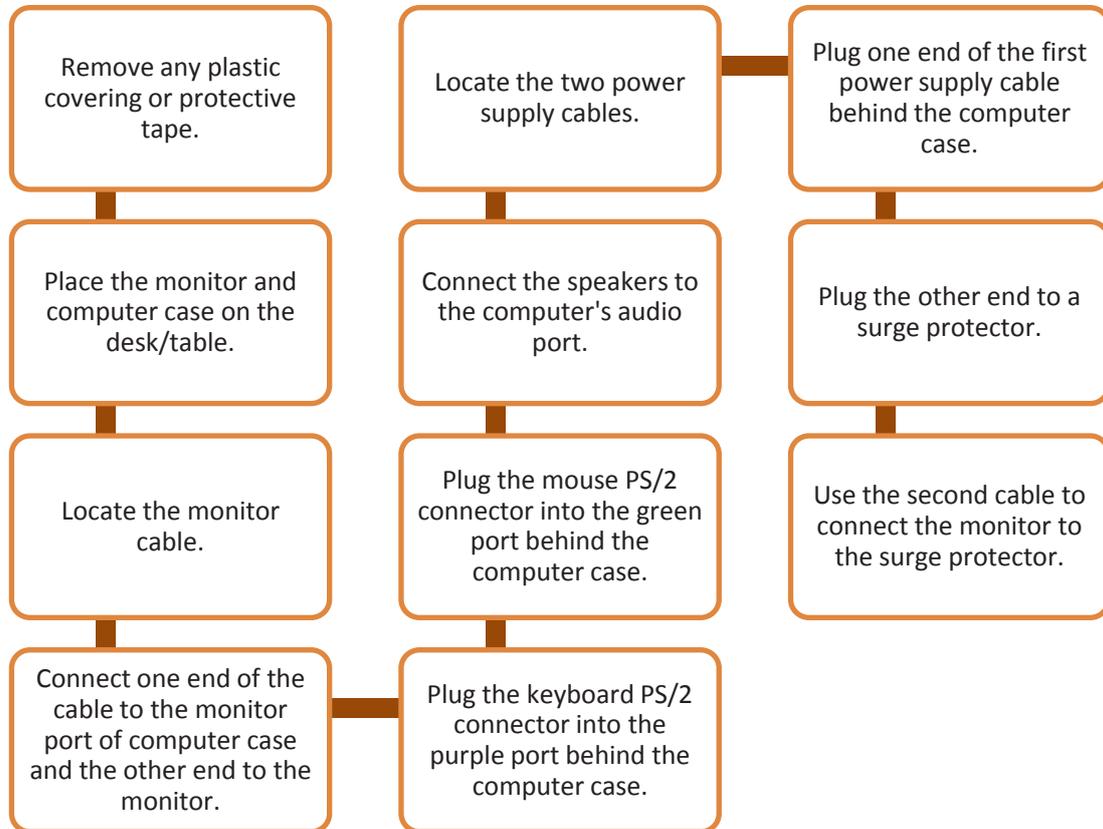


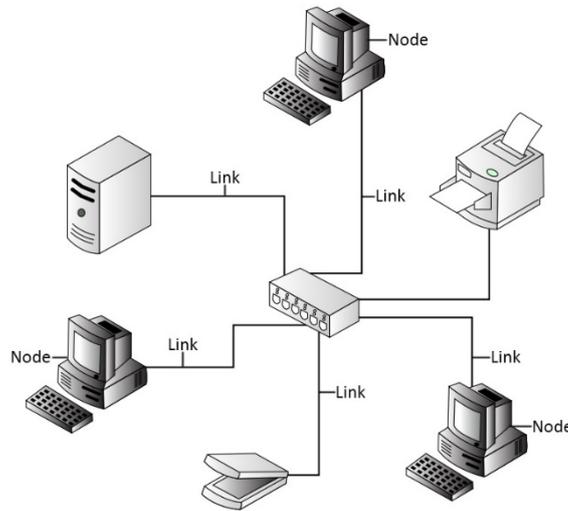
Fig.1.1.56: Steps to assemble and install a desktop



### 1.1.4 Networking Basics

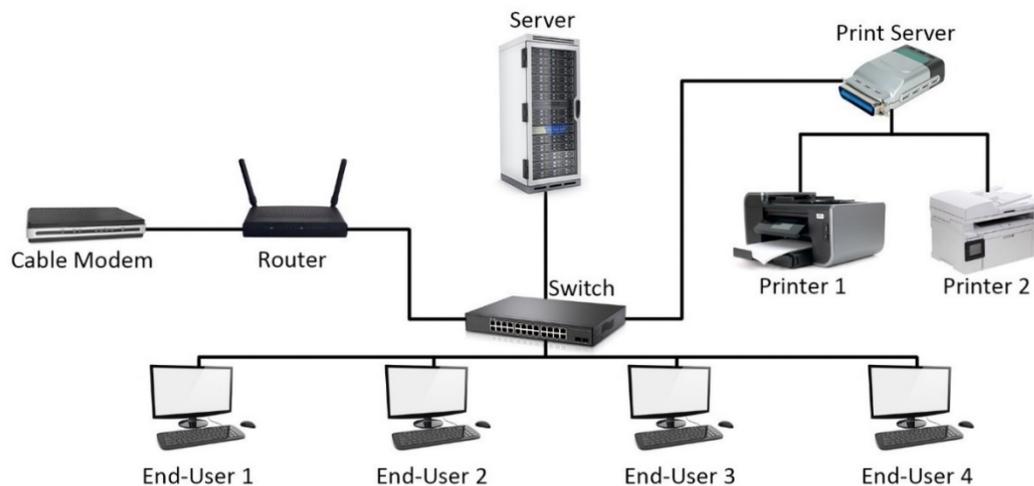
A computer network is a group of computers and other devices such as printers, scanners, copiers and fax machines, connected together with the help of transmission media and various communication devices. All electronic devices such as a computer or a printer attached to a computer network for data transmission or communication are called nodes. The transmission path between two nodes is called a link. The set of rules followed for data transmission over a network is called a protocol. These set of rules define how the data will be transmitted between the connected nodes.

The following figure shows basic diagram of a network:



*Fig.1.1.57: Basic diagram of a network*

A computer network helps the end-user computers to share common resources, as shown in the following figure:



*Fig.1.1.58: Computers accessing shared resources over network*

In the preceding figure, the main server is connected to the end-user computers through a switch. The switch is connected to the router, which is connected to the Internet via a modem. The switch is also connected to a print server acting as a medium between the end-user computer and the print server. The print server connects the two printers to the computers in the network.

### Advantages of a Computer Network

The following figure lists the various advantages of a computer network:

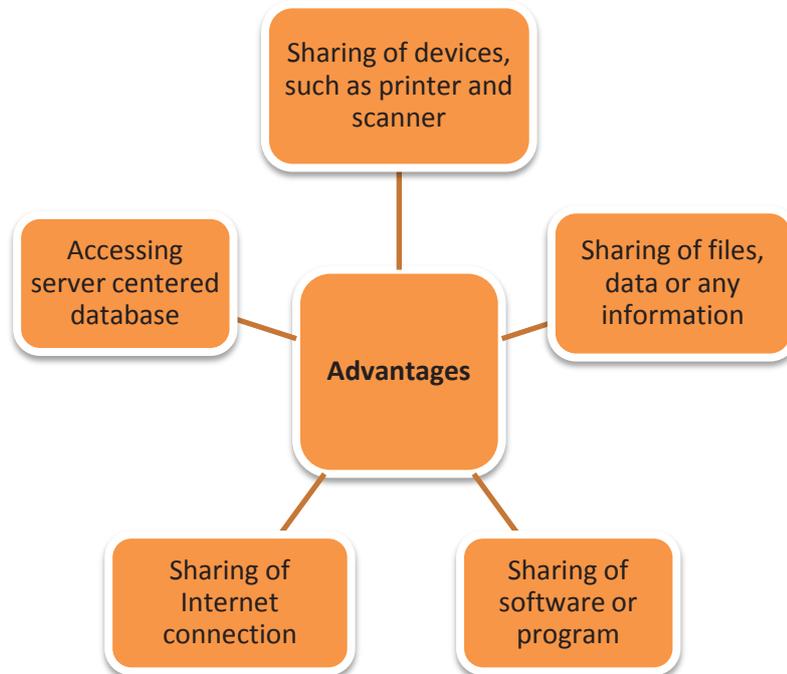


Fig.1.1.59: Advantages of a computer network

### Network Architecture

Network architecture is a structural model that specifies the type, layout and components of a network along with data format, different protocols and services provided. The following figure shows the types of network architecture:

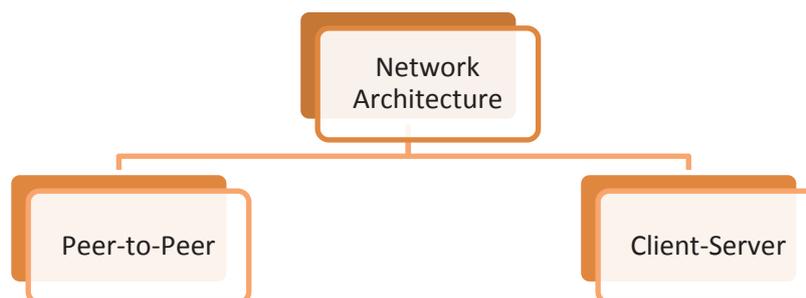
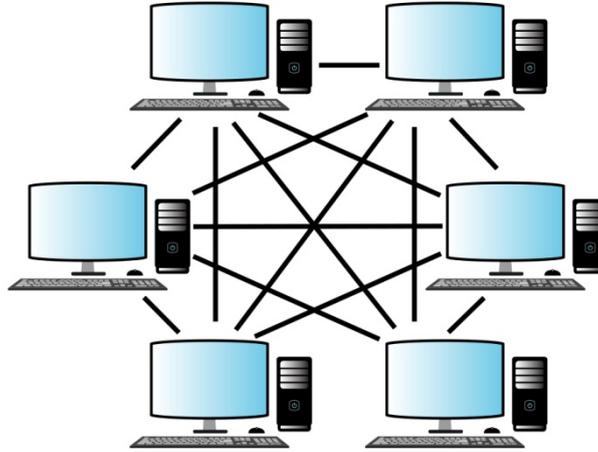


Fig.1.1.60: Types of network architecture

#### Peer-to-Peer Network Architecture

Peer-to-peer is a type of network architecture in which all the computers connected to the network have similar capabilities to use the resources that are available on the network. There is no central server in this architecture and each workstation on the network shares its files equally with the others. Peer-to-peer networks are usually simple, but they do not

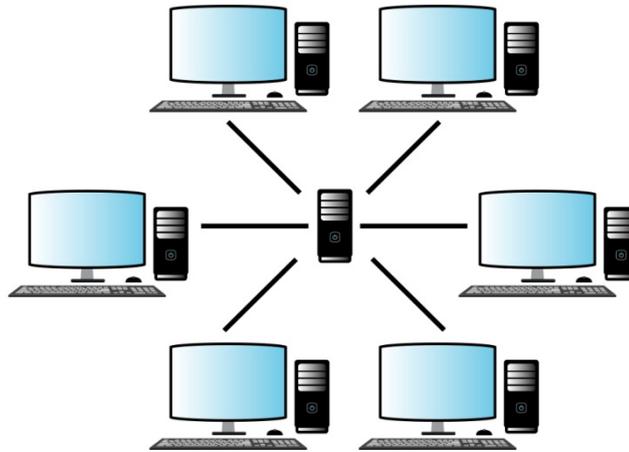
offer the same performance in case of heavy network loads. The following figure shows a peer to peer network architecture:



*Fig.1.1.61: Peer to peer network architecture*

### **Client-Server Network Architecture**

Client-server is a type of network architecture in which each computer on the network is either a client or a server. The following figure shows a client-server network architecture:



*Fig.1.1.62: Client server network architecture*

### **Server**

A computer which holds programs, network operating systems and the shared files is called a server. Servers are computers dedicated to managing disk drives (file servers), printers (print servers) or network traffic (network servers). They provide access to the network resources to all the devices which are using the network. There are different kinds of servers such as file servers, communication servers, print servers, database servers, mail servers, fax servers and so on.

The following figure lists some of the servers along with their description:

#### File Server

- It provides data such as data files, e-mail and printer access programs which are shared among various clients in the network.
- It has large hard disks which all users in the network share.
- Application softwares and shared data reside on this server.

#### Print Server

- It acts as a buffer for the print jobs sent by the users to the shared printers or centralised printers.

#### Communication Server

- It grants the outside users access to the network through a telephone line.

#### Mail Server

- It provides electronic mails (e-mails) to users of the network.

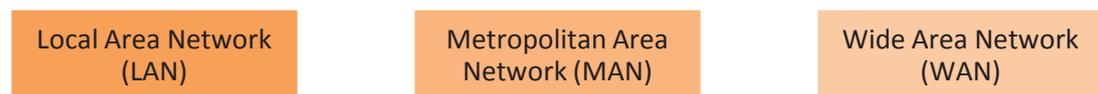
*Fig.1.1.63: Different types of servers*

#### Clients

Client computers access the network and use various shared resources in the network. They rely on servers for resources, such as files, devices, and even processing power. They receive services from the servers as per their request.

#### Types of Network

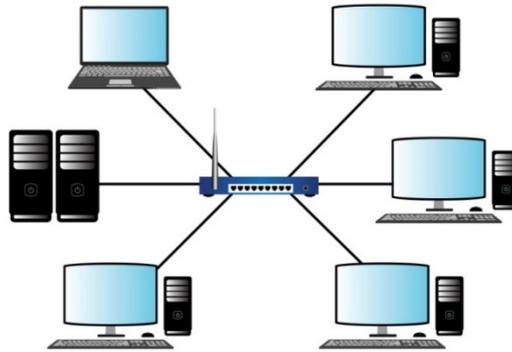
There are mainly three types of network classified according to the area covered for transmission, as shown in the following figure:



*Fig.1.1.64: Types of network*

**LAN**

The network that is distributed over a small area, such as within a building, school, or home is called LAN. It allows a number of users to share common resources. Generally, a LAN is limited to 255 users per LAN. The following figure shows a LAN:



*Fig.1.1.65: LAN*

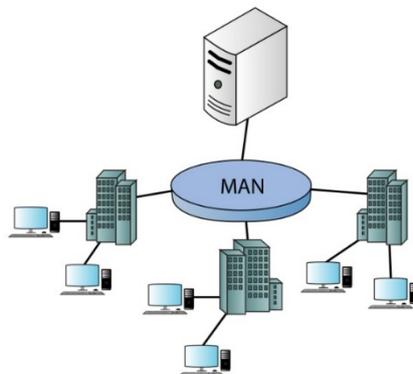
LANs generally employ Ethernet cables for connecting various devices within the network. It can connect to mainframe or the minicomputers through network devices such as routers or bridges.

**TIPS**

Ethernet is a network protocol which defines a standard way to connect computers on a network over a wired connection (LAN).

**MAN**

MAN is a network that interconnects the nodes or computers with resources within a geographic area or region which is larger than the area covered by a LAN but smaller than that of a WAN. The following figure shows a MAN:



*Fig.1.1.66: MAN*

A MAN typically includes one or more LAN but covers a smaller geographic area than a WAN. It can also be defined as the interconnection of several local area networks by bridging them with backbone lines. This usage of MAN is also sometimes referred to as a campus network.

### WAN

WAN is used to connect devices over much larger distances than LANs. A WAN is established by connecting LANs using routers. WAN is not limited to a single person or organization, for example, Internet, which is a network of networks spread across the globe for exchange of information and services. The following figure shows a WAN:

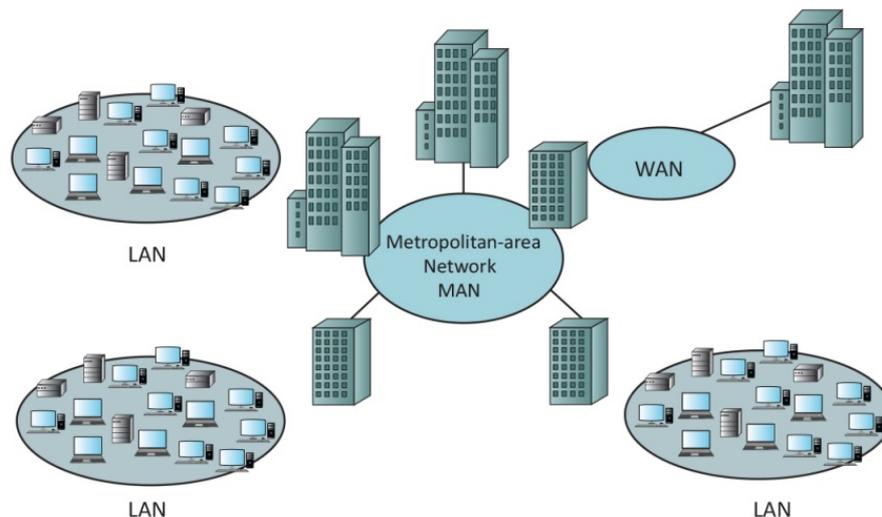


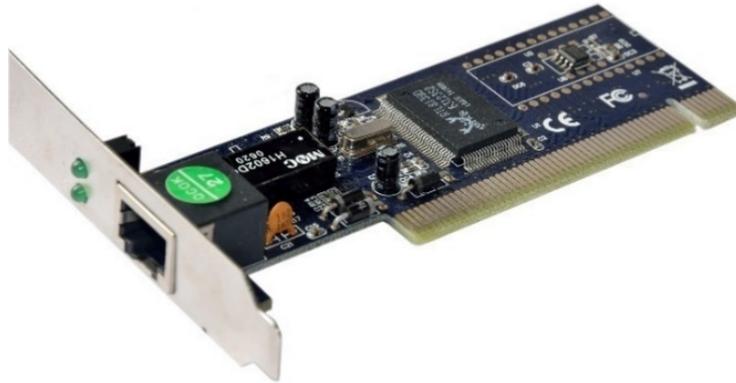
Fig.1.1.67: WAN

### Network Communication Technology

Network communication technology deals with the technology aspects of networking communication. Communication is the process of sharing information and ideas through speech, symbols, signals, or signs. Sharing of data and resources among different computers in a network needs a transmission system, communication protocols and technology. Communication network can be wired or wireless. Computers transmit and receive information across the communication links. The elements that are required for network communication are:

- **Network Interface Card:** Each computer requires a special card, called network interface card (NIC) to be connected to a network. The NIC prepares data to be sent, receives data and also controls the data flow between computer and network.

The following figure shows network interface card:



*Fig.1.1.68: Network interface card*

- **Data communication software:** It enables the computers to communicate with each other. It tells the computers how to exchange information with other computers.
  - Protocol: The data transmission protocols perform the following functions:
    - Data Sequencing: breaking up of a long message into smaller packets
    - Data Routing: finding out the best route for sending the packet to destination
    - Flow Control: regulates the speed of transmitting data between fast sender and slow receiver
    - Error Control: detecting error and recovering the data

Various types of network communication technologies are as follows:

- Internet is a wide range of computer network with unlimited number of users. It contains a large number of intranets.
- Intranet is a network of computers that is designed for a group of users. It serves as a private Internet for an organization. The authorized users or the employees of an organization can access intranet from Internet, but the number of users is less. For example, intranet is used in an organization to share information with its employees only.
- Extranet refers to an intranet which can be accessed by authorized users outside the intranet, but partially. It enables business to share information in a secure way over the Internet. For example, when an organization wants to exchange some information with another organization such as their customers or vendors, it may provide access to its intranet to the employees of the other organization.

The following figure shows the intranet, extranet and the Internet:

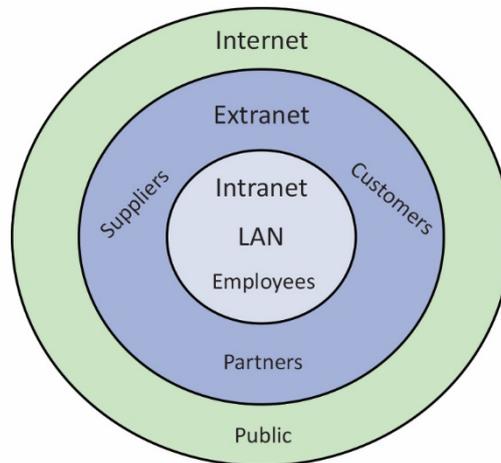


Fig.1.1.69: Intranet, Extranet and Internet

### Mode of Transmission

Communication technology also deals with the mode of transmission of data. Mode refers to the direction of data flow over the network. There are three types of modes:

- **Simplex:** Communication is unidirectional. Data can be sent in one direction only, from the sender to the receiver.

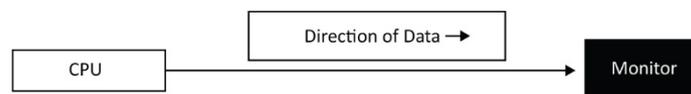


Fig.1.1.70: Simplex mode

- **Half Duplex:** Data can be sent in both the directions but not at the same time.

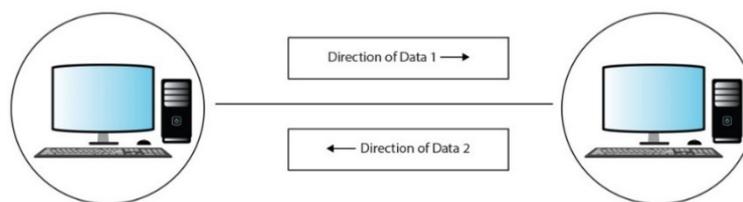


Fig.1.1.71: Half duplex mode

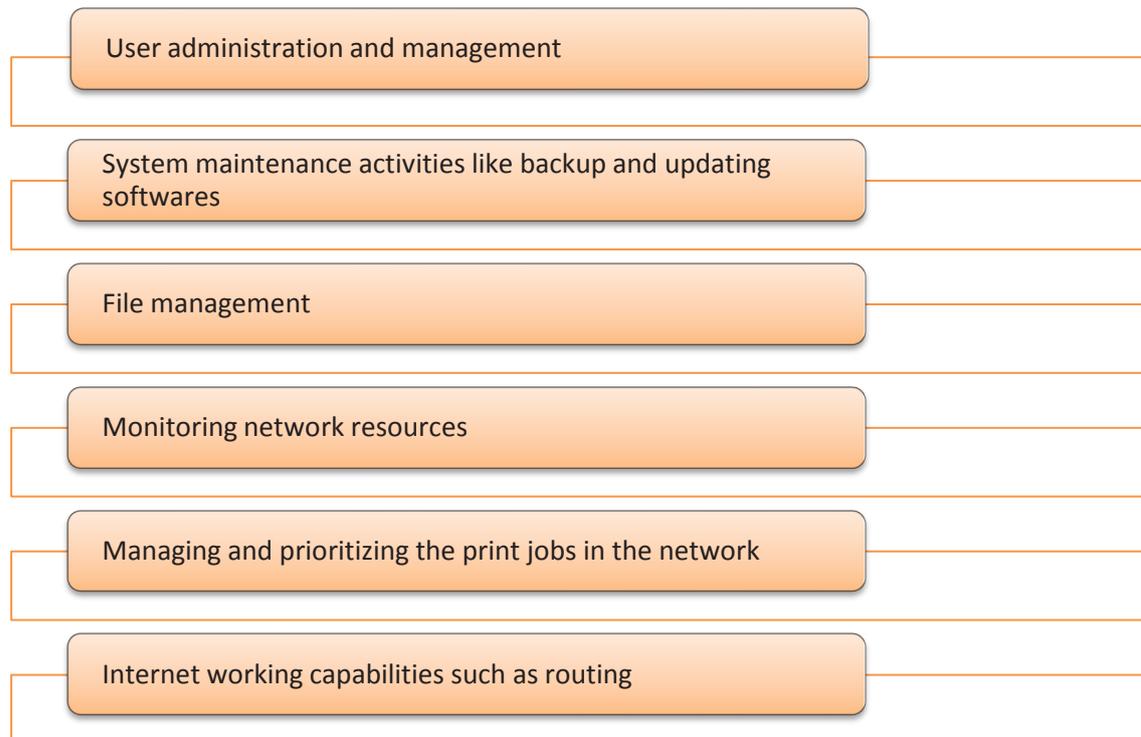
- **Duplex:** Data can be sent in both the directions simultaneously. A device can send as well as receive data. Example: Telephone network

### Network operating System (NOS)

An operating system dedicated to networking which:

- Allows shared file and printer access among the computers connected to the network
- Enables sharing of data, security, applications, and other networking functions

The common functionalities of NOS are as shown in the following figure:



*Fig.1.1.72: Functionalities of NOS*

Based on its architecture, there are two approaches to network operating system:

- **Network operating system based on a peer-to-peer architecture:** Users can share resources and access files from each other. This system does not have a file server or centralized management resource. For example, AppleShare is used for connecting Apple products.

The following figure lists the advantages and disadvantages of peer-to-peer NOS:

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Easy setup</li> <li>• Less hardware needed</li> </ul>	<ul style="list-style-type: none"> <li>• No central server for storage</li> <li>• Less security provided</li> </ul>

Fig.1.1.73: Advantages and disadvantages of peer-to-peer NOS

- **Network operating systems based on client-server architecture:** It allows the networks to centralize the applications and various functions in one or more dedicated servers. The server allows access to resource and maintains security. This system allows multiple users to share the same resources simultaneously regardless of their physical location; for example, Novell NetWare.

The following figure lists the advantages and disadvantages of client-server NOS:

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• It has greater stability</li> <li>• Security is maintained by the server</li> <li>• New hardware and technology can easily be integrated into the system</li> <li>• Hardware and operating system may be specialized</li> <li>• Servers can be accessed remotely from different locations</li> </ul>	<ul style="list-style-type: none"> <li>• Higher cost</li> <li>• Dependent on a central server for any operation</li> <li>• Regular maintenance required</li> </ul>

Fig.1.1.74: Advantages and disadvantages of client-server NOS

### 1.1.5 Troubleshooting

Operating system problems can be attributed to hardware, software, networks, or some combination of the three. There will be needing to resolve OS problems more often than others. A stop error is a hardware or software malfunction that causes the system to lock up. An example of this type of error is known as the Blue Screen of Death (BSOD) and appears when the system is unable to recover from an error. The BSOD is usually caused by device driver errors.

The problems related the OS can be due to one or more of the following:

- the hardware,
- the software,
- the networks

Certain errors are more common than the rest. A stop error occurs due to the malfunctioning of a hardware or a software and results in the lock up of the system. Blue Screen of Death (BSOD) is one such error and takes place when the system becomes incapable of recovering from an error. It generally happens because of device driver errors. The cause can be researched by using the Event Log or other diagnostic methods. Prevention of such errors entails:

- Verifying that compatible hardware and software drivers have been used
- Ensuring that the latest patches and updates of Windows have been installed

If the system stops working during Start up, it can begin to reboot due to the auto restart function of the Windows. The error message, then, cannot be read properly. One needs to go to the Advanced Start up Options menu and disable this function.

A few commonly occurring operating system problems and their solutions are shown in the following chart:

The Problem	Possible Causes	Possible Solutions
"Invalid Boot Disk" error displayed on the computer screen after the POST.	<ul style="list-style-type: none"> <li>• A drive has a media which does not have an OS.</li> <li>• The BIOS has incorrect boot order settings.</li> <li>• The hard drive is not detected, or the jumpers are not set correctly. The hard drive cannot be seen, or the jumpers are incorrectly set.</li> <li>• The hard drive is without an OS.</li> <li>• The MBR has become corrupted.</li> <li>• The computer is infected with a boot sector virus.</li> <li>• Hard drive failure is detected.</li> </ul>	<ul style="list-style-type: none"> <li>• Media should be taken out from all the drives.</li> <li>• The boot order within the BIOS settings should be altered to start the boot drive.</li> <li>• The cables of the hard drive should be re-joined, or the jumpers of the hard drive should be reset.</li> <li>• An OS should be installed.</li> <li>• The bootrec /fixmbr command present in the System Recovery options of Windows 7 or Vista should be used</li> <li>• The fdisk /mbr command present in the CLI of Windows XP only should be run.</li> <li>• The virus removal software should be run.</li> </ul>

<p>"Inaccessible Boot Device" error displayed on the computer screen after the POST.</p>	<ul style="list-style-type: none"> <li>• The device driver has been replaced and the new one shows incompatibility with the boot controller.</li> <li>• BOOTMGR has been corrupted in the Windows 7 or the Windows Vista.</li> <li>• NTLDR has been corrupted in the Windows XP.</li> </ul>	<ul style="list-style-type: none"> <li>• A previous good configuration should be used for booting the computer.</li> <li>• The computer should be booted in the safe mode after which a restore point from the time prior to the installation of new hardware should be loaded.</li> <li>• BOOTMGR file from the installation media of the Windows 7 or the Windows Vista should be restored.</li> <li>• NTLDR from the installation media of the Windows XP should be restored.</li> </ul>
<p>"BOOTMGR is missing" error is displayed on the computer screen after the POST in the Windows 7 and the Windows Vista.</p>	<ul style="list-style-type: none"> <li>• BOOTMGR has been removed or is impaired.</li> <li>• Boot Configuration Data has been removed or is impaired.</li> <li>• The BIOS has incorrect boot order settings</li> <li>• The MBR has become corrupted.</li> <li>• Hard drive failure is detected.</li> <li>• Hard drive jumpers are incorrectly set.</li> </ul>	<ul style="list-style-type: none"> <li>• BOOTMGR should be restored from the installation media.</li> <li>• Boot Configuration Data should be restored from the installation media.</li> <li>• The boot order within the BIOS settings should be altered to start the boot drive</li> <li>• <code>chkdsk /F /R</code> command present in the recovery console should be run.</li> </ul>

<p>"Missing NTLDR" error is displayed on the computer screen after the POST in the Windows XP.</p>	<ul style="list-style-type: none"> <li>• NTLDR has been removed or is impaired.</li> <li>• ntdetect.com has been removed or is impaired.</li> <li>• boot.ini has been removed or is impaired.</li> <li>• The BIOS has incorrect boot order settings</li> <li>• The MBR has been corrupted.</li> <li>• Hard drive failure is detected.</li> <li>• Hard drive jumpers are incorrectly set.</li> </ul>	<ul style="list-style-type: none"> <li>• NTLDR from the installation media should be restored.</li> <li>• ntdetect.com from the installation media should be restored.</li> <li>• boot.ini from the installation media should be restored.</li> <li>• The boot order within the BIOS settings should be altered to start the boot drive</li> <li>• fdisk /mbr command present in the Cmd prompt should be run.</li> <li>• chkdsk /F /R command from the recovery console should be run.</li> <li>• Hard drive jumpers should be reset.</li> </ul>
<p>Failure of a service to start after the computer has been booted</p>	<ul style="list-style-type: none"> <li>• The service has not been enabled.</li> <li>• The service has Manual settings.</li> <li>• Failed service needs some other service to get enabled.</li> </ul>	<ul style="list-style-type: none"> <li>• The service should be enabled.</li> <li>• The service should be set to Automatic.</li> <li>• The appropriate service should be re-enabled or re-installed.</li> </ul>
<p>Failure of a device to start after the computer has been booted</p>	<ul style="list-style-type: none"> <li>• The power for the external device has not been switched on.</li> <li>• The device is not joined to the data cable or the power cable.</li> <li>• The BIOS in its settings has the device as disabled.</li> <li>• Device failure is detected.</li> <li>• A device lacks compatibility with a recently installed device.</li> <li>• The driver has become corrupted.</li> <li>• The installation of the driver is still in process.</li> </ul>	<ul style="list-style-type: none"> <li>• The power for the external device should be switched on.</li> <li>• Both the cables should be checked, and the required connections should be done.</li> <li>• The BIOS settings should be opened, and the device should be enabled.</li> <li>• The device should be replaced.</li> <li>• The recently installed device should be removed.</li> <li>• The driver should be re-installed or rolled.</li> </ul>

<p>A program documented in the registry cannot be located</p>	<ul style="list-style-type: none"> <li>• Some program files have been removed.</li> <li>• A program did not get uninstalled correctly.</li> <li>• The installation directory got deleted.</li> <li>• The hard drive has become corrupted.</li> <li>• The computer is infected with a virus.</li> </ul>	<ul style="list-style-type: none"> <li>• The program should be re-installed.</li> <li>• The program should be re-installed then again uninstalled.</li> <li>• chkdsk /F /R command should be run to rectify hard drive file entries.</li> <li>• Scanning for virus should be done and the virus should be removed.</li> </ul>
<p>The desktop is not displayed though the computer keeps on restarting</p>	<ul style="list-style-type: none"> <li>• The computer has been restarted when there was a failure.</li> <li>• A start up file is corrupted.</li> </ul>	<ul style="list-style-type: none"> <li>• F8 button should be pressed for the Advanced Options Menu. Then, Disable, automatic restart on system failure option should be chosen.</li> <li>• chkdsk /F /R command present on the recovery console should be run.</li> </ul>
<p>BSOD is displayed on the computer</p>	<ul style="list-style-type: none"> <li>• There are compatibility issues between a driver and the hardware.</li> <li>• The RAM is failing.</li> <li>• The power supply is failing.</li> <li>• The CPU failure is detected.</li> <li>• The motherboard failure is detected.</li> </ul>	<ul style="list-style-type: none"> <li>• The STOP error and the module that caused the error should be checked.</li> <li>• Failing devices should be replaced with devices of good repute.</li> </ul>

<p>The computer freezes without showing an error message</p>	<ul style="list-style-type: none"> <li>• The settings of the CPU or the FSB on the motherboard are faulty.</li> <li>• The computer gets overheated.</li> <li>• The operating system has been corrupted by an update.</li> <li>• RAM failure is detected.</li> <li>• Hard drive failure is detected.</li> <li>• The power supply failure is detected.</li> <li>• The computer has become infected with a virus.</li> </ul>	<ul style="list-style-type: none"> <li>• Examine the settings and reset them.</li> <li>• Examine the cooling devices and replace if required.</li> <li>• A System Restore should be done or the update should be uninstalled.</li> <li>• chkdsk /F /R present on the recovery console should be run.</li> <li>• Failing devices should be replaced with devices of good repute.</li> <li>• Scanning for virus should be done and the virus should be removed.</li> </ul>
<p>An application fails to get installed.</p>	<ul style="list-style-type: none"> <li>• The application installer which has been downloaded is infected with a virus and has been obstructed from getting installed by the virus protection software.</li> <li>• The installation disk or the file has been corrupted.</li> <li>• The installation application lacks compatibility with operating system.</li> <li>• Lack of memory for installing an application due to excessive number of programs running</li> <li>• The hardware cannot cope even with the least requirements.</li> </ul>	<ul style="list-style-type: none"> <li>• A new installation disk should be obtained, or the file should be deleted, and the installation file should be downloaded again.</li> <li>• The installation application should be run in the compatibility mode.</li> <li>• The new program should be installed after closing all the applications</li> <li>• Hardware should be installed according to the least number of installation requirements.</li> <li>• The installation should be run again.</li> </ul>

Aero not running on a computer with Windows 7	<ul style="list-style-type: none"> <li>The computer lacks the minimum hardware requisites for running Aero.</li> </ul>	<ul style="list-style-type: none"> <li>The processor, the RAM and the video card should be upgraded to meet the minimum Microsoft requisites for Aero.</li> </ul>
Results are delayed on the search feature	<ul style="list-style-type: none"> <li>The index service has not been running.</li> <li>Indexing by the index service is not taking place at the correct location</li> </ul>	<ul style="list-style-type: none"> <li>The index services should be started using services.msc.</li> <li>The settings of the index service should be altered by going to the Advanced Options panel.</li> </ul>
No prompting by the UAC to the user for permit.	<ul style="list-style-type: none"> <li>The UAC is turned off.</li> </ul>	<ul style="list-style-type: none"> <li>The UAC should be turned on by going to the User Account applet place in the Control Panel.</li> </ul>
Gadgets cannot be seen on the desktop.	<ul style="list-style-type: none"> <li>The missing gadgets were not installed or were uninstalled.</li> <li>The XML required for the gadget has been broken, got corrupted, or was not installed.</li> </ul>	<ul style="list-style-type: none"> <li>Click right on the desktop and opt for Gadgets. Click right on the gadget and opt for Add.</li> <li>The file msxml3.dll should be registered by entering regsvr32 msxml3.dll &gt; Enter at the command prompt.</li> </ul>
The computer has slowed down and the response is delayed.	<ul style="list-style-type: none"> <li>Some process is utilizing the maximum CPU resources.</li> <li>The computer lacks the minimum hardware requisites for running Aero.</li> </ul>	<ul style="list-style-type: none"> <li>The process should be restarted with services. MSc.</li> <li>If there is no need of the process it should be ended using the Task Manager.</li> <li>The computer should be restarted.</li> <li>Aero should be disabled.</li> </ul>

<p>The OS cannot be detected.</p>	<ul style="list-style-type: none"> <li>• The partition has not been set to active mode.</li> <li>• The start-up files for Windows are missing.</li> </ul>	<ul style="list-style-type: none"> <li>• The active partition should be set up by utilizing the diskpart tool of the System Recovery Options.</li> <li>• The Windows Startup Repair should be run.</li> </ul>
<p>On running a program, there is a display of a missing or corrupt DLL message.</p>	<ul style="list-style-type: none"> <li>• Some program or programs working with the DLL file was uninstalled. This resulted in the removal of the DLL file required by some other program.</li> <li>• The DLL file had not been registered.</li> <li>• The DLL file had been corrupted during an improper installation.</li> </ul>	<ul style="list-style-type: none"> <li>• The program having a missing or a corrupt DLL file should be reinstalled.</li> <li>• The application that had uninstalled the DLL should be reinstalled.</li> <li>• The DLL file should be registered by using the Regsvr32 command.</li> <li>• sfc /scannow command should be run in the Safe Mode.</li> </ul>
<p>RAID is missing during installation.</p>	<p>Proper drivers required to recognize RAID are absent.</p> <ul style="list-style-type: none"> <li>• The RAID settings in the BIOS are wrong.</li> </ul>	<ul style="list-style-type: none"> <li>• Install the proper drivers.</li> <li>• The settings in the BIOS should be changed to enable RAID.</li> </ul>
<p>A system file has been corrupted.</p>	<ul style="list-style-type: none"> <li>• Computer had been shut down improperly.</li> </ul>	<ul style="list-style-type: none"> <li>• The computer should be repaired by going to the advanced start-up options menu.</li> <li>• The computer should be booted in the Safe Mode and sfc /scannow should be run.</li> </ul>

GUI is not detected for all the users or the GUI does not load.	<ul style="list-style-type: none"> <li>• The start-up files for Windows are missing.</li> <li>• The operating system has been corrupted by Windows updates.</li> </ul>	<ul style="list-style-type: none"> <li>• The computer should be repaired by going to the advanced start-up options menu.</li> <li>• The Windows Start-up Repair should be run.</li> <li>• The OS should be reinstalled.</li> </ul>
The computer abruptly shuts down.	A program is responsible for the sudden shut down of the Windows OS.	<ul style="list-style-type: none"> <li>• The computer should be booted to Safe Mode and start-up applications should be managed by using Ms-config command.</li> </ul>
Computer boots to the safe mode.	<ul style="list-style-type: none"> <li>• A program that has been installed leads to the computer booting to the safe mode.</li> <li>• The computer has been configured to boot in Safe Mode.</li> </ul>	<ul style="list-style-type: none"> <li>• The start-up settings of the program should be adjusted by using the msconfig command.</li> <li>• The computer should be configured to boot normally by using the msconfig command.</li> </ul>
Computer boots just to the VGA mode.	<ul style="list-style-type: none"> <li>• There is a corrupt video driver.</li> </ul>	<ul style="list-style-type: none"> <li>• The video driver should be reinstalled.</li> </ul>

*Fig.1.1.75: Troubleshooting*

## Exercise

1. What are the main functional units in a computer?
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_
  - d. \_\_\_\_\_
  
2. Which of these is not categorised under Navigation/Cursor key?
  - a. Shift key
  - b. Insert key
  - c. Delete key
  - d. Home key
  
3. What are the advantages of a computer network?
  - a. Sharing of software or program
  - b. Sharing of internet connection
  - c. \_\_\_\_\_
  - d. \_\_\_\_\_

## UNIT 1.2: Computer Peripherals

### Unit Objectives

**At the end of this unit, you will be able to:**

1. List the different types of peripherals
2. Describe peripherals' standard installation procedures
3. Identify different modules in the peripherals and their functions



### 1.2.1 Peripheral Devices

Peripheral devices are the input/output devices that are typically used to feed information and instructions into a computer for storage or processing, and to show an output.

An input device is any hardware that gives an input to a computer. Apart from mouse and keyboard there are many other input devices such as webcam, scanner and microphone. An output device gets information from the CPU and displays it to the user as desired. The output is typically presented either on a display device such as a monitor, or on paper (hard copy) with the help of a printer.

The peripheral devices are categorized as shown in the following figure:

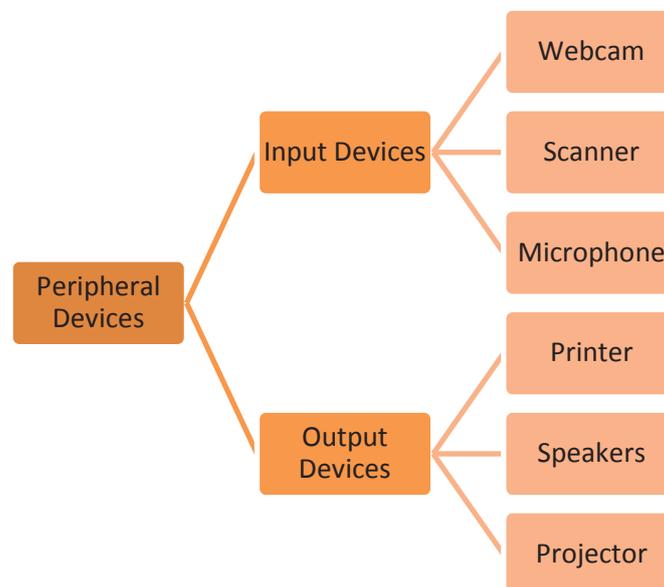


Fig.1.2.1: Different types of peripheral devices

**Webcam**

Webcam is a video camera which streams real-time images through a computer to a network. The video data/stream may be saved, viewed and sent via the Internet. Webcams are used for video conferences, video chats, video broadcasting, and security surveillances and so on. The following image shows a webcam:

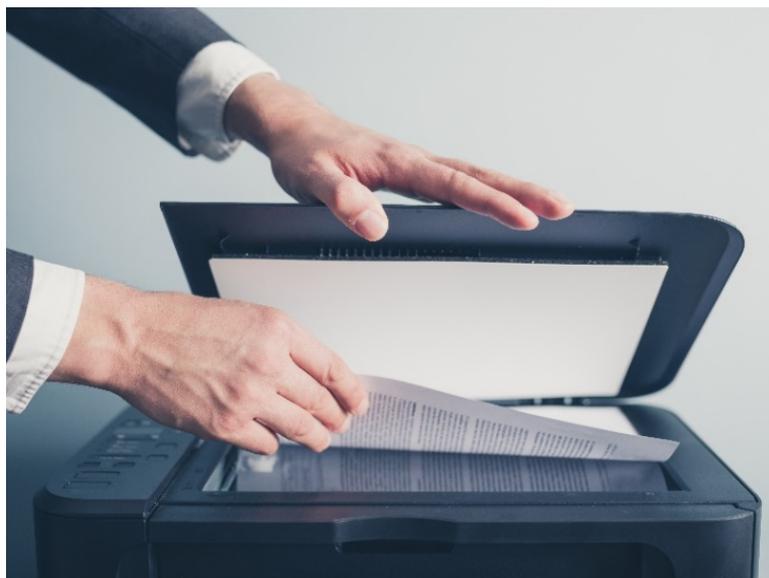


*Fig.1.2.2: Webcam*

**Scanner**

A scanner reads documents (text and photographs) and stores it in the computer to which it is connected. The physical document is converted to digital format after it gets scanned. The digital document can be viewed and modified on a computer. Earlier a software needs to be installed in the computer for scanners to work but now all the systems have inbuilt settings to detect the scanner automatically. Basic scanning software allows the user to import data from it.

Scanners with flat scanning surface are suitable for books, pages, photographs and so on. The following image shows a scanner:



*Fig.1.2.3: Scanner*

**Microphone**

A microphone is an input device which converts sounds to electrical energy variations, used to record voice or interact with the computer through voice. The following image shows a microphone:



*Fig.1.2.4: Microphone*

**Printer**

Printer is a peripheral device which is used to display graphics or text on paper. They are a great resource, but they should be used in a controlled way. Their overuse puts unnecessary wear and tear on them and also uses up expensive ink and paper. The following image shows a printer:



*Fig.1.2.5: Printer*

The historical backdrop of printing goes back to the duplication of pictures using stamps in early times. The evolution in printing has made it feasible for books, daily papers, magazines, and other readable materials to be created in appreciable numbers, and it plays a vital part in advancing literacy.

### Terminology used in printers

Printers use some common terminology and acronyms that are important to understand. These terms are used to describe the characteristics of the printer and help to determine their quality. Some of the common terms include the following:

- **Pages per minute (PPM):** PPM identifies the speed at which the printer can print. For example, laser printers can print between 10 and 100 PPM. Impact printers are much slower and are sometimes measured in characters per second (CPS) instead.
- **Dots per inch (dpi):** The resolution or clarity of a printer is determined by dpi, or how many dots it can print per inch. This is often the same number vertically and horizontally. For example, a 600-dpi printer can print 600 dots in a 1-inch horizontal line and 600 dots in a 1-inch vertical line. 600 dpi is referred to as letter quality.
- **Duplexing assembly:** Printers with a duplexing assembly can print double-sided print jobs. They flip the page so that the printer can print on the other side. It normally plugs into the back of the printer, but it is removed and turned over so that the rollers can be seen. Printer settings often include a setting to enable or disable duplexing when two-sided printing is supported.
- **Paper:** The printing papers are available in different types and forms. Some of them are listed below:
  - **Single-sheet paper:** Laser jet and inkjet printers use single-sheet paper fed into the printer from a feeder or a paper tray. Some general-purpose paper can be used in both laser jets and inkjet printers, but there are many higher-quality papers used to print better-quality colour pages. Low-quality paper can cause printing problems such as paper jams or poor printouts. Printers commonly include sensors to indicate when the paper runs out.
  - **Continuous-feed paper:** This is also known as fan-fold or sprocket paper, or even paper with holes. The sheets are connected and include sprocket holes on each side of the paper. A tractor feed mechanism feeds the paper using these sprocket holes. Each sheet includes perforations so that the pages and the edges can be separated after printing. Continuous-feed paper is used by impact printers.
  - **Thermal paper:** This is used by thermal printers. It is covered with a chemical that changes colour when it is heated

One of the most serious issues with paper happens when it is exposed to humidity. The paper would not really be wet, yet it can absorb the humidity from the air, making it more troublesome for the printer to move it through the paper way. The outcome is more paper jams. So, as a best practice, the paper should be put away from areas that are subjected to high humidity.

### Common Maintenance Tools

One of the basic maintenance tasks with any type of printer is cleaning it, and there are several common tools which can be used, such as the following:

- **Compressed air:** Compressed air in a can or compressed air from a compressor should be used. It is best to take the printer outside before blowing out the paper dust.
- **Computer vacuum:** While working inside a building, it is not always a good idea to blow the dirt and dust out of a printer into the workspaces. Instead, a vacuum should be used. Regular vacuum cleaners can cause electrostatic discharge (ESD) damage, so only ESD-safe vacuums should be used.
- **Isopropyl alcohol:** A considerable number of rollers inside a printer gets filthy, and they can be cleaned using isopropyl alcohol. The pickup roller in a laser printer used to get paper from a paper plate. At the point when the pickup roller gets filthy, it can have issues in getting the paper. So, this situation can be handled by using the isopropyl alcohol. The advantage of isopropyl alcohol is that it evaporates immediately and does not leave any residue.

### Types of Printers

There are four types of printers based on its usage:

- **Personal printers:** These printers are designed for personal use and may be connected to only a single computer. They are used for low-volume smaller printing, requiring minimal setup time to produce a hard copy of a given document.
- **Networked or shared printers:** These are typically used for high-volume and faster printing. They are shared by multiple users on a network.
- **Virtual printer:** It is a piece of software whose user interface resembles a printer driver, but it is not connected to a computer printer. It is generally used for archival purposes or as an input for another software.

On the basis of modern print technology, the printer can be classified into following types:

- Laser Printers:
  - High-quality output
  - Used by medium to- large organizations
  - Includes pickup rollers, separator pads and imaging drums
- Inkjet Printers:
  - Send jets of ink from the print head onto the paper
  - Print in black and white or in full colour
  - High-quality photographs
- Thermal Printers:
  - Heat up the paper to print the output
  - Used to print cash register and ATM receipts and lottery tickets
- Impact Printers
  - Create a print using small hammer-like pins to force ink onto the paper
  - Still used in businesses where multipart forms are printed

**Laser Printers:** Laser printers give a very high-quality output and are generally used as a part of medium to-substantial associations that require quick, top notch printers. They have turned out to be more reasonable and are additionally utilized as a part of little small offices/home workplaces (SOHOs) and even by a few individual clients. The description of a few components of a laser printer is as follows:

- Pickup rollers are used to pick up a sheet of paper and begin feeding it through the printer.
- Separator pads work with the pickup rollers to ensure that only one piece of paper is picked up at a time.
- Imaging drums are round, rotating cylinders that are covered with a photosensitive surface; meaning it is sensitive to light. A laser uses light to write an image onto the drum.
- Toner is an extremely fine powder that includes carbon and plastic. It is electrically charged during the imaging process, causing it to stick to the drum where the laser wrote the image. Later in the process, it is transferred to the paper.
- Transfer rollers charge the paper. The image is transferred to the paper because the charged paper attracts the toner.
- Fuser assemblies heat the toner and melt into the paper.
- Transfer belts are used only on some high-end colour laser printers. Colours are first applied to the transfer belt and then applied to the paper.
- A high-voltage power supply provides voltages as high as -1,000 VDC. This is used only in laser printers.

As a technician, one has to work with laser printers; so it is important to understand how they work to be better prepared to maintain and troubleshoot them. The laser imaging process includes seven stages or steps, and these steps work in a specific sequence as the imaging drum is rotating. The following figure shows an overview of these stages, labelled as Processing, Charging, Exposing, Developing, Transferring, Fusing, and Cleaning:

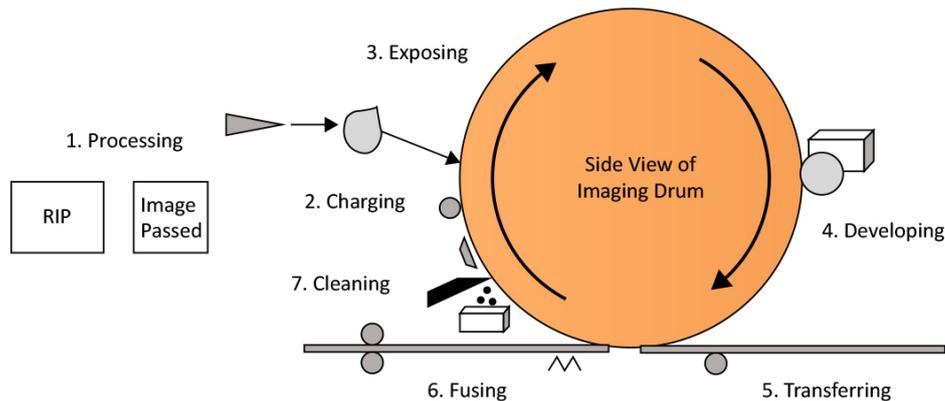


Fig.1.2.6: Laser imaging process

1. **Processing:** The handling stage is also called the raster image processing stage. A raster is a solitary line of spots, and a raster image is the mix of all the raster lines for a page. A laser printer recognizes the page as a raster dot images. For example, consider a 600 × 600 dpi laser printer. For a given square inch of a sheet of paper, the raster image incorporates insights about each of these 360,000 dots. These points of interest incorporate, regardless of whether it ought to be printed or not, how light or how dim the dab ought to be; and, if it's a colour printer, also, what should be the colour of the dots.

Most laser printers incorporate a raster image processor (RIP) that makes the raster image. The PC sends the print job to the printer in a configuration the RIP comprehends, and the RIP at that point makes the raster picture. Raster images can take up a great deal of room. On the off chance that pages are printed using 600-dpi illustrations, it takes around 4 MB of RAM for each page to hold the raster image. If it's a coloured page, it takes around 16 MB of RAM for every page. In a case when the printer doesn't have enough space to hold the print work, it will frequently give a "low memory" or "out of memory" blunder message.

2. **Charging:** In the charging step, an essential charge roller applies a high-voltage negative charge to the imaging drum. In an old laser printer, this was connected with a corona wire that was effortlessly broken during the maintenance activities. However, most new laser printers utilize an essential charge roller. This voltage is normally between 500 and 600 VDC, but they can be as high as - 1,000 VDC as well.

The following figure shows the process of charging the drum:

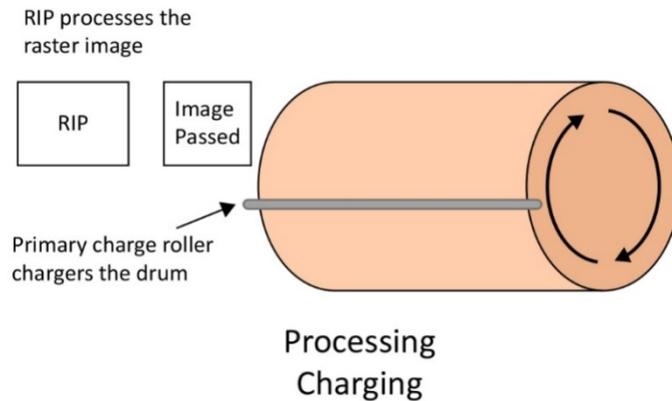


Fig.1.2.7: Processing and charging of drum

- 3. Exposing:** After the drum has a uniform charge, the laser exposes the imaging drum with the raster image in the exposing stage. It does this by sending a highly focused laser beam through one or more mirrors and lenses, and when the beam hits the photosensitive drum, it neutralizes the charge applied in the previous step. However, it neutralizes the charge only where the laser beam hits the drum, as shown in the following figure:

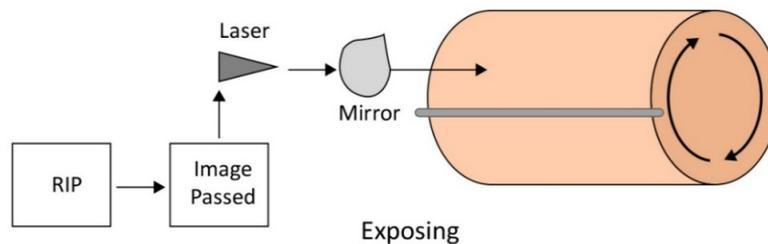


Fig.1.2.8: Exposing the drum

Now, the drum has a high-voltage negative charge everywhere, with the exception of where it has been uncovered by the light bar. At the place where the drum has been uncovered, it develops a negative charge.

- 4. Developing:** The toner is connected to the imaging drum in the creating stage. To start, the toner is given a negative charge. Now, the imaging drum has a negative charge with the exception of where the picture has been uncovered, and the toner likewise has a negative charge. When managing power, similar charges repulse and opposites are drawn toward each other. In this manner, in the event that there are two parts with comparative charges, they are pulled away from each other, while two segments with inverse charges are pulled in towards each other. For this situation, the contrarily

charged toner is pulled in to the uncovered ranges of the drum that have a nonpartisan charge.

Toner is in the toner cartridge, and the developer roller makes the toner available to the drum. As the drum turns, the toner adheres to the drum where the image has been composed to the drum. The following figure shows a side perspective of the imaging drum:

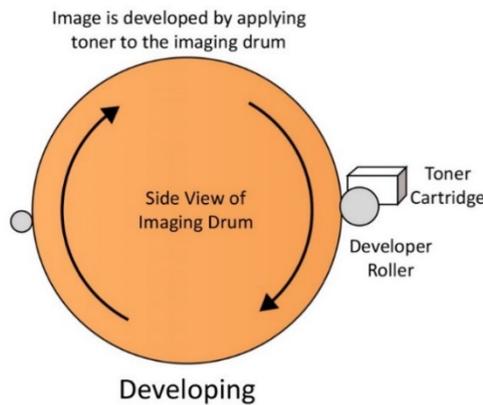


Fig.1.2.9: The process of developing

There are a wide range of toner and toner cartridges. For instance, a few producers incorporate the engineer roller (now and then called only the designer) in the toner cartridge.

5. **Transferring:** The toner is connected to the paper in the exchanging stage. In the first place, pickup rollers move over the top of the paper in the paper plate to get a page. Separator cushions roll the inverse path from underneath to guarantee that just a single sheet of paper is transferred. Next, an exchange roller (now and then called an exchange crown) charges the paper, giving it an inverse charge from the toner. Similarly, as the toner was pulled in to the drum in the creating stage due to inverse charges, it will be pulled in to the paper in this phase due to inverse charges. After the paper is charged, it's passed to the drum and the toner hops to the paper, as shown in the following figure:

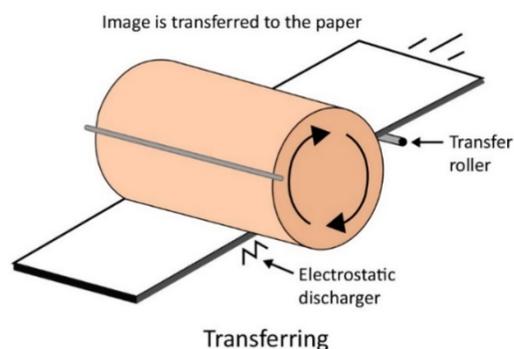


Fig.1.2.10: The process of transferring

Laser printers have a static charge eliminator that expels the static charge from the paper instantly after the picture is exchanged. It has been observed how socks stick together after they have expelled them from the clothes dryer. So also, the paper can adhere to the drum if the static charge isn't removed.

- 6. Fusing:** The toner isn't joined to the paper in the exchanging stage. On the off chance that it could be lifted up and shook, the toner would simply tumble off. The toner is melded to the paper in the combining step. Toner is made out of carbon and plastic particles, and on the off chance that plastic is warmed, it softens. The fuser get together warms the toner with the goal that it dissolves into the paper. One of the fuser rollers is heated, and the other fuser gives grinding to press the toner into the paper as it is softened. The following figure demonstrates how the paper is passed between two fuser rollers:

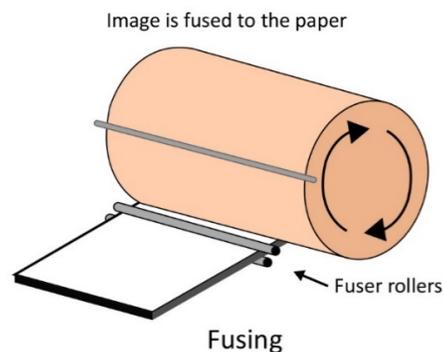


Fig.1.2.11: The process of fusing

- 7. Cleaning:** In this stage, excess amount of toner is scratched off the drum and gathered for transfer. The scrubber is a little plastic or elastic cutting edge that scratches the toner off without harming the drum. Next, an erase light kills the charge on the drum, as shown in the following figure:

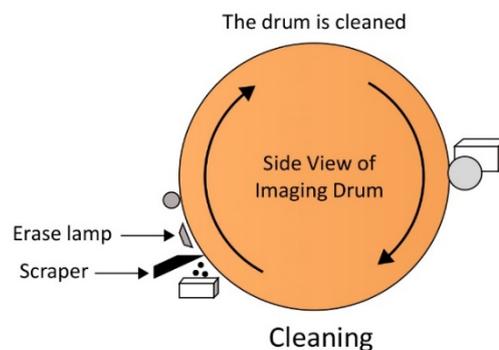


Fig.1.2.12: The process of cleaning

**Maintenance**

Despite the fact that there are various models of laser printers, it can be seen that they share regular upkeep undertakings. Security is one of the most critical things to acknowledge. A laser printer incorporates a high-voltage control supply. Voltages are as high as - 1,000 VDC and can be savage. Remain safe and unplug the laser printer before playing out any upkeep. Additionally, capacitors inside a power supply can hold a charge even after a gadget is unplugged. Hence, even after unplugging the printer, it should be handled with caution.

The fuser get together melts the toner onto the paper and achieves a temperature of around 180 degrees Centigrade (around 356 degrees Fahrenheit). Thus, after the printer has been unplugged, it could still be hot. In the event that the imaging drum is uncovered amid support, care should be taken not to touch it. It could get scratched or could be left with a check that would not be cleaned amid a print cycle. These scratches or checks would show up on each printout until the point that the drum is supplanted.

**Replacing Toner**

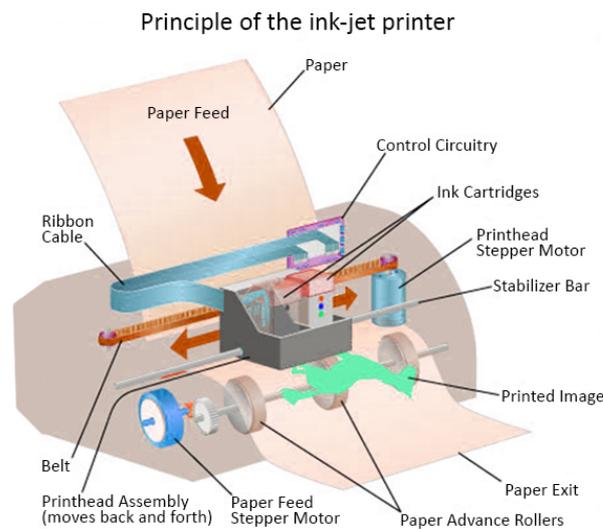
If the toner runs low, then it degrades the print quality of the printouts. Additionally, most laser printers give programming cautions telling that the toner is running low and its solution is to replace the toner.

Different printer models have distinctive techniques for replacing the toner, and it is essential to follow the maker's directions. Following are some broad rules that apply to most of the toner cartridges:

- Instructions will generally guide to shake the cartridge here and there and from side to side. This relaxes the toner and guarantees that there is full use out the cartridge.
- Most toner cartridges incorporate some kind of seal to keep the toner from spilling out. It is regularly a bit of tape or plastic that could get expelled before the new cartridge is introduced. In the event that it is not evacuated, the printouts will be clear.
- Be cautious when dealing with the new toner cartridge. In a perfect world, you should expel the new cartridge from the bundling and embed it instantly in the printer. This implies you have effectively expelled the old cartridge.
- If the toner spills on you or another person, counsel the guidelines or Material Safety Data Sheet (MSDS) to figure out what to do. By and large, you can wash it off with icy water. It's intended to soften, so you ought not to flush it off with warm or high temp water. In the event that it spills on a work area, you can evacuate it with paper or material towels doused with chilly water.
- If you have to vacuum a toner spill, you should utilize an exceptional vacuum with a high proficiency particulate capturing (HEPA) channel. Without a HEPA channel, the toner particles may very well blow appropriate over into the air.

- Recycle the old cartridge. Many organizations will buy these. Organizations revamp them, fill them with toner, and offer them at a reduced cost.

**Inkjet Printers:** Inkjet printers can create high quality coloured printouts and are extremely affordable. These two advantages make them extremely well known among home clients and a few SOHOs. They don't have the same number of serviceable parts inside them, so you don't need a profound comprehension of how they function to look after them. The following figure shows the main parts of an inkjet printer:



*Fig.1.2.13: Basic components of inkjet printers*

At least one print head is connected to a carriage and belt get together, and this gathering moves the heads from side to side as the paper is bolstered through the printer. Ink cartridges can be joined to the print head or can be found somewhere else.

A stepper motor and a pulley control the carriage and belt assembly and typically incorporates a plastic guide and sensors. The sensors identify the position of the print head and paper. The gathering additionally incorporates an information link associated from a printed circuit board to the print head.

**Impact Printers:** These are the first printers used with the computers. Despite the fact that the innovation for affect printers is exceptionally old, they are as yet utilized as a part of organizations where multipart shapes are printed. Different spots where you may see them include back divisions.

The main components of an impact printer are the platen, the ink lace, and the print head, appeared as things 1, 2, and 3 in the figure given below. Impact printers usually utilize a tractor encourage and utilize persistent nourish paper. The paper has openings on the edges the thing 4 that fit into sprockets in a tractor bolster instrument in the printer. The tractor feeder moves a persistent fan-crease move of paper through the printer. The following figure shows the basic components of impact printers:

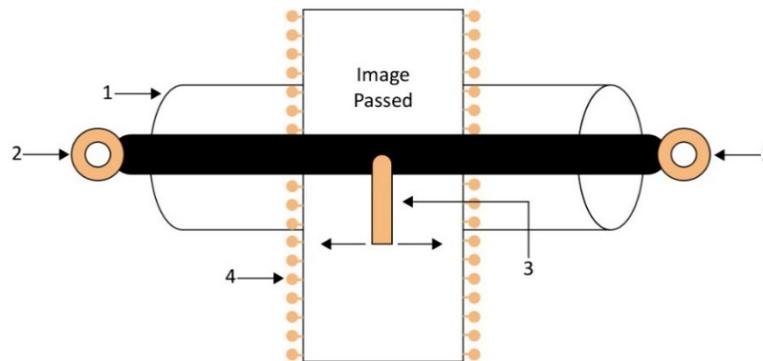


Fig.1.2.14: Basic components of impact printers

The platen is a hard, elastic like material that gives a back to the print head. The ink lace is a long segment of fabric soaked with ink. It's associated with two rollers that relentlessly wind the strip from one roller to the next, and when it achieves the end, it switches bearings.

The print head has little mallet like sticks that hit the strip and press the ink from the lace onto the paper. A motor and-carriage assembly move the print head from side to side as it prints. When the printer finishes a line, the tractor feed advances the paper to the next line.

**Thermal Printers:** Thermal printers are utilized to print money enrol receipts, ATM exchange slips, and even lottery tickets. More established fax machines utilized warm printers as well, yet most fax machines now catch the approaching fax as a document that can be printed with a laser or inkjet printer.

Thermal printers utilize an extraordinary sort of warm paper that is secured with a synthetic. At the point when the compound is warmed, it changes shading. Most warm printers can print just a solitary shading, yet some can print two hues. The paper is typically on a move with a middle sprocket, and clerks can for the most part supplant a void come in under a moment.

Different segments of a thermal printer are as follows:

1. A feed assembly that encourages the thermal paper through the printer. The nourish get together uses the sprocket in the focal point of the move to propel the paper.
2. A print head that incorporates a heating component to heat the paper. Warm printers are generally moderate, with their speed measured in inches every second (ips). Be that as it may, they don't have to print much. Likewise, with most printers, warm printers should be cleaned occasionally with compacted air or an ESD-safe vacuum to expel garbage. You can clean the print head with isopropyl liquor and a build-up free fabric or a cotton swab.

Cleaning the print head broadens its life, yet you can supplant it on the off chance that it falls flat.

### **Installing the printers**

In order to use the printers, it is necessary to install them. The greater part of printers utilize a USB interface, and Windows will design the printer consequently when you connect it to it. In any case, you should think about some different potential outcomes when introducing and designing printers.

### **Device Drivers**

When the printer makers make printers, they, likewise, compose device drivers for various working frameworks. These drivers give the working framework the points of interest it needs to work with the gadget. When you purchase another printer, the maker incorporates a CD with programming that you can use to introduce it.

Most of the makers also submit drivers to Microsoft. On the off chance that the drivers meet certain quality confirmation necessities, Microsoft makes them accessible by means of Windows Update. If none of these strategies work, you can go to the maker's site to find the right driver. On the off chance that you can't locate a reasonable driver, the printer will ordinarily create an output.

### **Required Permissions**

On Windows Vista and Windows 7, consistent users can introduce the printer with no uncommon authorizations as long as the print driver is accessible. If the print driver isn't accessible, the client will require managerial authorization to introduce an alternate print driver. Additionally, managerial consents are required to introduce applications, so normal clients won't have the capacity to introduce programming applications that accompany a printer.

On Windows XP, clients should be in the Power Users gathering to introduce a printer or include an alternate driver.

### **Wired Connections**

The most widely recognized way a printer is associated is by utilizing a USB association. Printers regularly have a USB Type B port, and you utilize a link with a USB Type A connector toward one side for the PC and a USB Type B connector on the other side for the printer.

### **Wireless Connections**

Numerous printers incorporate remote capacities that enable remote frameworks to interface with them without a wired association. The regular sorts of remote associations incorporate the accompanying:

1. Remote systems utilize one of the 802.11 conventions, for example, 802.11a, 802.11b, 802.11g, or 802.11n.

2. Bluetooth is regularly used to make individual territory systems; PANs, for example, with a cell phone and a headset. A few printers bolster Bluetooth, and with Class 2 Bluetooth, the printer can be upto 10 meters (33 feet) away.

3. TV remotes utilize infrared, and it has been utilized with printers. A disadvantage is that it requires an observable pathway between the printer and the PC.

### **Adding a Network Printer**

USB printers are automatically installed when you plug them in. However, you have to take some additional steps to add a networked printer to a computer. You can use the following steps to add a network printer on a Windows 7based computer:

1. Click on Start and then select Devices and Printers.
2. Click on Add a Printer.
3. Then Click on Add a Network, Wireless or Bluetooth Printer.
4. Select the desired printer and then click next.
5. Windows will attempt to automatically locate the driver. If it can't locate it, you'll be prompted to select it by first selecting the manufacturer and then selecting the printer model.
6. Select the printer, click on Next, and then click Finish.

### **Speakers**

Speakers receive audio signals as input from the sound card of the computer and produce them in the form of sound waves as audio output. The following image shows speakers:



*Fig.1.2.15: Speakers*

### Projector

A projector is also known as an image projector. It is an optical device that sets up the images onto a blank surface, generally on a projection screen. For example, a data projector simply connects with a laptop or any other computer system and projects/displays the output or data onto a white board. The following image shows a projector:



*Fig.1.2.16: Projector*

### 1.2.2 Multi-Function Peripherals (MFPs)

An MFP is a type of all in one machine. It incorporates the functionality of multiple devices into one. Hence, it can be of utility in homes or modest businesses [the small office/home office (SOHO) market section] as well as in bigger office settings where it facilitates sharing and management of a document.

A regular MFP may serve as a blend of a few or all of the devices shown in the following figure:

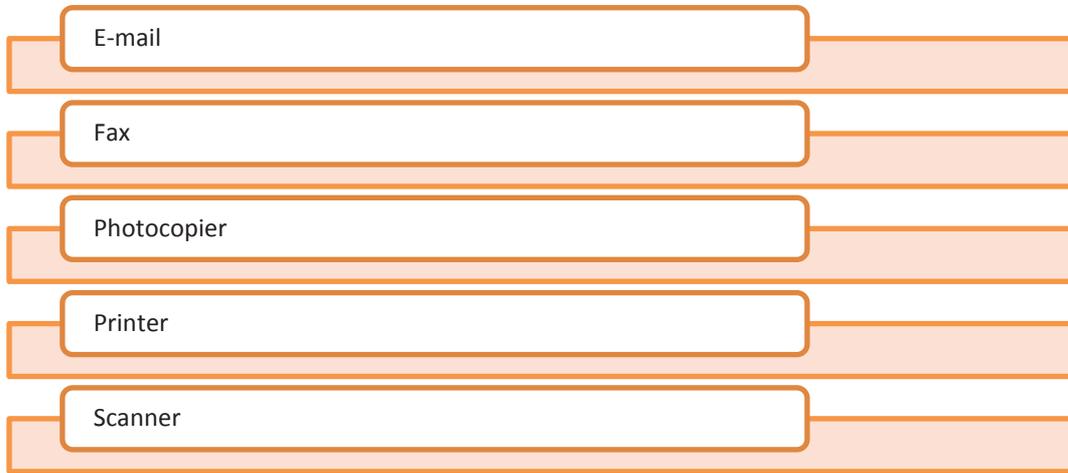


Fig.1.2.17: Devices that can be combined together to make an MFP

### Types of MFPs

MFPs are divided into different segments, according to their speed and duty cycle. The following figure shows various segments/categories of MFPs:

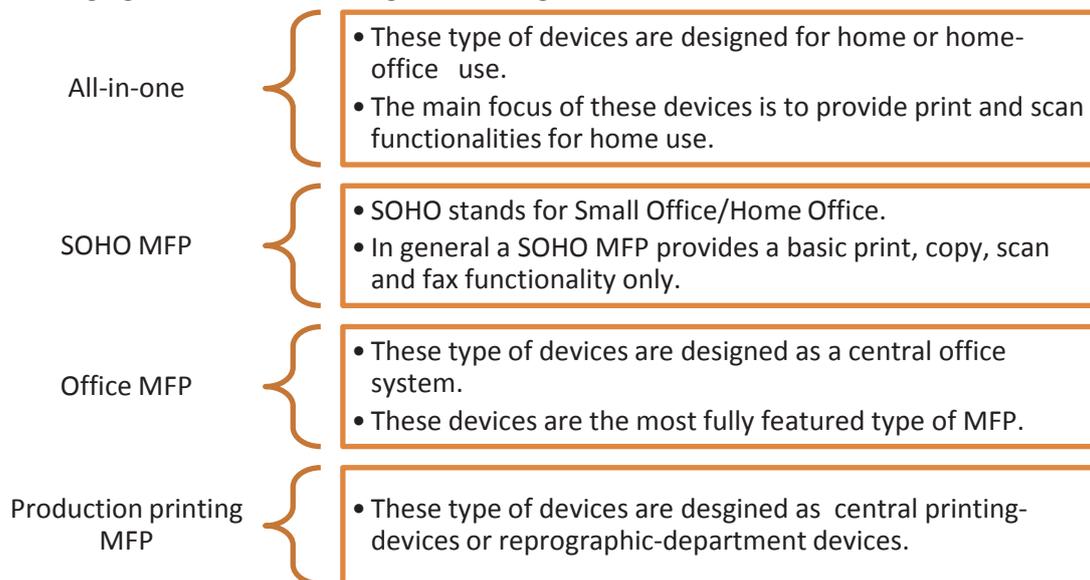


Fig.1.2.18: Types of MFPs

**Exercise** 

1. What are the types of printers?

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_

2. Name the following input and output devices.

(a)



\_\_\_\_\_

(b)



\_\_\_\_\_

(c)



\_\_\_\_\_

(d)



\_\_\_\_\_

## UNIT 1.3: Operating Hardware System and Peripherals

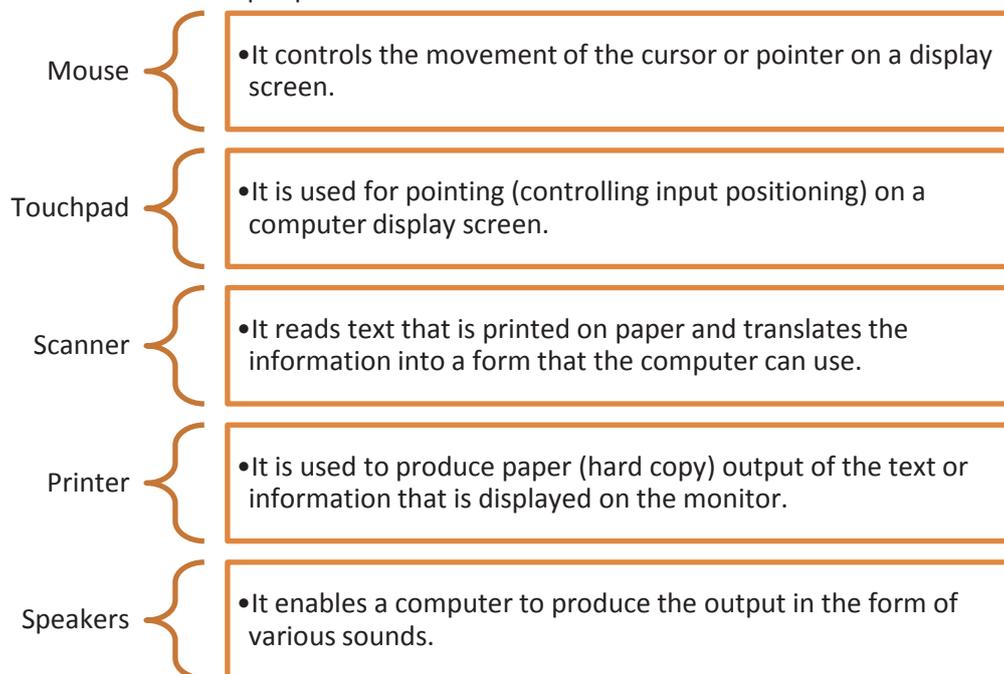
### Unit Objectives

**At the end of this unit, you will be able to:**

1. Explain the controls of different peripherals
2. Identify safety rules, policies and procedures while operating hardware and peripherals

### 1.3.1 Controls of Different Peripherals

Different peripheral devices control different things on the monitor. The following figure describes the controls of peripheral devices:



*Fig. 1.3.1: Controls of peripheral devices*

### 1.3.2 Safety Rules, Policies and Procedures

As a field technician, there are certain guidelines that must be followed to ensure own safety and that of the co-workers. These guidelines provide a sound, safe and flexible environment to work.

The following figure represents the general guidelines to be followed while working with electrical/electronic systems:

Follow the correct procedures to ensure zero accidents at work.

Obey safety signs, stickers and tags on the equipment/devices.

Use an appropriate tool for the respective task.

Read labels and instructions given on the components.

Wear appropriate clothing and remove metal objects before working.

Use prescribed protective safety equipment only.

Follow electrical safety rules when working with electrical machinery/equipment.

Report all unsafe acts or unsafe conditions to the supervisor.

*Fig. 1.3.2: Safety guidelines*

### **Electrical Safety**

It is of utmost importance to remove the power while disassembling the computer except while measuring voltages. Removing the power not only includes turning off the power switch but also unplugging it from the socket.

Ensure that the power plug should be unplugged to ascertain that there is no power in the computer. This is required as certain power providers need to provide service to the motherboard even when the power has been switched off.

The following two important points should be kept in mind while working with power supplies:

- Refrain from opening it when it is plugged in.
- Even after unplugging, the capacitors continue to hold, in which case, if the capacitor is touched, it can discharge and give a shock.

### Earthing the Equipment

Earthing means connecting an electrical system, through its non-current carrying conductor part, with the ground. The earthing or grounding of a system plays a vital role in maintaining the stability and safety of the system. With poor earthing, electrical systems are prone to damage or accidents. The following figure lists the purpose of earthing:

Purpose of Earthing	Fix the potential of active conductors with respect to the earth
	Limit the voltage in electrical system between non-current carrying parts and the earth
	Remove risk of electric shocks by implementing protection devices
	Limit rise in potential because of medium voltage faults in network with low voltage

*Fig. 1.3.3: Purpose of earthing*

Earthing can be mainly classified as follows:

- Equipment grounding
- System grounding

#### Equipment Grounding

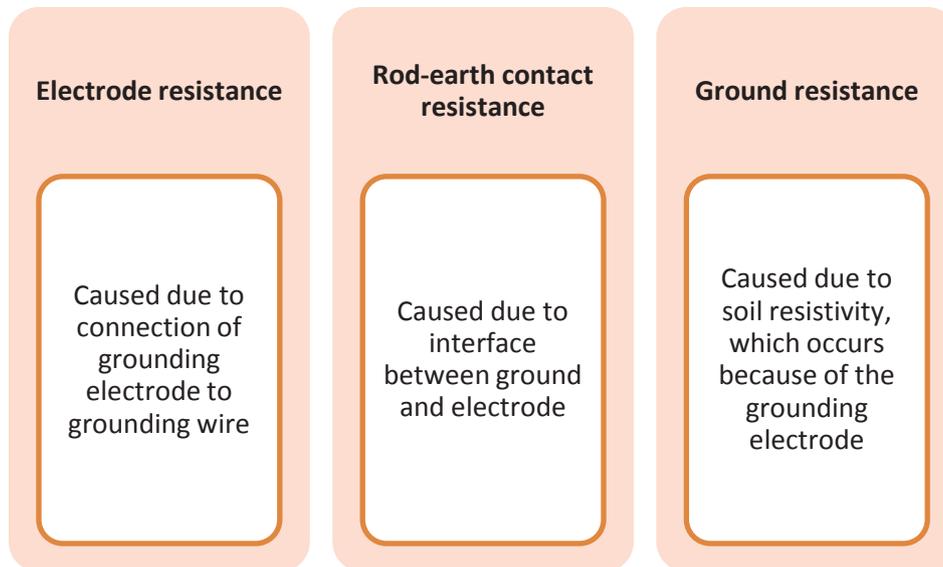
In this type of earthing system, all the metal parts that are not carrying current are interconnected and then they are connected to the earth. Hence, there is no potential or voltage between:

- The metal parts that are not carrying current, such as the enclosure body, cable channels, metal race way and equipment frame.
- The non-current carrying metal parts and the earth

#### System Grounding

System grounding is used to protect an electrical/electronic system from any kind of superimposed voltages that are caused by an accidental contact with systems with high voltage and lightning. This is also required to prevent building up of static charge on the equipment. System grounding establishes a reference point with zero-voltage for the system.

The components of a ground electrode are listed in the following figure:



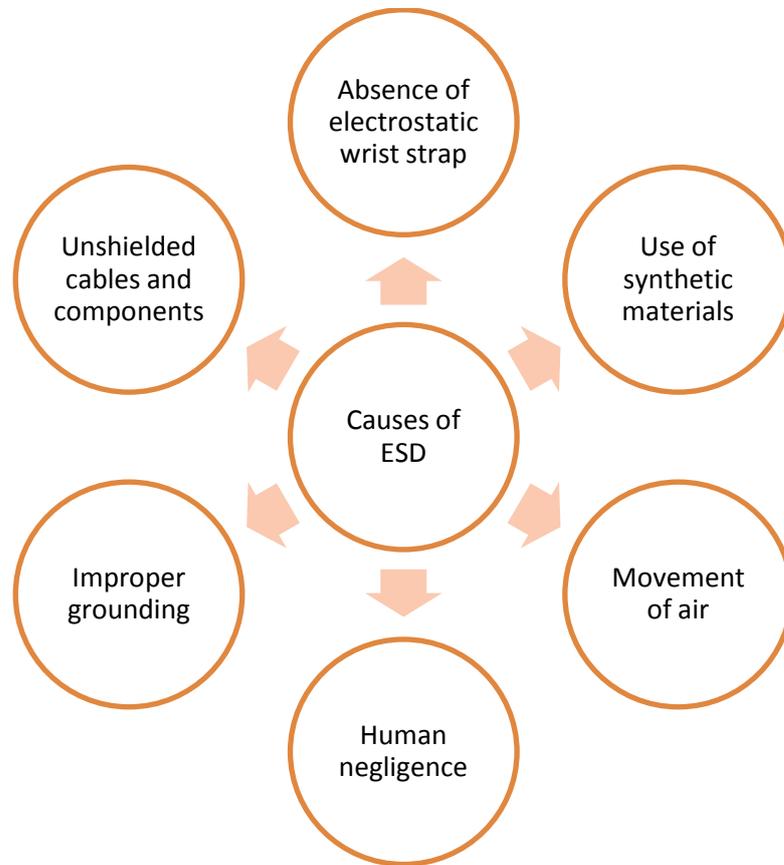
*Fig. 1.3.4: Components of a ground electrode*

The resistance of ground electrode connection influences the levels of transient voltage during any event of switching and lightning. The body of earth may be considered as several concentric shells surrounding the electrode. The shells, near the electrode, are of small cross-sectional area and relatively of high resistance. For example, some of the screws which connect motherboard to the computer case also connect the motherboard to the ground case. The ground case is further connected to the earth by the help of power cables.

#### **Electro Static Discharge (ESD)**

ESD is the sudden build-up of static electricity when two differently charged objects are brought together. While repairing electronic products, ESD is one of the issues that arises, as it can cause damage to the electronic devices and components.

The following figure represents some causes of ESD:



*Fig. 1.3.5: ESD causes*

ESD protection is essential for sensitive components during assembly of a device and in the finished device. It can cause severe damage to components such as microchips. Grounding is imperative for ESD prevention. An ESD simulator having special output circuit called human body model (HBM) is generally utilized to test the vulnerability of electronic devices to ESD from human contact.

The following figure list a few points that should be kept in mind in order to reduce ESD damage:

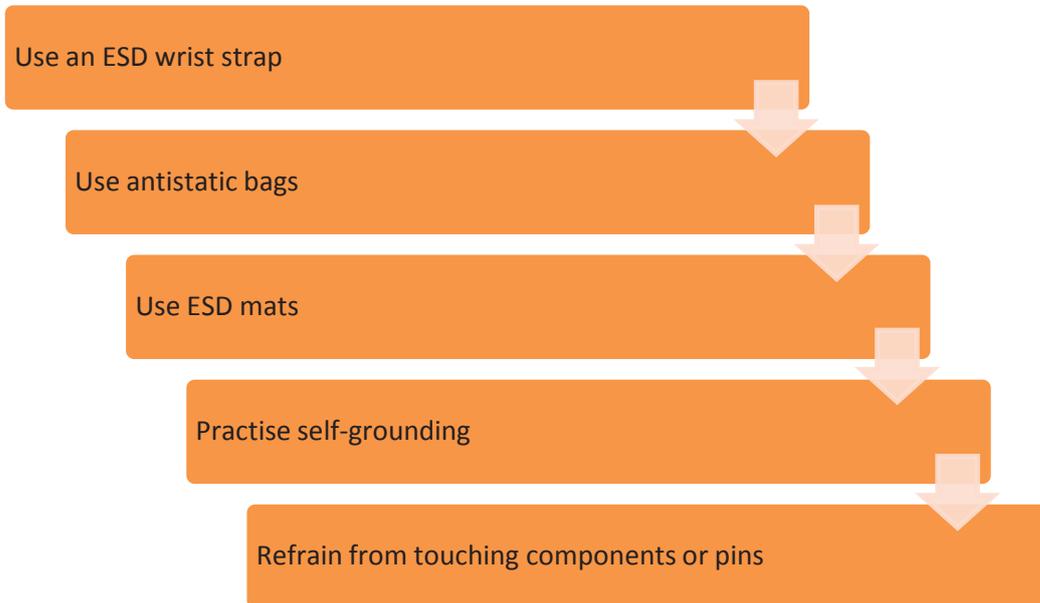


Fig. 1.3.6: Steps to be taken for ESD damage reduction

- Use an ESD wrist strap: It wraps around the wrist and contains a metal component touching the skin. A wire leads from the strap to an alligator clip that can be clipped to the computer case. This results in the user and the case being at the same potential and prevents static discharge.
- Use antistatic bags: For handling electronic components, use antistatic bags. These bags prevent static from building up and thus helps in preventing ESD damage to the components.
- Use ESD mats: These prevent static build-up at work benches. Technicians usually use computers on antistatic mat.
- Practise self-grounding: Usually self-grounding is used to ensure that the body is at the same ground potential as the case.
- Do not touch components or pins: If any circuit cards are removed, do not touch the components or the pins. Hold the outside edges or the plastic handles.
- Control humidity: When humidity is very low, static builds up faster.
- Avoid placing computers on carpets: Static can build up on rugs or carpets easily than on other surfaces.

### Material Safety Data Sheets (MSDSs)

MSDSs are available with most of the products which have a potential to cause damage to the equipment or some sort of harm to the humans while dealing with them. A few examples of these products are:



*Fig. 1.3.7: Examples of harmful products*

Cleaning solutions such as LCD cleaner, battery, adapter and printer cartridge.

MSDS provides information about the safety factors of handling the products and includes their characteristics, handling strategy, storage instruction and disposal method.

It is the responsibility of the technician to read the MSDS sheets which are available with the products. For example, while using a cleaning product to clean the LCD screen of the monitor, if that product is leaving some patches on the screen, then the MSDS sheet should be immediately checked. To avoid such kind of situations, it is advisable to read the MSDS sheets prior to using the product.

**Exercise** 

1. Match the following:

- |             |   |
|-------------|---|
| a. Mouse    | Produce output in the form of various sounds.   |
| b. Touchpad | Controls the movement of the cursor.            |
| c. Scanner  | Reads text that is printed on paper.            |
| d. Printer  | Used for pointing on a computer display screen. |
| e. Speakers | Produce paper output of the text.               |

2. What are the steps that can be taken for ESD damage reduction?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_





## 2. Basics of Electronics

Unit 2.1 – Fundamentals of Electronics

Unit 2.2 – Other Electronic Concepts

Unit 2.3 – Inside a Computer



## Key Learning Outcomes



**At the end of this module, you will be able to:**

1. Explain the fundamentals of electronics
2. Define electronic circuits and components
3. Identify different types of electronic circuits
4. Define fundamentals of electricity
5. Explain other electronics concepts

## UNIT 2.1: Fundamentals of Electronics

### Unit Objectives

**At the end of this unit, you will be able to:**

1. Define electronics
2. Explain the basics concepts of electronics
3. Identify electronic circuits and their components
4. Explain the fundamentals of electricity

### 2.1.1 Introduction to Electronics

Electronics is the branch of science which involves the study of flow and control of electrons (electricity) and their behaviour and effects. This branch deals with electrical circuits involving active electronic components such as vacuum tubes, transistors, diodes and integrated circuits and passive electronic components such as resistors, capacitors and inductors, along with interconnection technologies.

The following figure shows some concepts that form the basics of electronics:

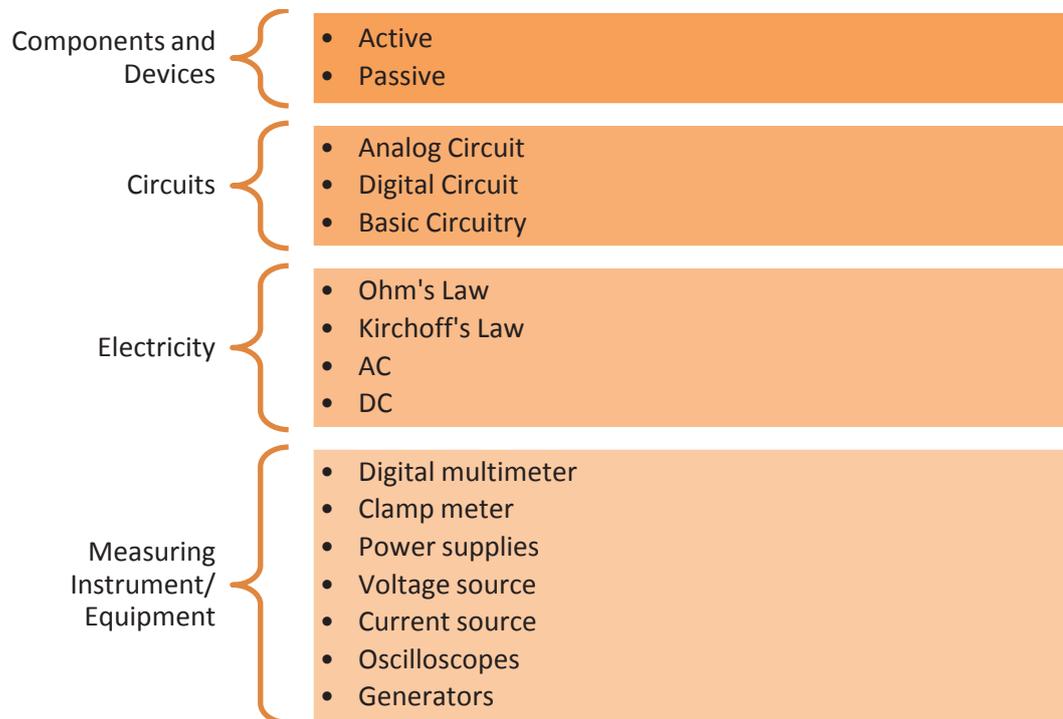


Fig. 2.1.1: Basic concepts of electronics



## 2.1.2 Electronic Circuits and their Components

All the circuits of a computer are made up of various basic electronic components. These components are the fundamental building blocks of the electrical/electronic circuits. They are generally found on the hard disk drive, motherboard and on the other parts of a computer and its peripherals. For a field technician, it is necessary to identify these components correctly.

The electronic components are embedded on PCBs. A PCB acts as a base for the components that are mounted on its surface and soldered. The components are generally soldered on the circuit board according to a specified design. The circuits are initially build and tested on a breadboard before being embedded on a PCB. The following image shows a mother board PCB and a few electronic components embedded on it:

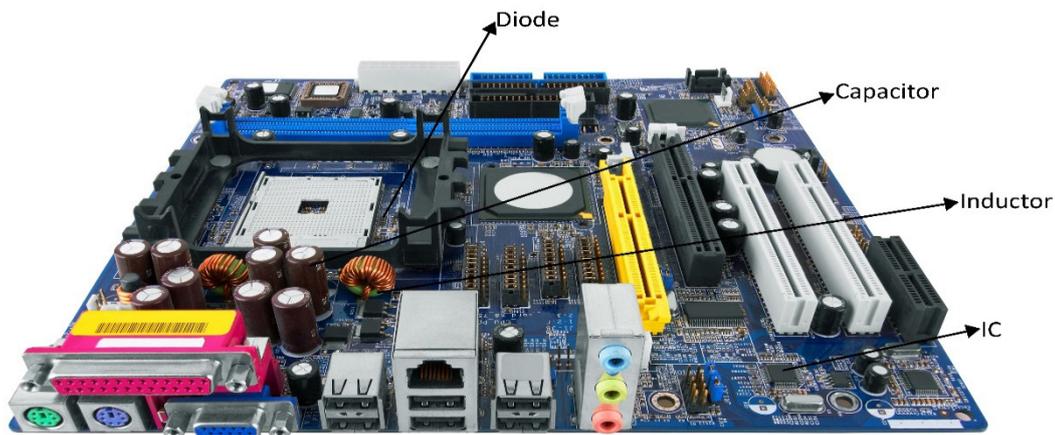


Fig. 2.1.2: Electronic components on motherboard's PCB

Electronic components that may be embedded on a PCB are of two types:

- Active
- Passive

### Active Components

These components depend on a source of energy to perform their functions. They can amplify current and produce a power gain.

The following figure represents a list of active components:

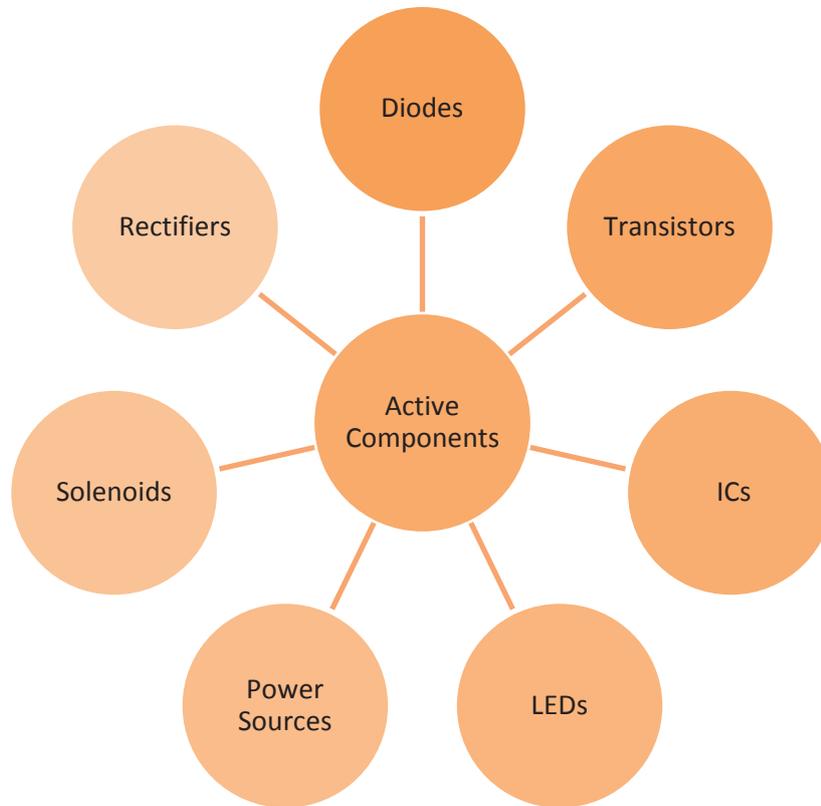


Fig 2.1.3: Active components

### Diode

A diode is a specialized electronic component with two terminals known as the anode and the cathode. It has asymmetric conductance, which means that it conducts mainly in one direction. It has very less resistance (ideally zero), to the flow of current in one direction. It has high resistance (ideally infinite), in the other direction. Diodes are usually made up of semiconductor materials such as germanium, silicon or selenium. The following image shows diodes:

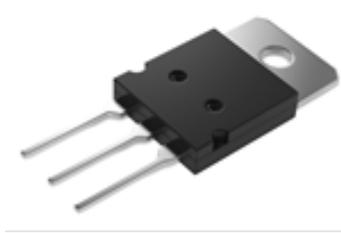


Fig. 2.1.4: Diodes

### Transistor

A transistor is an electronic device, made up of semiconductor material. Usually, it has at least three terminals to connect to an external circuit. It is used to amplify or switch electrical power and electronic signals.

The following image shows a transistor:



*Fig 2.1.5: A transistor*

### IC

An IC, also known as a microchip, is a semiconductor wafer on which a number of small resistors, capacitors and transistors are fabricated. It can work as an oscillator, an amplifier, a timer, a counter, a microprocessor or as computer memory. The following image shows an IC:



*Fig 2.1.6: An IC*

### LED

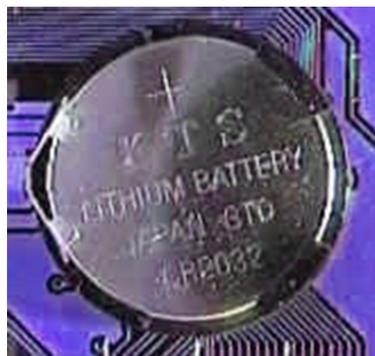
An LED is a p-n junction diode which gives out light when it is activated. It is a two-lead semiconductor source of light. Energy is released as photons when a suitable voltage is applied to the leads. The following image shows an LED:



*Fig.2.1.7: An LED*

### Power Source

A power source is a source which provides power to a circuit. Generally, it is a generator or a battery. The following image shows a battery:



*Fig. 2.1.8: A battery*

### Solenoid

A solenoid is an insulated or enamelled wire coil wrapped around a cylindrical solid core. The solid core may be of iron, steel or powdered iron. Solenoids can be used as electromagnets and inductors in electronic circuits. The motherboard contains solenoids to perform different functions. The following image shows a solenoid:

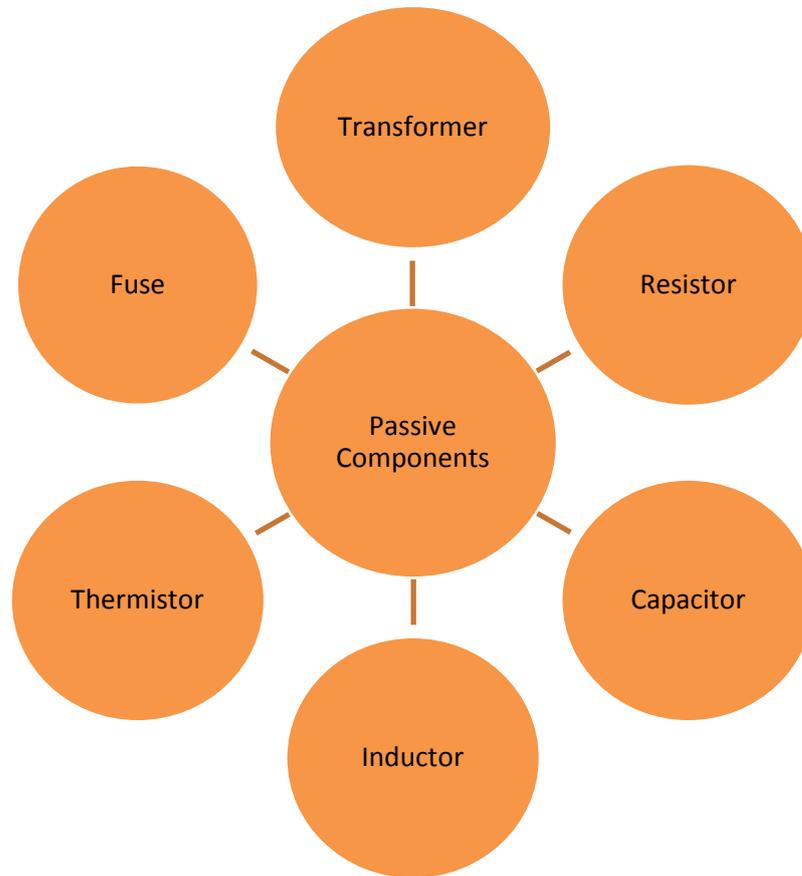


*Fig. 2.1.9: A solenoid*

### Passive Components

These components do not require any power source to perform their specific functions. They are not capable of controlling current.

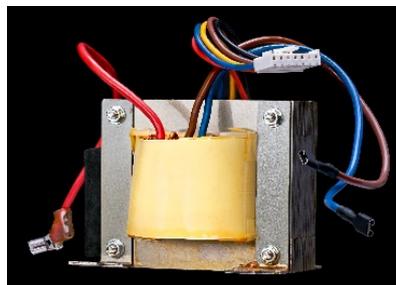
The following figure lists different passive components in a circuit:



*Fig. 2.1.10: Passive components*

### **Transformer**

A transformer consists of a metal core with coils of wire around it. It is a device used to convert AC to the required values by decreasing or increasing the alternating voltages in an electronic or electric system. The following image shows a transformer:

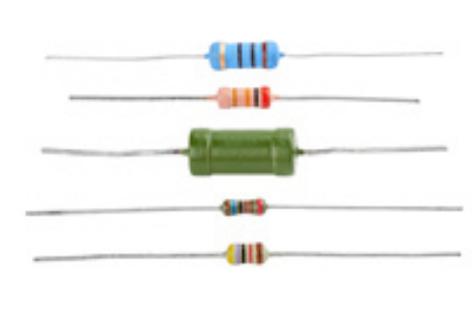


*Fig 2.1.11: A transformer*

### **Resistor**

A resistor is a component in an electronic circuit which is built to resist or limit the flow of current in that circuit. It may be a small carbon device or a big wire-wound power resistor. Its size varies in length from 5mm up to 300mm.

The following image shows different types of resistors:



*Fig. 2.1.12: Resistors*

### Capacitor

A capacitor is a device which is made up of one or more pairs of conductors and an insulator separating them. It is used to store electric charge. The following image shows capacitors:



*Fig. 2.1.13: Capacitors*

### Inductor

An inductor consists of a coil or a wire loop. This component is used to store energy in the form of a magnetic field. The more the turns in the coil, the more will be the inductance. The following image shows inductors:



*Fig. 2.1.14: Inductors*

**Fuse**

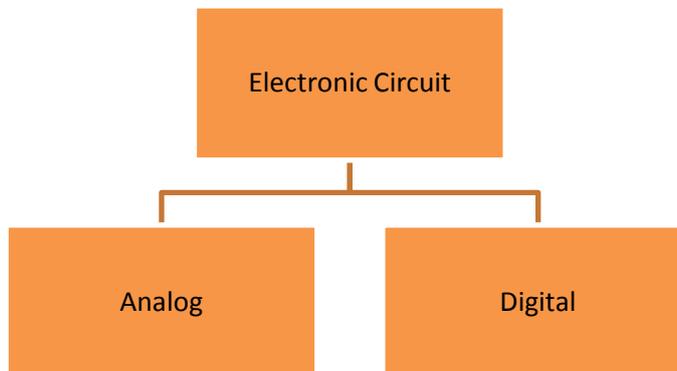
A fuse is a device which is used to protect electrical systems against excessive current. The following image represents a fuse:



*Fig 2.1.15: A fuse*

**Types of Electronic Circuits**

An electronic circuit is a combination of electronic components that are connected to provide flow of current. The different combination of wires and components allows different operations, such as amplification of signals, computation and transmission of data, to be performed. The following figure represents types of electronic circuits:



*Fig. 2.1.16: Classification of electronic circuits*

**Analog Circuit**

In analog circuits, there is a continuous variation of voltage or current with time. These circuits are a combination of basic components such as resistors, capacitors, diodes, inductors and transistors.

The following figure represents an analog circuit:

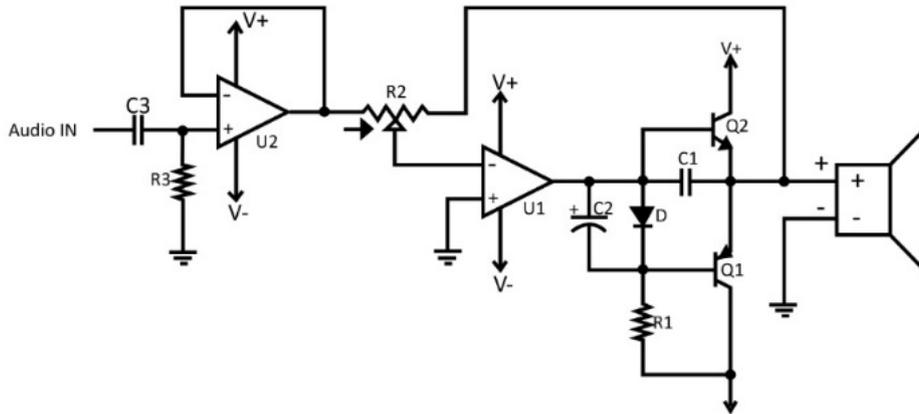


Fig 2.1.17: An analog circuit

The fundamental building blocks of analog circuits are:

- Series connection
- Parallel connection

**Series Connection**

In series connection, the magnitude of current is same through all the connected components. The following figure shows a series circuit and, in the figure,  $R = R_1 + R_2 + R_3$ , where, R represents the resistance in the circuit:

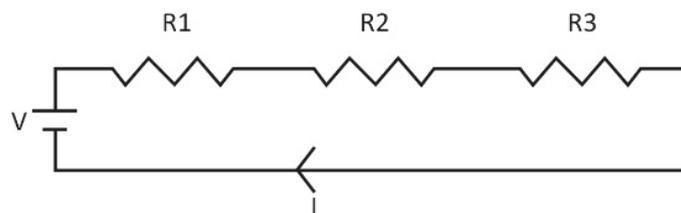


Fig. 2.1.18: A series circuit

**Parallel Connection**

In a parallel connection, the magnitude of voltage is same through all the connected components and the current is divided among the various components. The following figure represents a parallel circuit.  $1/R = 1/R_1 + 1/R_2 + 1/R_3$ , where, R shows the resistance in the circuit and I represent the current:

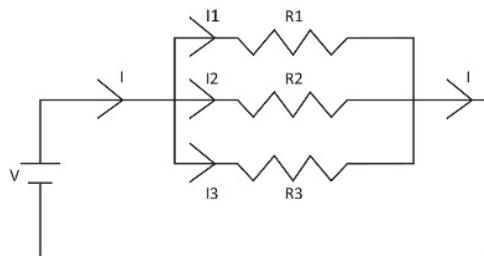


Fig. 2.1.19:A parallel circuit

### Digital Circuit

Digital circuits use a binary scheme for digital signalling. Two different voltages (high or low) are represented by different logic levels. High voltage, generally 5V, represents one value and the other value represents low voltage that is generally 0V. The following figure shows a digital circuit:

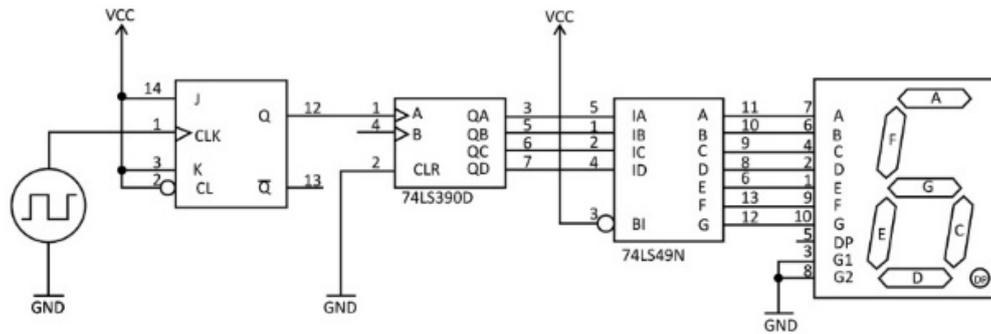


Fig. 2.1.20: A digital circuit

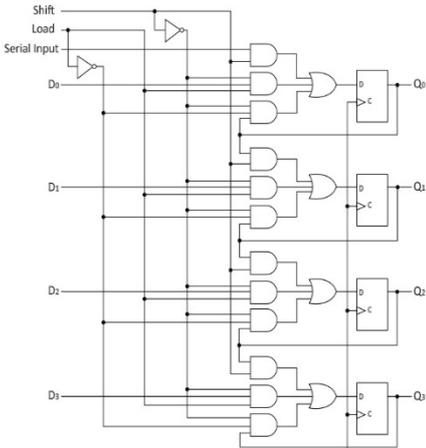
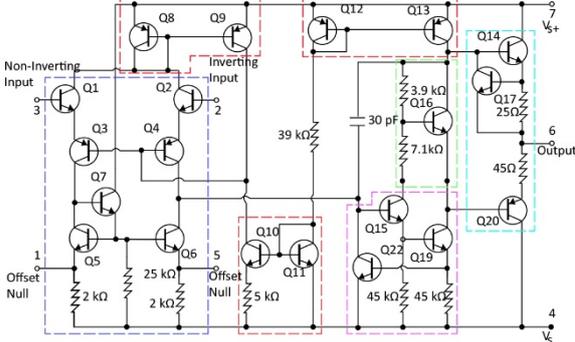
The following table describes basic building blocks of digital circuits:

<p><b>Logic Gates</b></p> <p>These are elementary blocks of a digital circuit. At any moment, the terminal voltage level is either high represented by 1 or low represented by 0</p>	<p><b>OR Gate</b></p> <p>The output terminal is at 1 when any of the inputs is 1 and is at 0 when all the inputs are at 0.</p>	
	<p><b>AND Gate</b></p> <p>The output terminal is at 1 when all the inputs are at 1, otherwise the output is 0.</p>	
	<p><b>NOT Gate/Inverter</b></p> <p>The output is 0 when the input is 1 and vice-versa.</p>	
<p><b>Microprocessor/Chip</b></p>	<p>An IC containing all the functions of a computer's CPU.</p>	
<p><b>Microcontroller</b></p>	<p>A small computer on an IC which controls devices that contain the microprocessor such as remote controls, office machines and appliances</p>	

Fig. 2.1.21: Building blocks of digital circuits

### Basic Integrated Circuits

When an electronic circuit array is created by the fabrication process of different electrical and electronic components on a silicon wafer, then that circuit is known as Integrated circuit or simply IC. These circuits have operations similar to the large discrete electronic circuits made of discrete electronic components. The following table describes some basic integrated circuits:

Circuit	Image	Description
<p>Digital Integrated Circuit</p>		<p>These types of integrated circuits do not operate at all the levels of the signal. They operate only at some defined levels. The basic building blocks of these circuits are logical gates, multiplexers, demultiplexers, flip flops and other electronic components of circuits.</p>
<p>Analog Integrated Circuit</p>		<p>These types of integrated circuits operate over a continuous range of signals. These circuits can be further classified as linear integrated circuits (Linear ICs) and radio frequency integrated circuits (RF ICs).</p>



## Exercise



1. Categorise the following components as active or passive:

- a. Resistor
- b. Transistor
- c. Capacitor
- d. Diode
- e. Fuse
- f. Transformer
- g. Battery
- h. Solenoid

2. What are the types of basic integrated circuits?

- a. Digital Integrated Type
- b. General Integrated Type
- c. \_\_\_\_\_
- d. \_\_\_\_\_

## UNIT 2.2: Other Electronic Concepts

### Unit Objectives

At the end of this unit, you will be able to:

1. Define voltage and power
2. Identify voltage and power requirement for different hardware devices



### 2.2.1 Voltage and Power

Voltage is the potential difference between a negatively charged component and a component with positive charge. It is a measure of the energy carried by the charge and is the "energy per unit charge". The proper name for voltage is potential difference or p.d. in short and it is measured in volts.

Power is the amount of electrical energy per unit time given by an electric circuit. It is measured in watts (W) or joules per second.

#### Voltage and Power Requirement by Hardware Devices

Computer is an electronic machine and hence it can only be operated with a source of energy. It requires a standard power and voltage range for its operation. Every electronic device or circuit is fed by the PSU.

### 2.2.2 Computer Power Supply Voltages

All the hardware components present in a computer, require some amount of DC voltage to run. This amount may differ from component to component. The following table lists a few components and their voltage requirement:

Component	Voltage Requirement (in volts)
Mainboard or motherboard	12
CPU	3.3
Graphic cards	12
CPU fan	5
USB ports	5

Fig. 2.2.1: Components and voltage requirement

So, in a computer broadly three types of DC voltages are required, which are  $\pm 12V$ ,  $\pm 5V$  and  $+3.3 V$ .

**TIPS**

Power ratings and voltages outside the permissible range can cause system failure.

**PSU**

A PSU draws the AC voltage from the source (generally from the socket) and converts it to the desired level of DC voltage. It is usually found at the back side of a computer case. The following figure lists the parts found on the back of a PSU:

---

A connection for the power cord to the computer.

---

A fan opening to draw air out of the PSU.

---

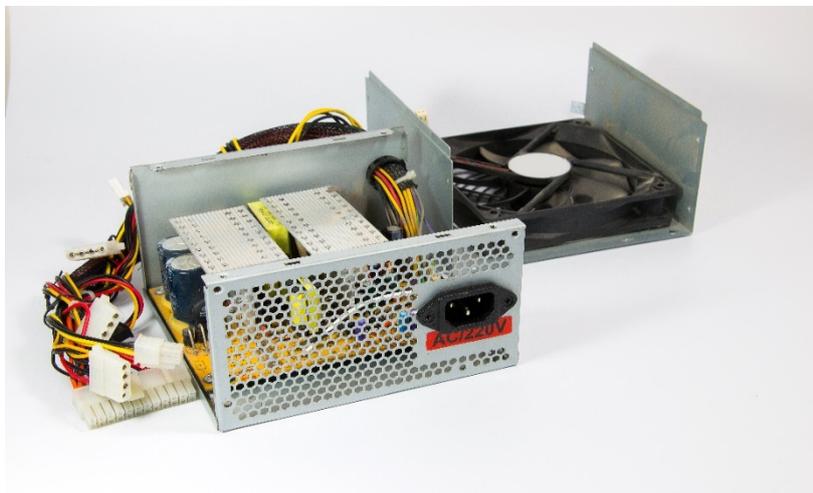
A red switch to change the power supply voltage.

---

A rocker switch to turn the power supply on and off.

*Fig. 2.2.2: Components of a PSU*

The following image shows a PSU:



*Fig. 2.2.3: Interior view of a PSU*

There are different types of power supplies available in the market but switched-mode power supplies are globally used today in personal computers.

There is also a stack of different coloured cables inside a PSU.

The following figure lists the colour codes of the PSU cables:

Black Wires	<ul style="list-style-type: none"><li>•These wires are used to provide grounding.</li><li>•Every other color should be paired with a black wire.</li></ul>
Yellow Wires	<ul style="list-style-type: none"><li>•These wires denote +12V</li></ul>
Blue Wires	<ul style="list-style-type: none"><li>•These wires denote -12V</li></ul>
Red Wires	<ul style="list-style-type: none"><li>•These wires denote +5V</li></ul>
White Wires	<ul style="list-style-type: none"><li>•These wires denote -5V</li></ul>
Orange Wires	<ul style="list-style-type: none"><li>•These wires denote 3.3V</li></ul>
Green Wires	<ul style="list-style-type: none"><li>•These are control wires to check the DC voltage</li></ul>
Purple Wires	<ul style="list-style-type: none"><li>•These wires denote +5V on standby mode</li></ul>

Fig. 2.2.4: Colour codes of PSU cables

## TIPS



Power supply and computer can be protected from a surge and voltage drops by simply adding a UPS (backup) to the computer.

## Exercise

1. Write the voltage requirement of the given components:

- i. USB ports
- ii. CPU fan
- iii. Motherboard
- iv. Graphic cards
- v. CPU

2. Match the following:

- |       |            |         |
|-------|------------|---------|
| i. i. | Red Wires  | a. +12V |
| ii.   | Blue Wires | b. -5V  |
| iii.  | White      | c. 3.3V |
| iv.   | Orange     | d. -12V |
| v.    | Yellow     | e. +5V  |

## UNIT 2.3: Inside a Computer

### Unit Objectives

At the end of this unit, you will be able to:

1. Explain the different modules inside a computer system such as SMPS, drivers, hard disk, battery and mother board



### 2.3.1 Internal Hardware Components

Inside a computer, there are various small electrical and electronic components. These form the internal hardware parts of a computer. The components such as the keyboard, mouse, speakers and printers are called peripherals and form the external hardware parts of a computer. The following image shows some internal hardware components of a computer:

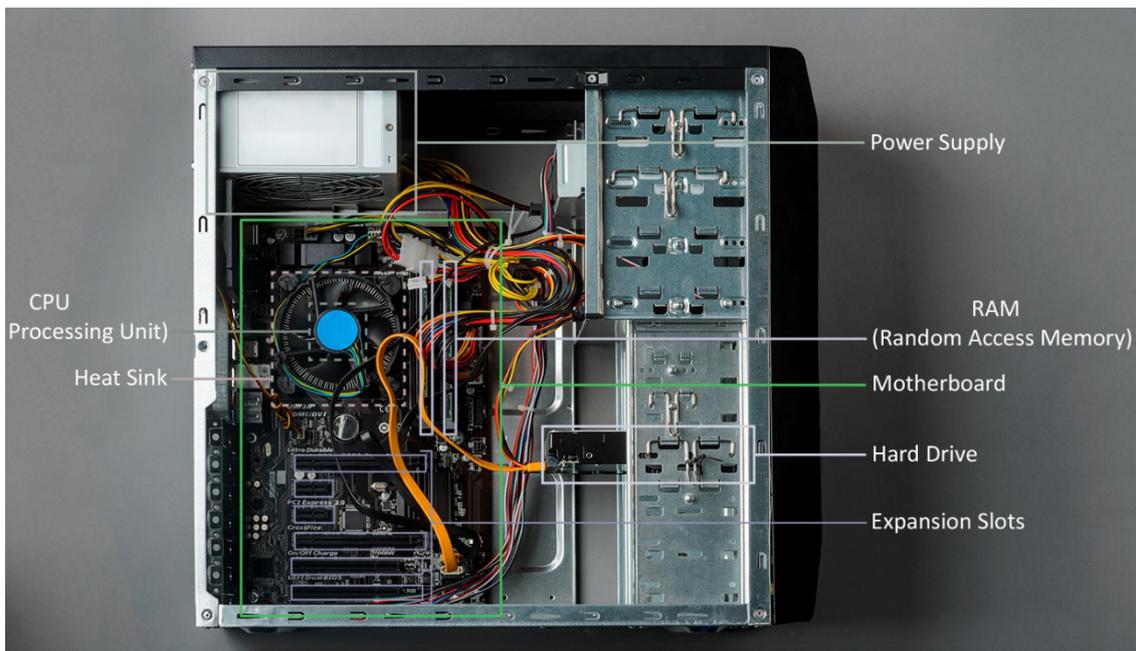


Fig. 2.3.1: Internal hardware components

#### Motherboard

A motherboard is the main PCB of a computer. It contains the CPU, memory, expansion cards to regulate the audio and video, the attachments for the hard drive and optical drives and links to ports of the computer such as the USB port. There is a direct or an indirect connection between the motherboard and every other part of the computer.

**CPU**

A CPU, also called as the processor, is positioned on the motherboard, inside the computer case. It is called the brain of the computer. This unit takes data and instructions from the storage unit and processes it as per the instructions given and the type of data provided. It is then sent back to the storage unit. Whenever any keyboard key is pressed, or the mouse is clicked or any application is started, the instructions are sent to the CPU.

The CPU chip (processor chip) can be identified by the processor type and the name of the manufacturer. This information can be found on the chip itself. For example, Intel 386, Advanced Micro Devices (AMD) 386, Cyrix 486, Pentium MMX, Intel Core 2Duo and iCore7.

**RAM**

RAM is the short-term memory in a computer that is used to store documents while they are being processed. It is available as a chip and is an IC soldered on the motherboard.

RAM slots are present on the motherboard and provide slots for inserting RAM chips. These can be easily removed and replaced.

**BIOS**

A motherboard also has a provision for initial set up of a computer after the power is turned on, which is called BIOS or boot firmware. The BIOS consists of a software code that gives a computer the basic instructions to start. Whenever the computer is turned on, it runs the program within BIOS to do some basic system checks, locates the operating system on the disk and starts the computer.

**PSU**

A PSU converts the input AC to low-voltage regulated DC power for the internal components of a computer. The most commonly used PSU in modern computers is Switched-mode Power Supply SMPS.

**SMPS**

An SMPS is also known as switching-mode power supply, switch-mode power supply, switched power supply or simply a switcher. It is an electronic power supply which efficiently converts electrical power, i.e. transfers power from a DC or AC source to DC loads, such as a personal computer. The conversion process of electrical power becomes more efficient with high input voltage and synchronous rectification.

The following images shows an SMPS:



Fig. 2.3.2: An SMPS

The following figure shows the block diagram of a mains operated AC/DC SMPS with output voltage regulation:

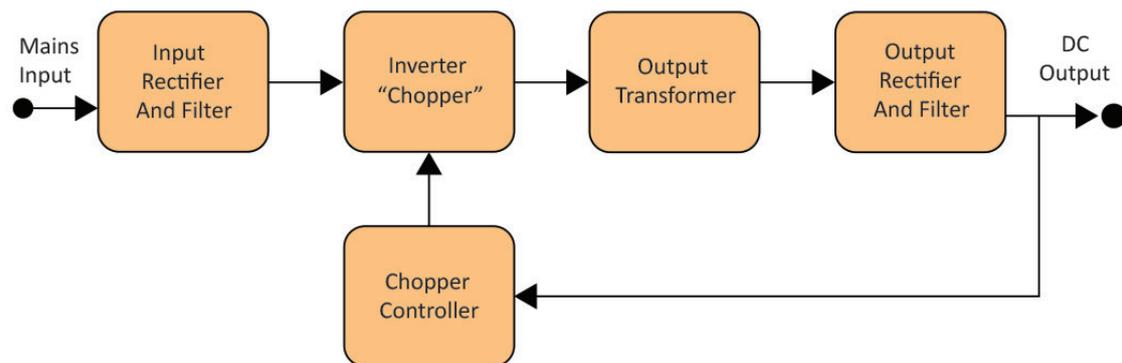


Fig. 2.3.3: Block diagram of a mains operated AC/DC SMPS

In the process of output voltage regulation by SMPS, there are certain stages involved which are:

**Input rectifier stage:** This is the first stage of voltage regulation known as rectification. In this stage an AC input is converted into DC. If the input is already in the form DC, then there is no requirement of this stage.

**Inverter stage:** The second stage of voltage regulation converts the input DC, which comes either directly from the source or from the rectification stage, into AC. DC is converted into AC by passing it through a power oscillator.

**Voltage converter and output rectifier:** The inverted AC should drive the primary winding of a transformer, if the output needs to be isolated from the input. This in turn makes the voltage high or low to reach the desired output level on the secondary winding of the transformer. The AC output is rectified from the transformer if the desired output is DC.

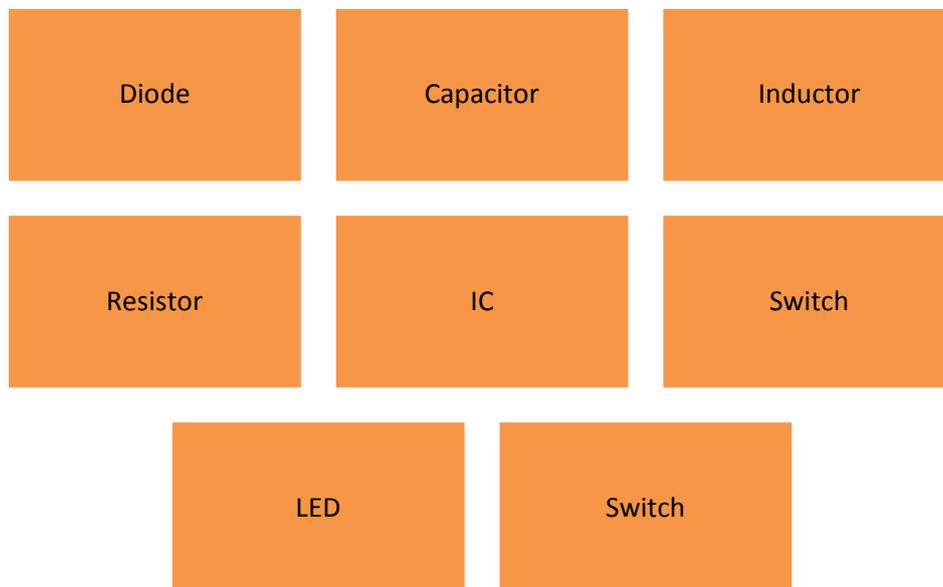
**Regulation:** The output voltage is monitored by a feedback circuit and is compared with a reference voltage. An additional power supply is used because the feedback circuit needs power to function before it can generate it.

### Expansion Cards

The motherboard also contains slots and provision for expansion cards. The circuit boards which are inserted in the slots are called expansion cards. These cards allow a computer to connect and communicate with various input and output devices. The various types of expansion cards are video card, sound card, graphic card, network interface card and Bluetooth card.

## 2.3.2 Electronic Components found in a Computer

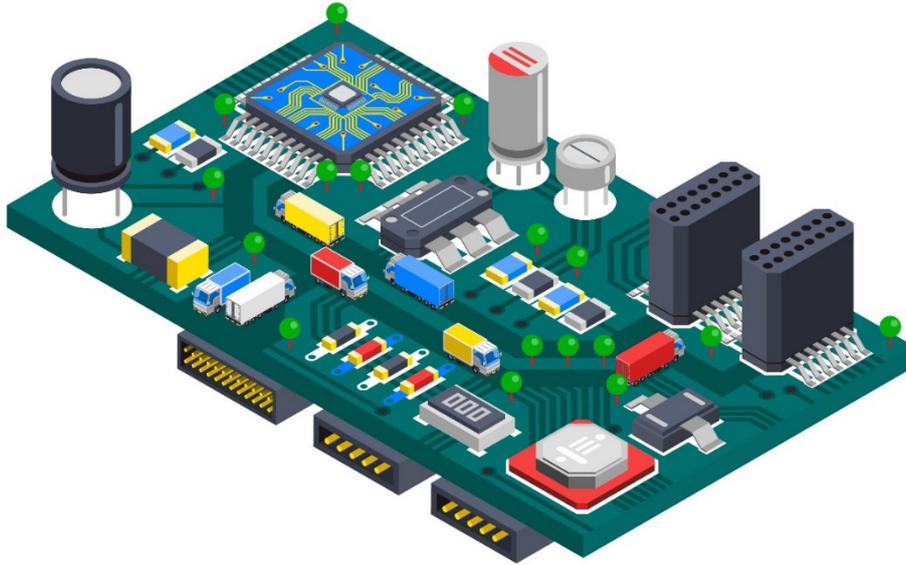
The following figure lists a few common electronic components present inside all the hardware devices:



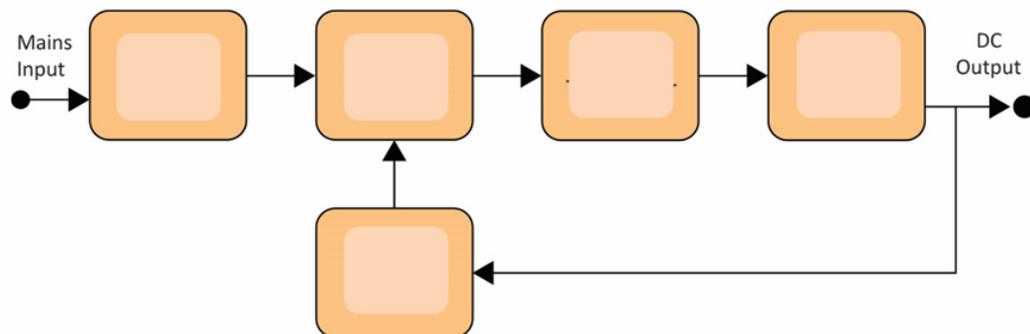
*Fig. 2.3.4: A few electronic components present inside the hardware devices*

## Exercise

1. Given below is an electronic circuit. Identify all the basic electronic components embedded in the circuit.



2. Identify the components in the block diagram of a mains operated AC/DC SMPS with output voltage regulation.



## Practical

1. Perform the steps of connecting the wires of computer peripherals in a CPU cabinet.

Equipment:

- CPU cabinet
- Mouse
- Headphone
- Keyboard
- Monitor
- UPS
- Printer

2. Perform the steps of connecting a UPS with a computer system and check the voltage.

Equipment:

- Computer system
- UPS
- Multimeter



## 3. Interacting with Customers



Unit 3.1 – Understand Customer Requirements

Unit 3.2 – Interaction with Customers

Unit 3.3 – Suggest resolution to Problems

Unit 3.4 – Maintaining records for complaints and resolutions

Unit 3.5 – Achieving Productivity and Quality



## Key Learning Outcomes



**At the end of this module, you will be able to:**

1. Understand customer requirements
2. Learn how to interact with customers
3. Suggest resolution to the problems of customers
4. Learn how to maintain records of customer's complaints and resolutions
5. Describe the importance of productivity and quality

## UNIT 3.1: Understand Customers Requirements

### Unit Objectives

**At the end of this unit, you will be able to:**

1. Identify the customer requirements
2. Educate customer about different aspects of installing and repairing hardware

### 3.1.1 Understand Customer Requirements

Understanding the needs of a customer is one of the foremost parts of a technician's job role. This includes the following practices:

- Call the customer as per the complaint registered to understand the issues
- Check time of visiting the location
- Greet the customer and talk politely
- Understand the customer's requirement
- Provide the best possible and cost effective solution to the customer
- Ensure that the customer is satisfied with the service
- Address the queries and issues raised by the customer about the hardware devices

### 3.1.2 Educating and Informing the Customer

Educating the customer about the products and their operation is an important aspect of field technician. For the satisfaction of customer, a field technician should inform the customer about the operational behaviour and other information of hardware installed by him at the customer site or premises.

The following figure shows list of information about hardware which is to be used by customer:

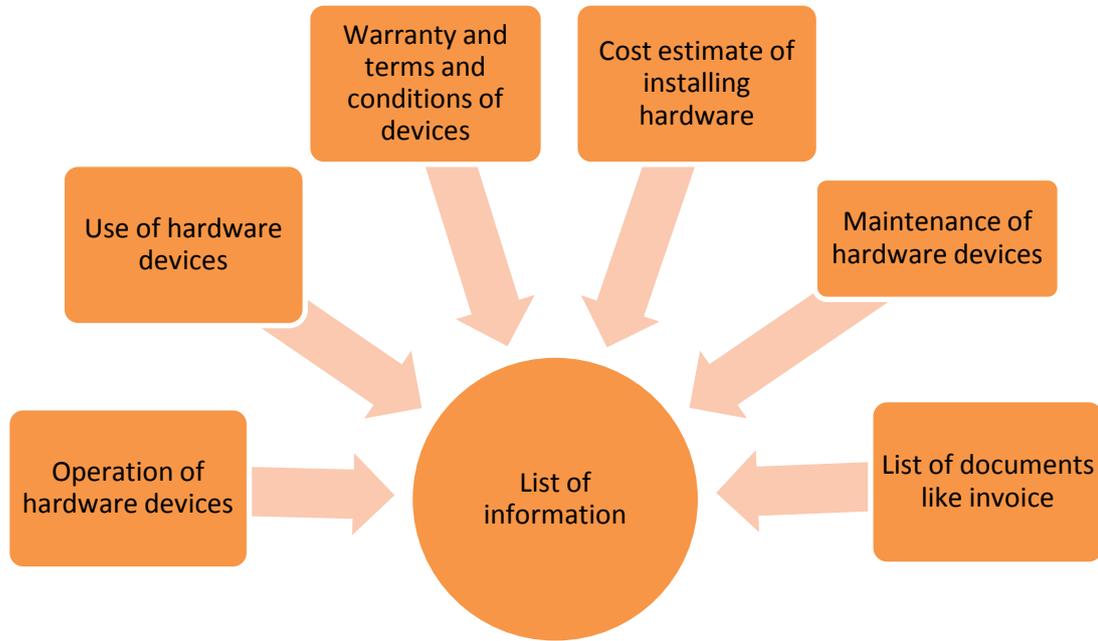


Fig 3.1.1: List of information about hardware

## Exercise

1. What practices can be used to understand customer requirements?

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

d. \_\_\_\_\_

e. \_\_\_\_\_

## UNIT 3.2: Interacting with Customer

### Unit Objectives

**At the end of this unit, you will be able to:**

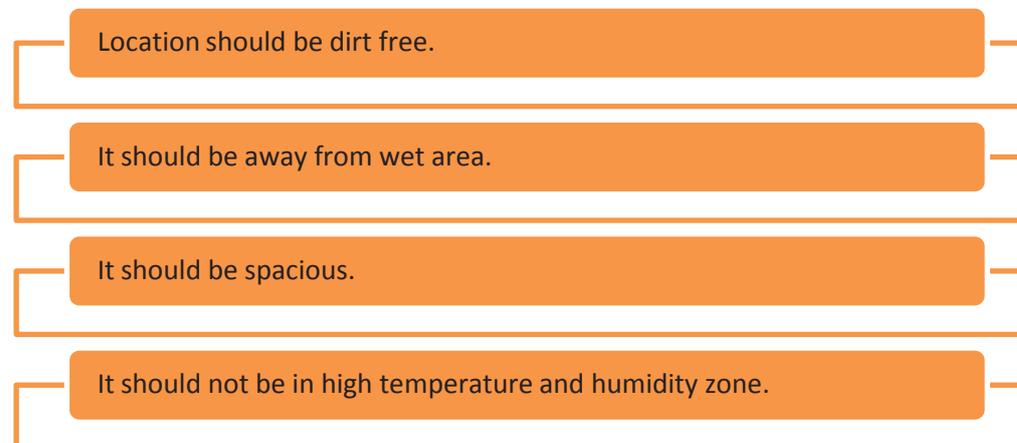
1. Analyse location requirements for hardware devices
2. Ask customers about their issues
3. Inform customers about repair procedure and warranty coverage of devices
4. Educate customer about annual maintenance contract

### 3.2.1 Analyse Location Requirements

For a field technician, it is important to analyse the location before installing the hardware components and other peripherals, for proper handling of and to prevent the devices from any damage.

While analysing the location, understand the customer requirements such as where it should be installed and whether it can be installed at that location or should be taken to the service centre for any changes.

Some points that should be kept in mind while analysing the location requirements for hardware installation are as shown in the figure:



*Fig 3.2.1: Analysing the location requirements for hardware installation*

### 3.2.2 Asking Questions

Asking Questions is also a skill. Questions may be asked to get more details or to be sure of something. A field technician should ask customer queries to analyse the problems faced and seek inputs from them to understand the symptoms.

This figure enlists the points to be asked at customer’s premises:

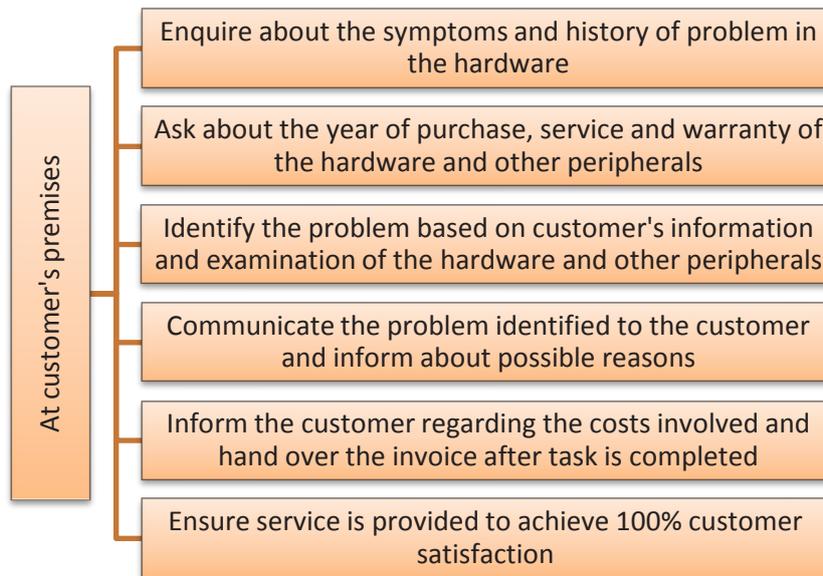


Fig 3.2.2: Points to be asked at customer’s premises

Depending upon the intention of asking a question, it can be:

- Close ended questions – are mainly yes, no answer type questions. The purpose of asking such questions is to get specific details. The following table shows close ended questions:

Example	Question Tag
Did you come yesterday?	Do, Did, Is, Can, Could, Will, Would, Shall, Should and so on
Can you finish this task in 2 hours?	
Shall I do it now?	

- Open ended questions – are mainly questions which do not demand a specific answer but are probing for details. The following table shows pattern of open ended questions:

Example	
What do you think about the meeting yesterday?	
How was your day?	
Where have you been all afternoon?	

### 3.2.3 Warranty Coverage and Annual Maintenance Contract

A warranty coverage is an agreement between manufacturer and buyer which assure the customer to give free repair service till the mentioned date of warranty. A field technician should enquire about warranty coverage after inspecting the device which is to be replaced or repair.

If the device is out of warranty coverage, inform the customer about the initial charges of replacing the damaged part.

The following figure shows a warranty card template:

The image shows a warranty card template with the following fields:

- Name \_\_\_\_\_
- Address \_\_\_\_\_
- \_\_\_\_\_
- Zip code \_\_\_\_\_ State \_\_\_\_\_
- Email \_\_\_\_\_ Contact number \_\_\_\_\_
- Model number \_\_\_\_\_ Serial number \_\_\_\_\_  
(these can be found on the base of the machine)
- Date of purchase \_\_\_\_\_ Place of purchase \_\_\_\_\_

A barcode is located to the right of the Serial number field, and a red arrow points to it.

Fig 3.2.3: Warranty card template

#### Informing Customer about Replacement

In this, a technician is responsible to inform customer about the replacement or repairing procedure of hardware. Tell the customer about the estimated cost of repairing or whether the repairing will take place at service centre.

#### Annual Maintenance Contract

It is defined as a contract between two parties about maintenance of the product owned by other party on some terms and conditions which is negotiated in the starting and it is maintained in the form of legal contract.

A technician should educate customer about this contract and its benefits regarding product maintenance and legal terms and conditions, so that in future customer should be able to use this contract for repairing purpose of the damaged products.

This image shows template for annual maintenance contract of hardware and peripherals:

**Computer and Network Systems  
Service Level Agreement (SLA)**

This Agreement entered into on this \_\_\_\_\_ day of \_\_\_\_\_, 2011 by and between \_\_\_\_\_ Inc., a \_\_\_\_\_ Corporation, herein after referred to as \_\_\_\_\_, with offices located in \_\_\_\_\_ and \_\_\_\_\_ a \_\_\_\_\_ (Corporation, \_\_\_\_\_ Partnership) herein after referred to as Client.

**RECITALS**

Whereas \_\_\_\_\_ is an IT Company validly existing and in good standing under the laws of the State of \_\_\_\_\_, with power to carry on its business as it is now being conducted.

Whereas Client is a \_\_\_\_\_ doing business in \_\_\_\_\_ and is in need of IT services and whereas Client desires to retain \_\_\_\_\_ to service Client under the following terms and conditions:

**AGREEMENT**

\_\_\_\_\_ shall provide to Client Support which includes, but is not limited to the following:

This Agreement is for onsite and remote Corporate Support services provided for the offices, or building of Client, Headquartered at:

Any discounts offered under this Agreement are not transferrable and cannot be extended to other businesses or entities.

1. This Agreement may be used toward residential computer and network support for Client staff and family, providing the work is approved by Client and requested as part of the Client extended user network.
  - 1.1. Troubleshooting of reported computer or network problems,
  - 1.2. Installing and configuring computer operating systems, application software
  - 1.3. Remote support
  - 1.4. User access addition(s) / removal(s)
  - 1.5. Office automation and technology integration, long-term planning, technology consultation
  - 1.6. Computer network asset documentation and acquisition services
  - 1.7. Practice Management Software customizations and interface/file structure design
  - 1.8. Computer, Server and Network security services, network optimization services
2. Additional Support services including, but is not limited to the following may be contracted by client and will be quoted and billed separately:
  - 2.1. Structured Wiring and network physical infrastructure
  - 2.2. Planning

Fig 3.2.4: Template for annual maintenance contract

## Exercise



1. What are important requirements to analyse a location for hardware installation?
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_
  - d. \_\_\_\_\_
  
2. Write some important questions to be asked at the customer to identify the requirement for the selection of site.
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_
  - d. \_\_\_\_\_

## UNIT 3.3: Suggest Solutions to Customer Problems

### Unit Objectives

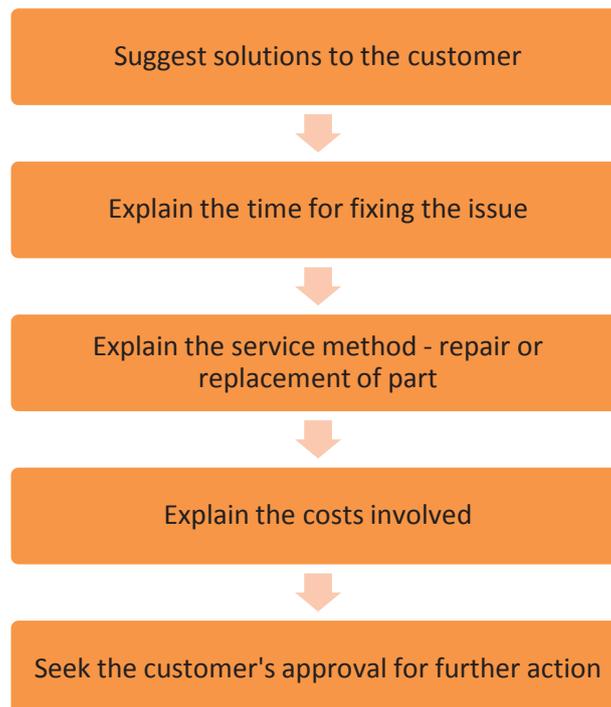
**At the end of this unit, you will be able to:**

1. Provide solution to the customer problems
2. Explain customer about the estimated cost of repairing under warranty and time required to repair the faulty equipment
3. Inform customer whether the module require replacement with reasons

### 3.3.1 Suggest a Solution to the Customer

After identifying the issue, a field technician needs to offer solutions. The field technician should explain all the possible solutions along with the cost associated. The field technician should then propose the best solution and let the customer decide whether to go ahead with the given solution or not.

The following figure shows the steps involved in offering solutions to a customer:



*Fig 3.3.1: Suggesting a solution to the customer for an issue*

### 3.3.2 Inform and Explain Customer about Modules Replacement

Under this topic, a technician required to inform customers on whether the module has to be replaced or repaired with reasons. For an instance, if the product is under warranty coverage then tell the customer about the estimated cost of repairing and time required to repair it.

The following figure shows the step required to inform the customer about modules replacement:

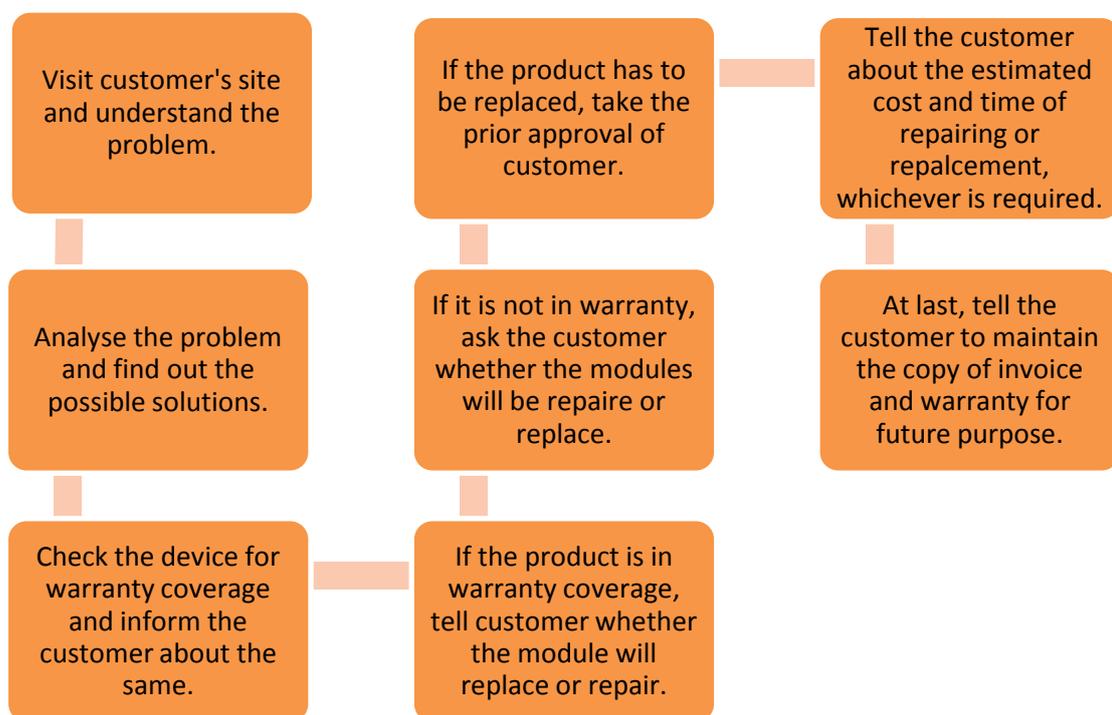
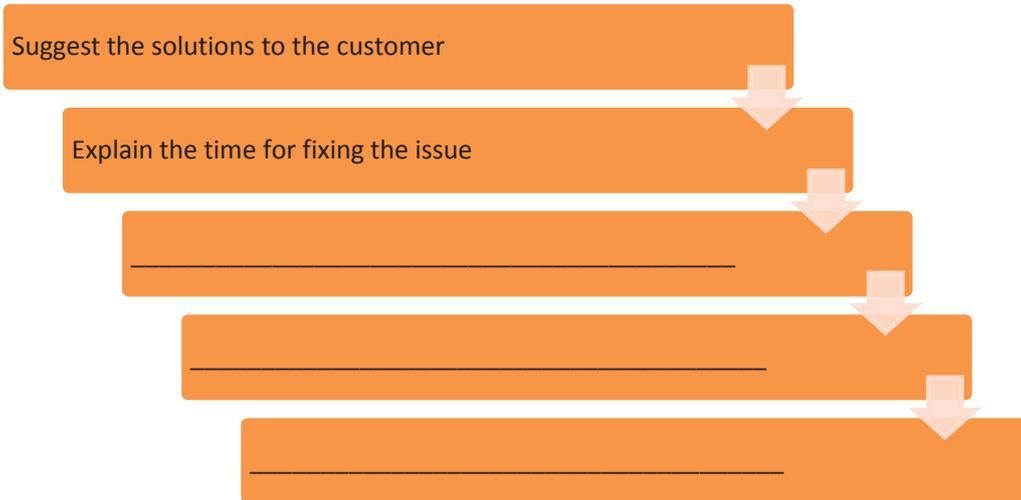


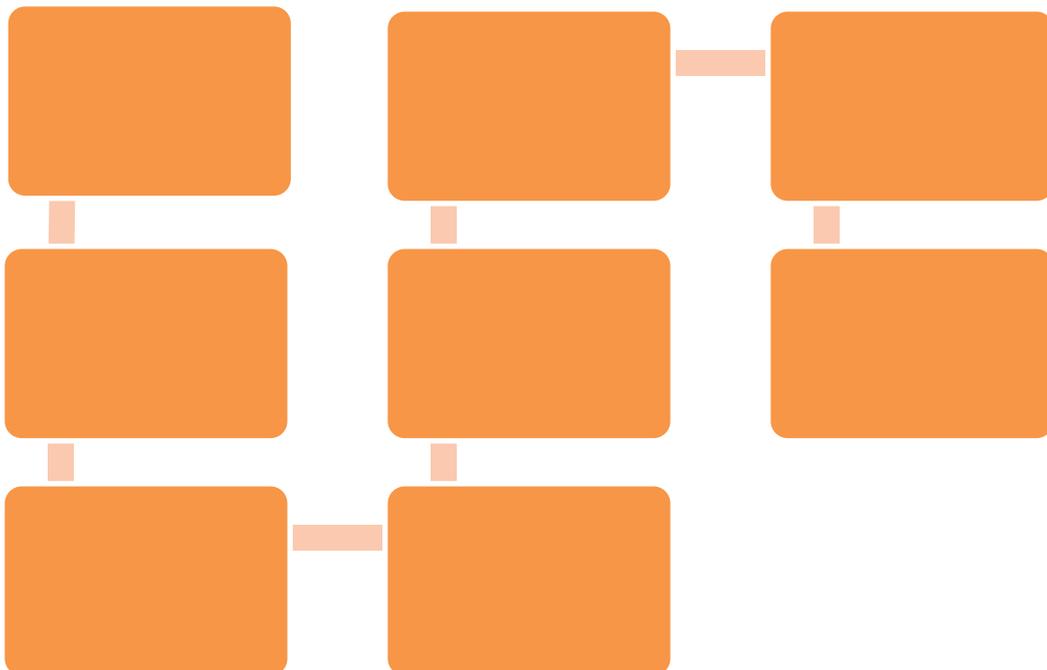
Fig 3.3.2: Steps required to inform the customer about modules replacement

**Exercise** 

1. What are the steps involved in suggesting a solution to the customer?



2. Write down the step required to inform the customer about modules replacement:



## UNIT 3.4: Maintaining Schedules and Records

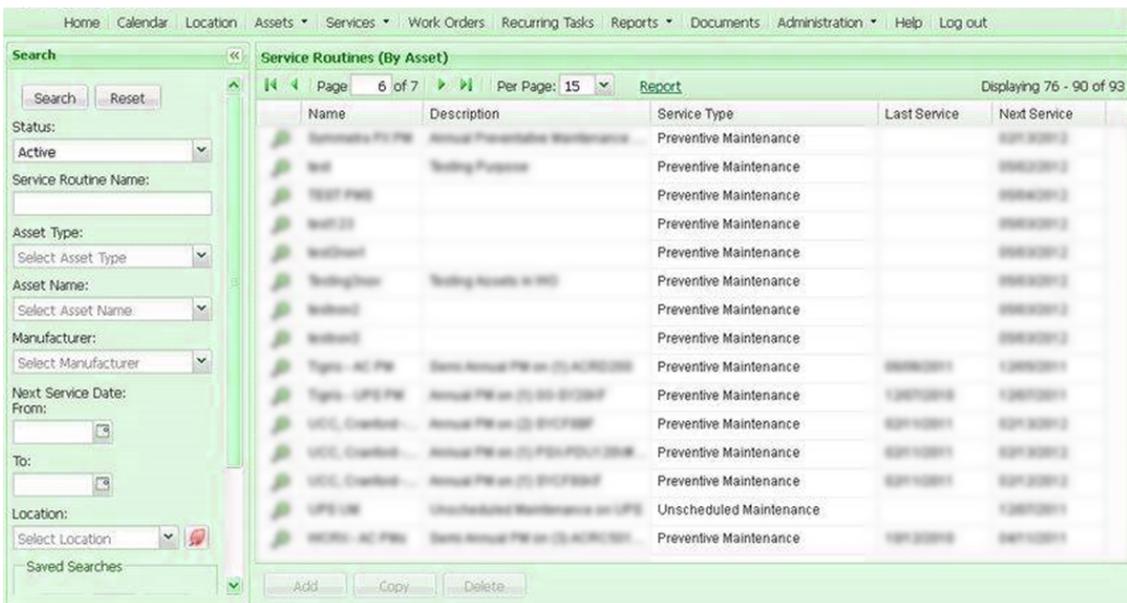
### Unit Objectives

At the end of this unit, you will be able to:

1. Explain maintenance schedules
2. Tell customer to retain the copy of invoice and provide the same

### 3.4.1 Maintenance Schedule

Maintenance schedule is vital for keeping records of servicing, repairing and performing preventive maintenance. The service engineer should maintain service records and next servicing schedules to be inform the customer about the maintenance of the components at the facility. The service engineer needs to perform hardware and software maintenance. The following image shows a sample maintenance schedule report:



Name	Description	Service Type	Last Service	Next Service
Service Annual PM	Annual Preventive Maintenance	Preventive Maintenance	02/11/2011	02/11/2012
Test	Testing Program	Preventive Maintenance	05/04/2011	05/04/2012
Test PM		Preventive Maintenance	05/04/2011	05/04/2012
Test 20		Preventive Maintenance	05/04/2011	05/04/2012
Test/20		Preventive Maintenance	05/04/2011	05/04/2012
Testing/20	Testing Assets in 2011	Preventive Maintenance	05/04/2011	05/04/2012
Test/20		Preventive Maintenance	05/04/2011	05/04/2012
Test/20		Preventive Maintenance	05/04/2011	05/04/2012
Tiger - AC PM	Service Annual PM on (2) AC/RCU/200	Preventive Maintenance	05/04/2011	12/01/2011
Tiger - UPS PM	Annual PM on (2) 00-01/2007	Preventive Maintenance	12/01/2010	12/01/2011
WCL, Checkb...	Annual PM on (2) 01/2/007	Preventive Maintenance	02/11/2011	02/11/2012
WCL, Checkb...	Annual PM on (2) PDU/PSU/1/2008	Preventive Maintenance	02/11/2011	02/11/2012
WCL, Checkb...	Annual PM on (2) 01/2/007	Preventive Maintenance	02/11/2011	02/11/2012
UPS 200	Unscheduled Maintenance on UPS	Unscheduled Maintenance		12/01/2011
WCL/1 - AC PM	Service Annual PM on (2) AC/RCU/200	Preventive Maintenance	12/01/2010	04/11/2011

Fig. 3.4.1: Sample maintenance schedule report

#### Hardware Maintenance

The field technician should assess the condition of hardware components and upgrade if required. He/she should be aware of the compatibility issue. He also need to maintain the warranty details of the components. If the warranty period is going to expire, he/she should communicate that with the customer and ask for any extended warranty he needs.

In this case, there are two ways:

- The customer can ask for extending the warranty period.
- The customer doesn't want to extend it. If there is any problem, he will buy a new one.

The field technician need to communicate about the above two ways and then tell the details of further procedure.

The following image shows a sample maintenance requirement form:

Fig. 3.4.2: Sample maintenance requirement form

The technician should maintain a checklist for scheduling the maintenance. The following figure shows a maintenance checklist:

Activity	Frequency	Auto?
Check power supply fan for ventilation and dirt build-up and clean if necessary	Quarterly	No
Back up CMOS information	Quarterly	No
Check processor temperature, inspect heat sink and fan to ensure they are working	Annually or Whenever case is open	No
Check hard disk for temperature and vibration	Annually (or whenever case is opened)	No
Clean exterior of case	Annually	No
Clean exterior of monitor	Annually	No
Check and clean interior, motherboard and expansion cards if necessary	Annually	No
Check internal connections and cables	Annually	No

Fig. 3.4.3: Maintenance checklist

### 3.4.2 Maintain the Copy of Invoice

Invoice is defined as a non-negotiable instrument given by the seller to the customer after purchasing of the goods and services. It acts as the bill of sale or contract of sale.



## UNIT 3.5: Achieving Productivity and Quality

### Unit Objectives

**At the end of this unit, you will be able to:**

1. Deliver the service within service level agreement (SLA) time
2. Identify customer's requirement and put them at ease by providing appropriate solutions
3. Achieve customer's satisfaction
4. Maintain no repeat or second escalation from customer

### 3.5.1 Deliver Service within SLA time

To achieve customer's satisfaction, it is necessary to deliver the service within the time as mentioned in SLA. Managing the expectation of a customer is not easy for a field technician. The expectations can turn into a grave problem if the responsibilities and the roles of both the parties are not clearly defined on paper and agreed upon by both the customer and the service provider.

An agreement of a sort is therefore important to understand that both the parties – customer and organisation– have duties and responsibilities to each other and these must be properly detailed. This is where Service Level Agreement (SLA) comes in. An SLA is a formal contract between the service provider and the customer, defining services, responsibilities, scope and duties of both the parties. For instance, an IT hardware company may offer routine inspection and maintenance service for a certain period of time as part of one time cost at the time of purchase of equipment.

The following image shows an SLA:



*Fig. 3.5.1: Writing out an SLA*

It's important for the service engineer to read and understand the SLA before visiting a customer, so that all the queries, support and service can be addressed according to the

terms specified. This will minimize all the issues related to service expectations of a customer.

The following figure enlist points required to achieve customer's satisfaction:

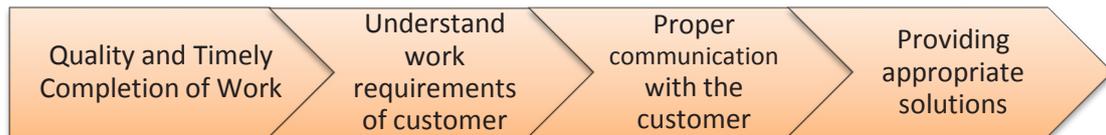


Fig 3.5.2: Points required to achieve customer's satisfaction

### Maintain Records of Activity

One of the most important parts of good customer service is maintaining accurate records, containing details of dealings with the customers. Customer records can help gather information about how best to market a company's services and also help to ensure that the organisation runs smoothly. Most records are stored electronically on a database.

### Objectives of Documentation

- To record all the problems reported by users.
- To record the timing of the corrective action.
- To record the issues that are escalated and to whom.
- To record what action has been taken by whom.
- To record when the outstanding requests get cleared.

## 3.5.2 Maintain No Repeat or Second Escalation from Customer

Zero defect in work can be achieved in the following ways:

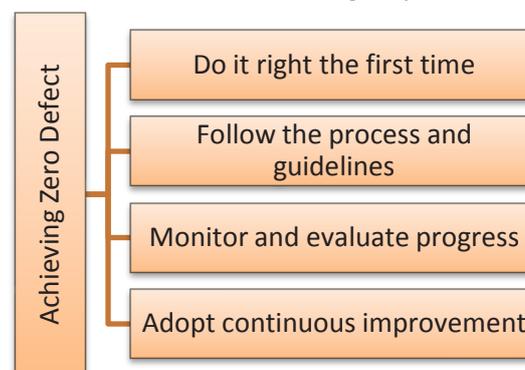


Fig. 3.5.4: Measures to achieve zero defect in work

### Escalation Process

There may be cases where the customer's request is not closed within the agreed SLA time frame. In such a situation, the technician should escalate the matter to his superior/ back line support and the escalation manager. The supervisor is responsible for ensuring that all escalated enquiries are dealt with and resolved promptly. However, the technician should try to exhaust all the options at his level before escalating any enquiry to the supervisor.

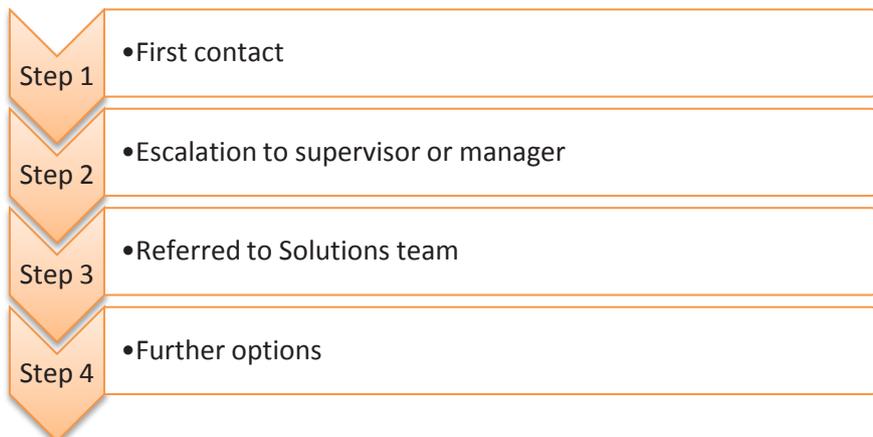
A customer enquiry should reach the supervisor only if there is a need to oversee the issue from a holistic viewpoint. The manager will evaluate the situation, facilitate the issue resolution and act as an advocate on behalf of the customer.

### Complaints escalation process

The technician should do everything to resolve an issue in the first instance. To facilitate the fast and efficient resolution of the issues at the first point of contact, a complaint process needs to be designed and followed.

If an issue is unresolved and needs expert guidance, the helpdesk technician should clearly explain the escalation options to the customer before proceeding.

The following figure illustrates the steps of a complaint resolution process:



*Fig. 3.5.5: A complaint resolution process*

- Step 1: First contact**  
 A helpdesk technician needs to be empowered to resolve first level complaints, complex issues and make rational customer service decisions.
- Step 2: Escalation to a supervisor or manager**  
 If a helpdesk technician is not able to resolve a complaint, it can be escalated to a supervisor or manager. The manager will review the problem, respond to the complainant and attempt to resolve the issue to the customer's satisfaction. In circumstances where the manager is unable to resolve the complaint to the customer's satisfaction, the complaint will be referred to the Solutions team.

- **Step 3:** Referred to Solutions team

The Solutions team will review and try to resolve the issue to the customer's satisfaction in accordance with industry code and regulation.

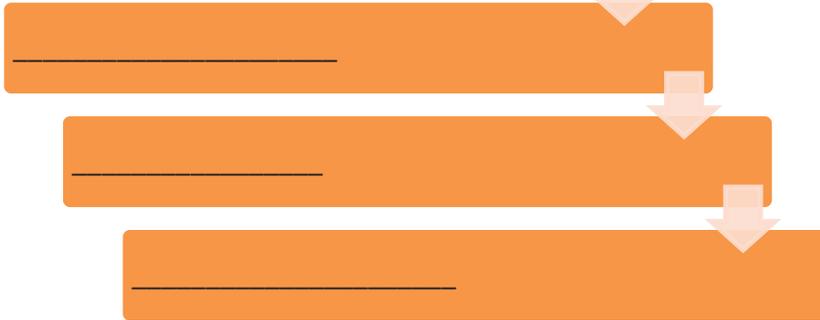
- **Step 4:** Further options

Most of the complaints can be handled internally by utilizing all possible avenues in resolving the complaint. However, if customer is still not satisfied with the handling of the complaint, then as a last resort helpdesk technician may seek complaint mediation or further assistance from the supervisor.

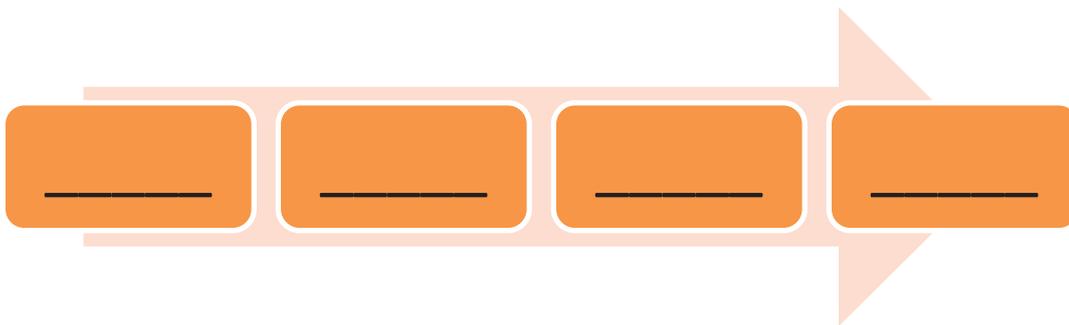
## Exercise

1. What are the measures to achieve zero defects in work?

Do it right the first time.



2. Write the steps of a complaint resolution process.



## Practical

1. Perform the steps to identify and fill in customer details in the invoice to be generated.

Equipment:

- Working system/Desktop
- Invoice
- Customer details

2. Perform the steps to record details of a faulty printer for escalation of the issues in the faulty printer as per customer inputs.

Equipment:

- Faulty printer
- Escalation form
- Customer details



## 4. Installing Hardware and Software

Unit 4.1 – Installing Hardware

Unit 4.2 – Configuring and Setting up Peripherals

Unit 4.3 – Completing the Installation Process



## Key Learning Outcomes



**At the end of this module, you will be able to:**

1. Install the hardware
2. Configure and set up peripherals
3. Set up the software
4. Verify the installations

## UNIT 4.1: Installing Hardware

### Unit Objectives

**At the end of this unit, you will be able to:**

1. Explain the installation procedures given in the manuals
2. Identify the specifications for setting up the system
3. Check site conditions and customer requirements
4. Connect the system
5. Follow standard operating procedures

#### 4.1.1 Reading the Product Manuals

A field technician is responsible for visiting a customer's site, reading the product or equipment manual and understanding how the equipment works and should be installed. Reading the manual plays a vital role in the correct installation/repair of the product. One of the common causes of non-functioning of components of a system may be its improper installation, which may happen due to non-compliance of user manual instructions. Hence, it is of utmost importance for a field technician to always follow the process and guidelines mentioned in the manual.

The product manuals are also known as user manuals. They contain all essential information for the user to make full use of the computer system. They include a description of the system functions and capabilities, contingencies and alternate modes of operation and step-by-step procedures for system access and use. The following image shows a typical motherboard instruction manual with a CPU:

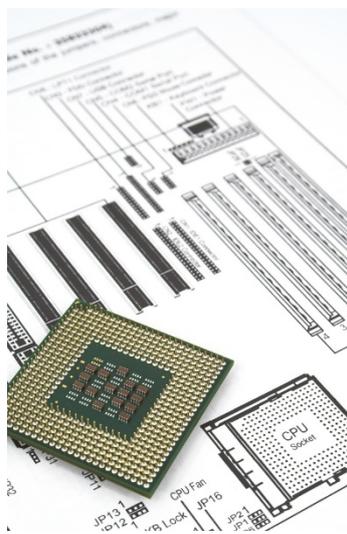


Fig. 4.1.1: Example of a user manual

A user manual generally has five sections. The following figure shows the five segments of a user manual:

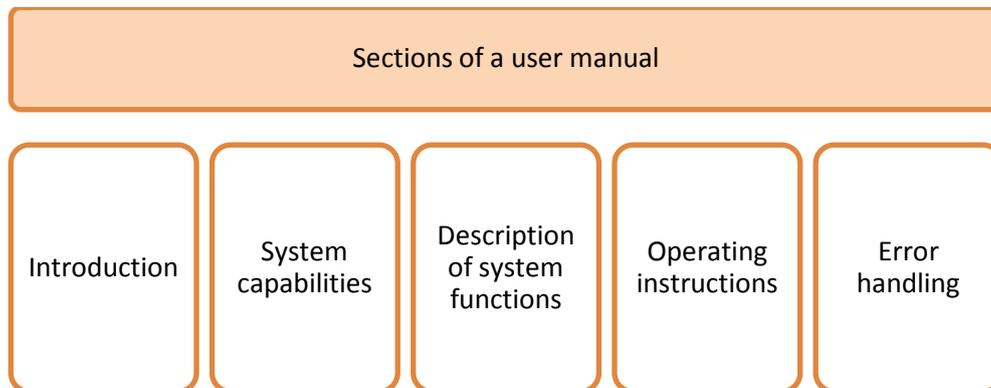


Fig. 4.1.2: Sections of a user manual

There is a help facilities section also available in the manual which describes a help desk facility that the user can contact for error resolution. Help desk telephone numbers are also included.

There are various sections in a typical help book of a particular equipment.

The following figure lists the contents of a user manual:



Fig. 4.1.3: Contents of a user manual

- **Cover page:** Shows the image of the equipment along with the manufacture's name. The title page shows the name of the equipment.
  - **Preface:** Gives a brief introduction to the equipment.
  - **Contents page:** Lists down the table of contents, that is, the list of topics along with the page numbers.
  - **Guide:** Includes all the instructions that enable a user to operate the equipment.
  - **Troubleshoot section:** Includes all the issues and the resolutions for them, which the users can handle at their end.
  - **FAQs section:** Covers all possible questions related to the product and the answers to them.
  - **Contact details section:** Provides a call centre or service centre number where the users can call and register their complaints and seek assistance to their grievances.
- Glossary section:** Includes terms which have been mentioned in the manual along with their definitions. Their page numbers are mentioned alongside.

### 4.1.2 Specifications for Setting up a System

To be utilized productively, all computer software need certain hardware components or other software assets to be available on a computer. These essentials components are known as computer system necessities and are frequently utilized as a guideline as opposed to an absolute rule. Most of the software specify two types of system necessities that are the minimum requirement and recommended. With expanding interest for higher processing power and assets in latest versions of software, system necessities tend to need some increment after some time. Industry experts recommend that this pattern has a greater influence in driving upgrades to existing computer systems than technological advancements.

#### Recommended System Requirements

Some manufacturers of a software often provide the consumer with a set of requirements that are different from those that are needed to run a usual software. These requirements are generally known as the recommended requirements. They are always at a level above that of the minimum requirements. They show an ideal situation which is required to run the software.

Along the same lines, it is recommended that a field technician, prior to a client visit, checks the site conditions. This will help in the analysis and identification of the actual conditions at a customer's site.

### 4.1.3 Check Customer Requirements

A field technician is responsible for the installation or repair/maintenance of the computer and its peripherals. When work is allocated, it is important to understand and analyse the requirement before going ahead with the plan of action or visiting the customer's site.

The following figure shows the workflow for the role of a field technician:

New Installation:	Carry the needed equipment, manual and warranty
	Carry the bill/invoice for new purchase
	Confirm the address and inform about the time of visit
Maintenance/Repair:	Ask about the service, repair, maintenance and Annual Maintenance Contract (AMC) of the equipment
	Carry the required tools and equipment parts
	Confirm the address and inform about the time of visit

Fig.4.1.4: The workflow for installation and repair

Before visiting the customer for installation or repair, it is important to understand the requirement of the customer. The following figure represents the various activities which should be done before a visit to the customer's site is scheduled:

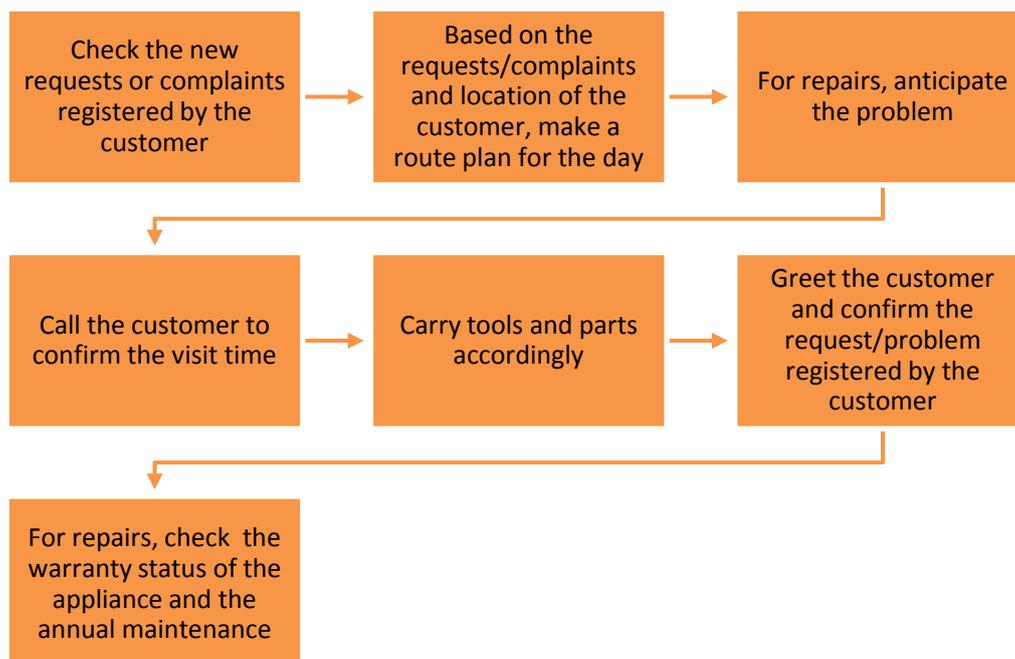


Fig.4.1.5: To-do list for a field technician

### 4.1.4 Setting up the System

There are certain steps involved in complete setting up of a system. The following figure lists the main steps involved in a system set up:

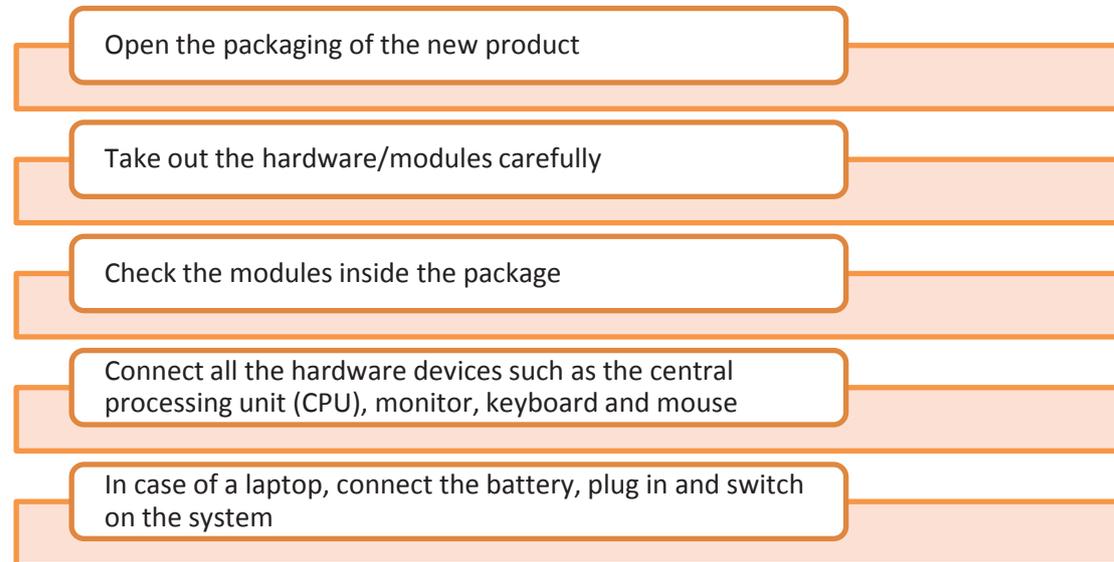


Fig.4.1.6: Steps involved in setting up a system

#### Open the Packaging

After getting the system to the site, remove the package carefully and check the modules inside it. They should match the checklist. The following figure represents the steps involved for unpacking the system to ensure proper installation:

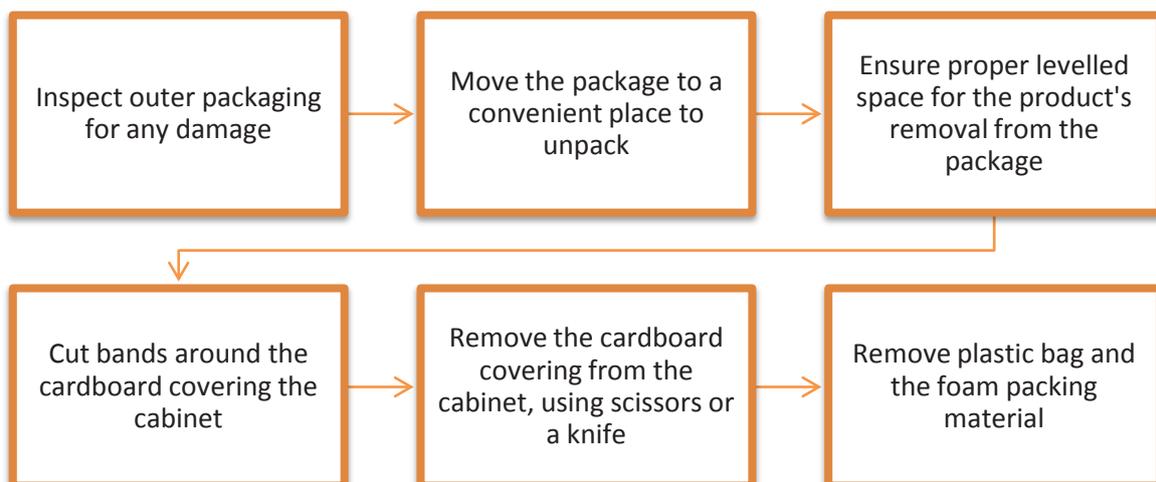


Fig. 4.1.7: Steps for unpacking a system

The tools used for handling and unpacking the system are shown in the following figure:

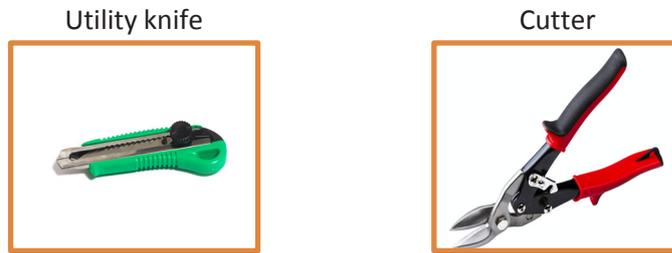


Fig. 4.1.8: Tools used in handling and unpacking a system

### Take out the Hardware/Modules

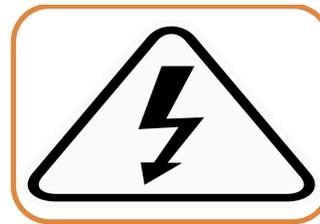
Take out all the hardware/modules carefully from the package. Check and understand the symbols on the package to know about the cautions and warnings related to the installation. The following figure depicts some common warning symbols along with their meanings:



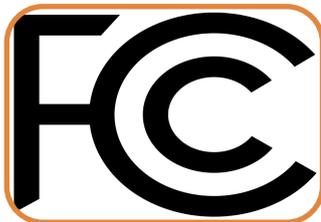
It represents a warning or a notice that is important.



It represent a product that is sensitive to electroStatic discharge (ESD).



It represent a warning for the potential of an electrical shock.



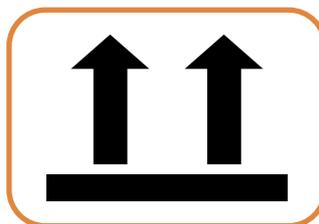
It means the package meets the FCC (Federal Communications Commission) guidelines.



It means the package are sensitive to water and should be protected.



It means the contents of a package are fragile.



The line shows the bottom and the arrows point upwards.

Fig. 4.1.9: Common warning symbols on a package

### Check the Modules

To ensure smooth installation, the modules inside the package must be checked so that if there is any module missing or any damage found, it can be informed to the company as early as possible. In addition, do the following things:

- Check all the modules for any damage that may be caused during shipping. If any damage is found, it should be reported to the carrier and the dealer
- Check for any cracks on the monitor screen
- Match the accessories against the delivery checklist

### Connect all the Hardware Devices

After checking all the modules, the next step is to connect all the hardware devices such as mouse, keyboard, Ethernet and so on to their respective ports. Computer ports are connecting points or interfaces with peripheral devices that work to communicate with the computer. For making the connection, correct identification of these ports is necessary. These ports are usually located at the backside of the CPU (in case of desktop computers). The following image shows the different connection ports for connecting mouse, keyboard, USB and so on:

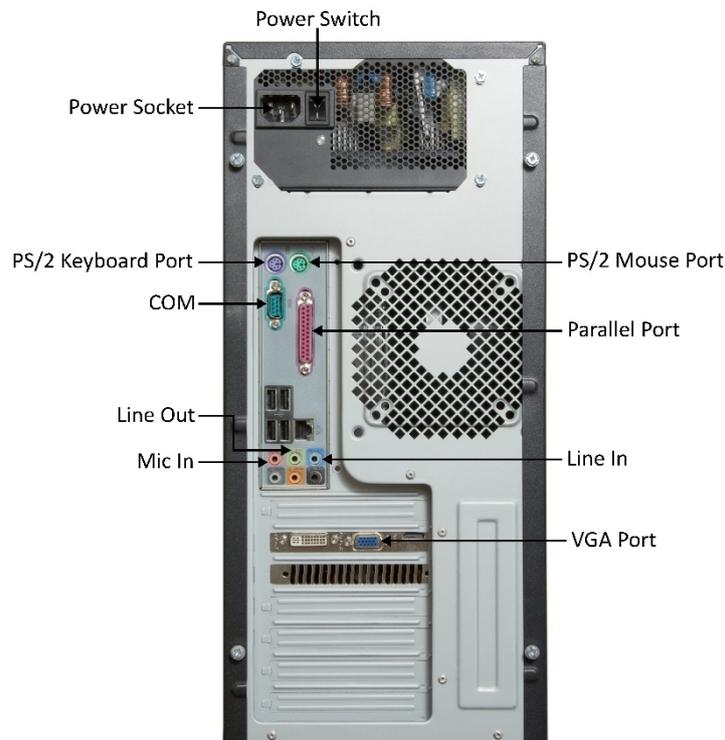


Fig. 4.1.10. Different connection ports in a desktop computer

In the case of laptop computers, the keyboard is attached to the monitor and other connection ports are located on the side of the laptop as shown in the following image:



*Fig. 4.1.11: Different connection ports in a laptop computer*

#### **Provide Power Source**

The last step of the assembling process is to provide power to the computer. In case of a desktop computer, the power can be provided by simply inserting the power plug into the socket and turning it on. In case of laptops, first the battery should be placed into its correct location. It needs to be charged after getting drained. For this purpose, an adapter is used, which generally comes along with the laptop.

### **4.1.5 Standard Operating Procedures**

Standard operating procedures provide a stable platform for performance measurements. All companies, be it small or large, have documented work standards to ensure consistent progress. It is the responsibility of the field technician to follow these standards. The technician should adhere to work standards to meet the targets and achieve sustainability in the workplace. He/she should also follow the safety standards to stay safe while working with electrical and electronic components.

The following figure lists a few standard operating procedures for a field technician:



*Fig. 4.1.12: Standard operating procedures for a field technician*

### **ESD**

ESD is the sudden build-up of static electricity when two differently charged objects are brought together. While manufacturing electronic products, ESD is one of the issues that arises, as it can cause damage to the electronic devices and components.

The following figure represents some causes of ESD:

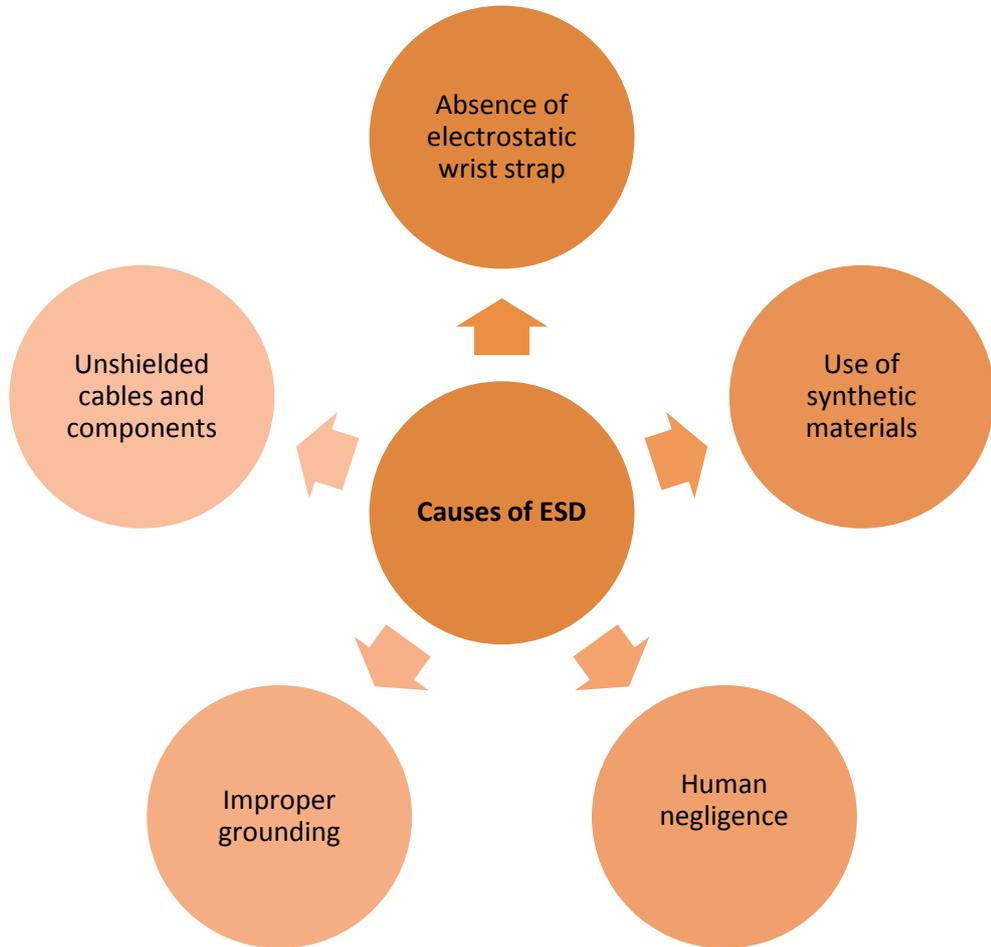


Fig. 4.1.13: Causes of ESD



## UNIT 4.2: Configuring and Setting up Peripherals

### Unit Objectives

**At the end of this unit, you will be able to:**

1. Identify the customer's peripheral requirements and their placement
2. Connect all the peripherals
3. Install the peripherals

### 4.2.1 Customer Requirements

Understanding the needs of a customer is one of the foremost parts of a technician's job role. This includes the following practices:

- Greet the customer and talk politely
- Understand the customer's requirement
- Provide the best possible and cost effective solution to the customer
- Ensure that the customer is satisfied with the service

When work is allocated, it is important for the field technicians to understand and analyse the requirement before going ahead with the plan of action or visiting the customer's site. This means that they should be able to understand what their customers want and also know how to satisfy their needs. They need to know how to deal effectively with the customers.

Requirement of some customers is such that they ask for additional peripherals apart from those which are provided by the manufacturer. A few of the peripherals which they want are printers, scanners, webcams, microphones, tape drives and speakers. It is important to understand which peripherals should be carried while visiting the customer's site. This can be achieved by talking to the customer prior to the visit.

Further, the technician should place all the peripherals as per the customer's need. Primarily, the field technician must listen to the customer, even if the viewpoint is the same – let the customer vent it off. After the customer has finished, express feeling and then respond accordingly.

Provide immediate response to the problem detailed by the customer, if possible. At times, it may mean bending the rules, but customer satisfaction is the key to success and going out of the way can just hit the nail on its head.

### 4.2.2. Connecting and Installing the Peripherals

After the correct placement of the peripherals, the next step is to connect them with the computer. Most printers, scanners, speakers and other peripheral devices are connected to the system via USB ports. The following figure shows how to connect various peripheral devices to the system:

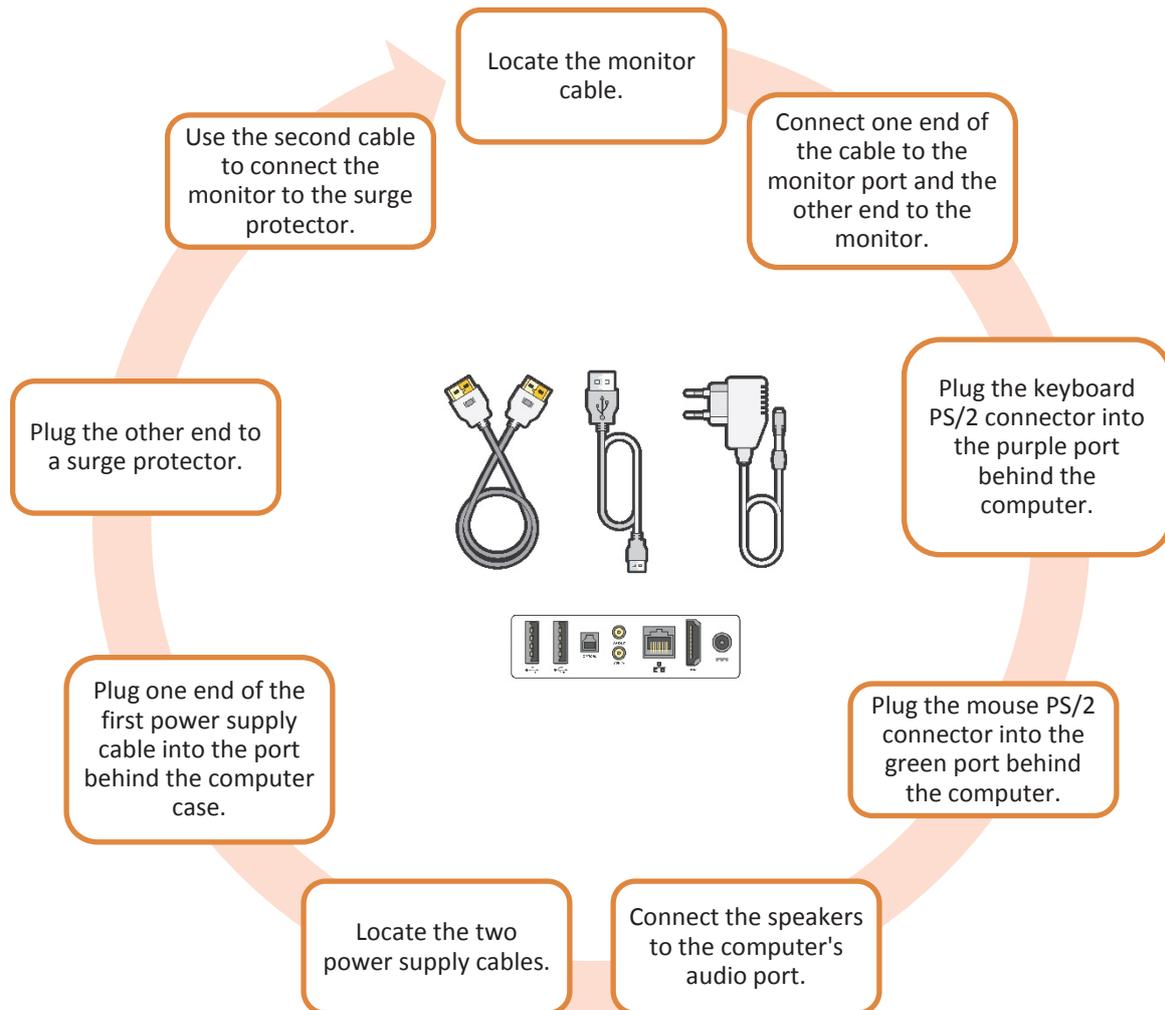


Fig. 4.2.1: Connection of peripherals

#### Installing a Printer

A typical printer includes components such as a cord, cable, ribbon and cartridges. Papers placed in the printer's tray are a part of the printing stationary and not of the printer.

The following figure lists the steps to install a printer:

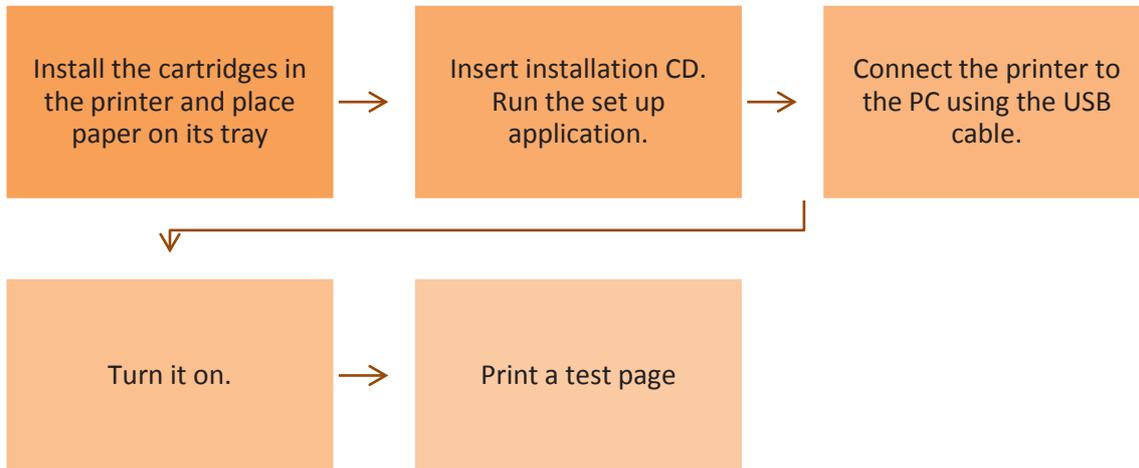


Fig. 4.2.2: Steps to install a printer

### Installing a Scanner

The following figure lists the steps to install a scanner:

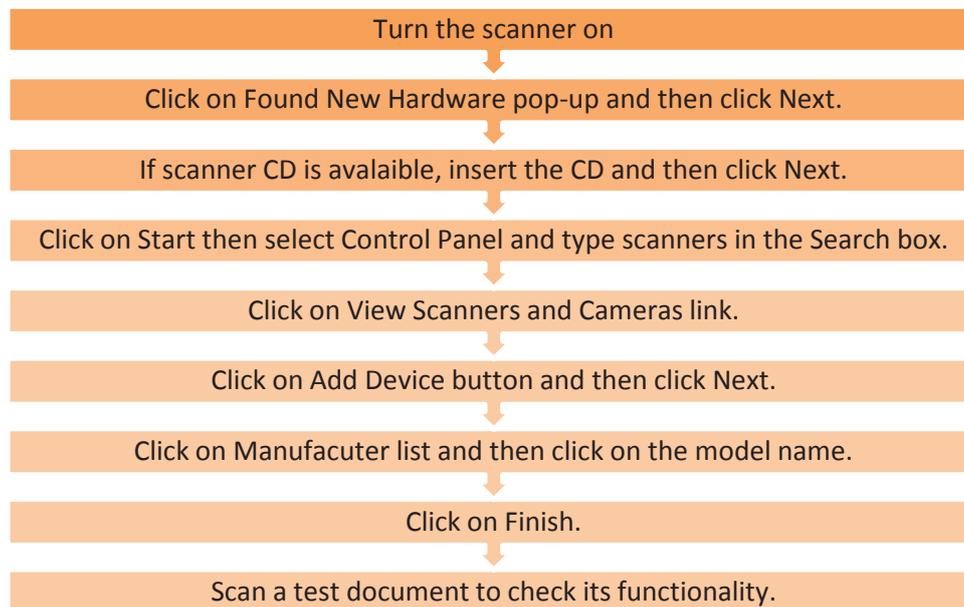


Fig. 4.2.3: Steps to install a scanner

### Installing a Modem

Before installing a modem, it should be ensured that it can work with the service provider of that area. In addition, compatibility of the modem with the current version of the OS should be checked.

The following figure lists the steps to install a modem:

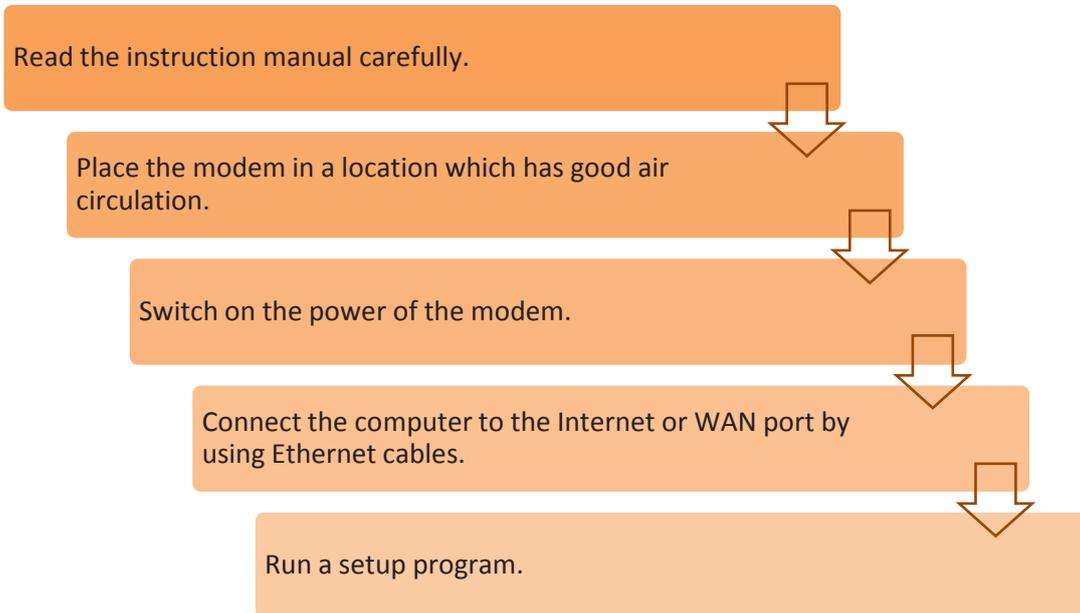


Fig. 4.2.4: Steps to install a modem

### Installing a Webcam

A very small amount of user input is required to install the modern webcams. Most of the webcams automatically get installed after being plugged in. If they do not get installed automatically, then the driver file from the manufacturer's website needs to be downloaded. The following figure lists the steps to install a webcam:

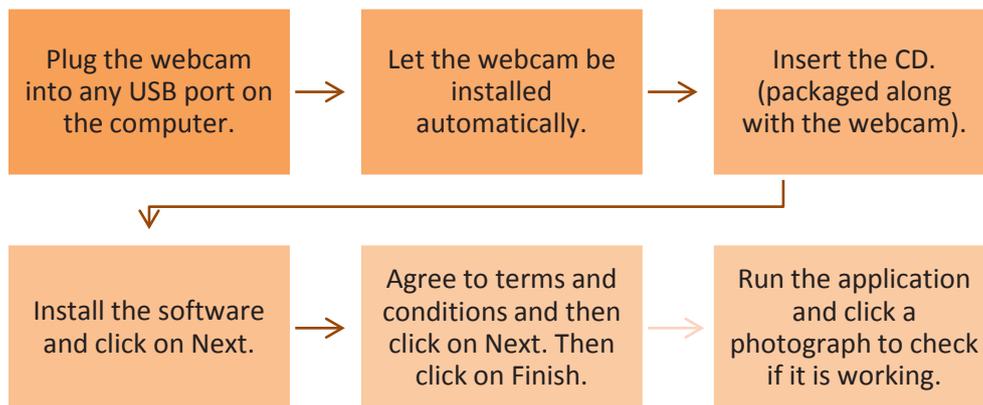


Fig. 4.2.5: Steps to install a webcam

### Installing Speakers

There are two types of speakers that can be installed in a system, that is, USB speakers and headphone jack speakers.

The following figures list the steps to install both the types of speakers:

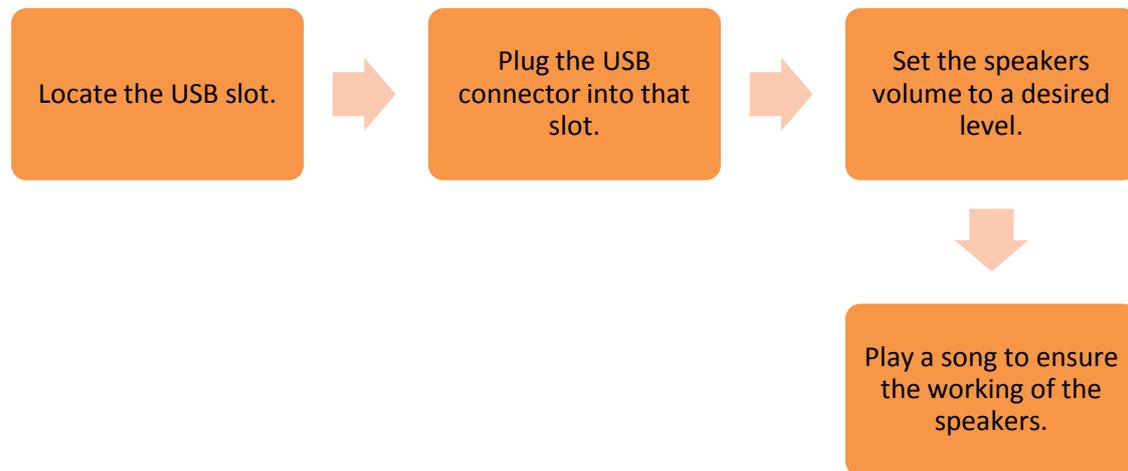


Fig. 4.2.6(i): Steps to install USB speakers

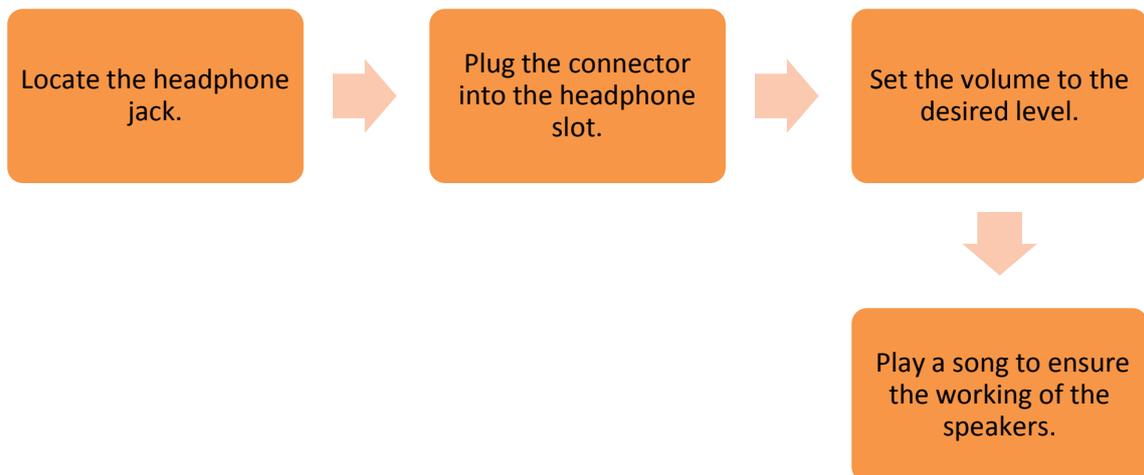


Fig. 4.2.6(ii): Steps to install headphone jack speakers

### 4.2.3. Installing Software

A software is a part of a computer which helps the hardware to function properly. It also helps the input/output devices to communicate with the CPU. It comprises of the operating system along with various programs of the computer.

A field technician is responsible for installing the operating system software on the customer's system. Prior to the installation process, it is mandatory to check the system requirements which include the storage capacity of the hard disk and random-access memory (RAM). In addition, he/she should be able to install additional software as per standard customer requirement.

### Installing the Anti-Virus Software

An antivirus software, also referred to as anti-malware software, is a software that helps to prevent, detect and remove unwanted, malicious software from a computer. Malicious software of malware is used to harm the computer and disrupt its functioning with the intention of gathering personal information from it. In absence of a good antivirus software, hackers can infect the computers with malware and steal sensitive data such as passwords, personal data and identity. The following figure shows the steps for standard antivirus installation:

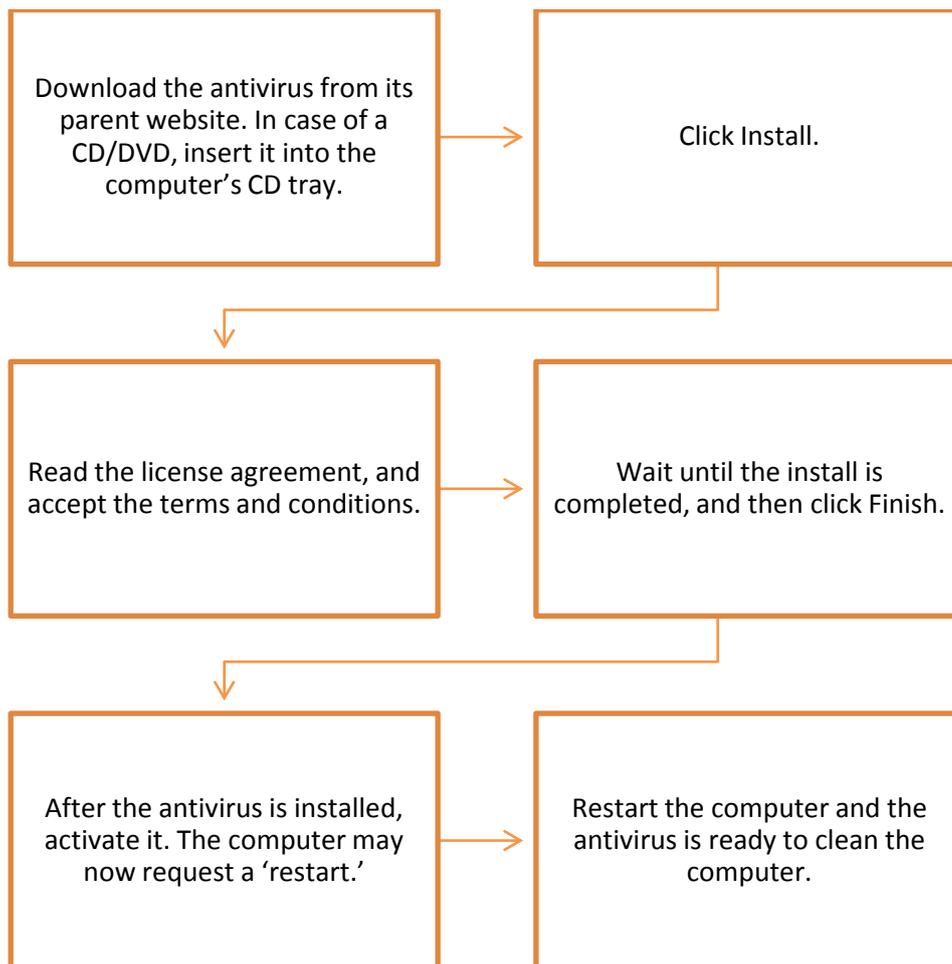


Fig. 4.2.7: Steps for standard antivirus installation

### 4.2.4. Safety Procedures

The field technician must adhere to the safety procedures. There are certain guidelines that must be followed to ensure own safety and that of the co-workers. These guidelines provide a sound, safe and flexible environment to work.

The following figure explains the general safety guidelines that must be followed by a field technician:

- Check if the tools and equipment are in a good working condition
- Wear personal protective equipment
- Keep the work area clean and free from clutter
- Maintain proper body posture at work
- Follow safety rules and guidelines
- Report any breach of safety

*Fig.4.2.8: Safety procedures*

The PPE needed by a technician includes:

PPE	Description	Image
<b>Safety goggles</b>	It protect eyes from any kind of spark or dust.	
<b>Rubber (safety) gloves</b>	It protects the wearer from abrasion, electric shock and vibrations.	
<b>Safety boots</b>	It protects the wearer from electrostatic build-up and slipping.	

*Fig. 4.2.9: PPE*

## UNIT 4.3: Completing the Installation Process

### Unit Objectives

**At the end of this unit, you will be able to:**

1. Check the functioning of the system
2. Check the functioning of the installed software such as antivirus
3. Ensure product functions are tested
4. Provide demo to the customer
5. Resolve customer queries
6. Take feedback from the customer

### 4.3.1 Check the System's Functioning

After installing all the required peripherals and software, it is mandatory to check the working of the system, to identify problems (if any) and to ensure its smooth functioning. For computing and display systems, keeping a check on problems at the initial stage ensures the longevity of hardware and software applications. The following figure lists some basic questions that must be answered to ensure the proper functioning of a system:

Is the computer switching on?

Are there any error messages?

Has any new hardware or software been added?

Has the computer been shifted?

Have there been any power outages or electrical storms?

Have all the power cords been reconnected and checked?

Is it a hardware/software issue?

Is there any malware or virus in the computer?

*Fig. 4.3.1: Basic questions to answer to ensure the system's proper functioning*

In addition, testing should also be performed to check the performance of a system as shown in the following figure:

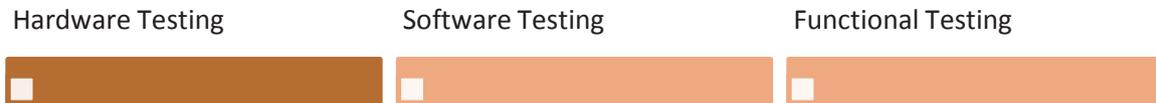


Fig. 4.3.2: Testing required for checking the system's functioning

### Hardware Testing

Hardware failures are responsible for problems, such as the computer not getting switched on by the user, it getting overheated or appearance of a blue screen. A computer can function only when all the components work well together. Consider a scenario, there is a broken hard drive, which implies that it doesn't work. Alternatively, it can also mean that it is slow or gives an error message on the screen informing that one of the hardware components is having an issue.

As compared to software issues, hardware issues are harder to tackle, as a process is needed to find out exactly which component is not working properly. Hardware diagnostics is run on most computers. It is used to check the health of the system and detect faults in normal operations of computers.

### Software Testing

When testing the software of a computer, the field technician should ensure that correct drivers are installed on that system. The technician should know how to use hardware troubleshooter, how to configure a device and how to download as well as install and update device drivers.

### Using Windows 7 Troubleshooter

To run the Hardware and Devices Troubleshooter in Windows 7:

- Select the Start button and click on Control Panel
- Type 'troubleshooter' in the search box and click on Troubleshooting
- Select Configure a device under Hardware and Sound tab

### Download and Install a Driver

- Select the Start button, enter "device manager" in the search box, and then click on Device Manager.
- Find the device that needs to be updated.
- Double-click on the device name.
- Click the Driver tab and select Update Driver.

**Update a Device Driver Using Windows Update:**

- Select the Start button, type "Windows Update" in the search box
- Select Windows Update
- In the left pane, click on Check for updates
- Select the updates that needs to be installed. Then select the check box for the driver that needs to be installed, then select OK.
- On the Windows Update page, select Install updates.

**Functional Testing**

Functional testing can be done at the end. This implies that the computer should be used as desired and then checked to see if its performance is up to expectations. For example, boot up the computer and browse the internet after connecting it to a network through a wireless fidelity (Wi-Fi). This action will check the working of the browser, the functionality of the Wi-Fi hardware and the configuration of the network connection.

**4.3.2 Check the Functioning of the Installed Software**

After installing the software, it is mandatory to check its functioning. If there is any software problem, it will manifest itself into various issues: freezing of the computer, pages not getting loaded, glitches during playing games or movies from the computer. A computer needs device drivers to perform these functions. If the correct drivers are not installed, it will lead to software issues. The only way to resolve such a situation is to install correct drivers followed by re-installing the software or upgrading the Windows program.

**Check the Functioning of an Anti-Virus Software**

The typical steps to run an antivirus are shown in the following figure:

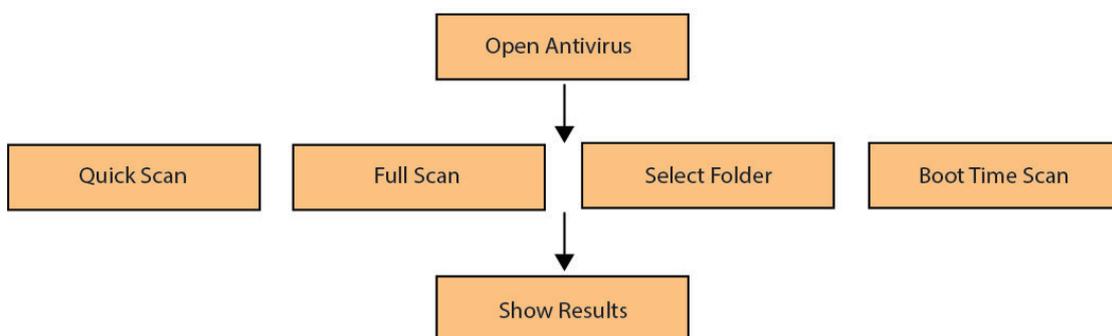


Fig. 4.3.3: Steps to run an antivirus software

Open the antivirus user interface by double-clicking the icon on the computer and select any of the following options:

- Quick scan - This will guide the antivirus to perform a scan on the area on the computer most susceptible to malware infection.
- Full scan – This performs an in-depth scan of the computer. All the files are scanned. It can take time to complete as it is a detailed scan.
- Select folder scan – If malicious files are only in a particular folder, select the folder(s) and perform scan on the specific or multiple folders.
- Boot-time scan – Some viruses are in the system but they do not show up after the computer is started. Perform a boot-time scan to detect and remove such viruses while booting.

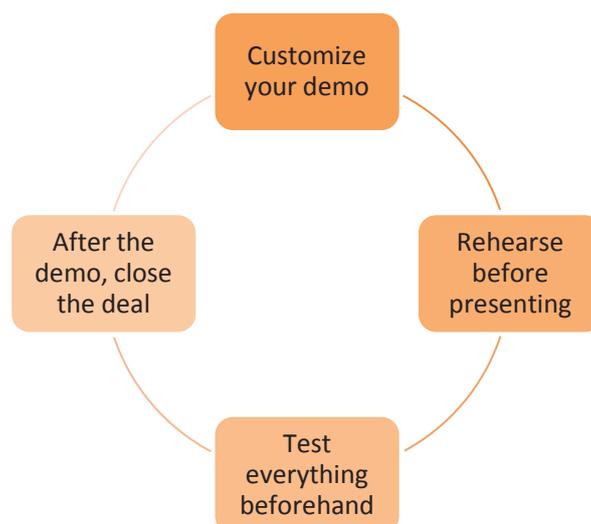
After the scanning is complete (irrespective of the option), a notification will appear with the scan result. If threat(s) is detected, click 'show result' to view the automatic action taken by the software. Action on a threat(s) can also be taken manually.

#### Providing Guidance to the Customer

Demonstrating a product is a way of promoting or showing the operation of an equipment to the users. The goal of demonstrating the workability of an equipment, such as a newly installed desktop, peripheral device, software or hardware, to the customer is to make them aware of the operation of that equipment and answer their queries related to its operation.

There is nothing better than a good demonstration session. It is only after a demonstration (demo) that the users understand the operation of a particular equipment.

There are a few rules which must be considered while preparing for the demo. The following figure lists these rules:



*Fig. 4.3.4: Rules to be followed to prepare for an effective demo*

In addition, it is the responsibility of a field technician to make the customers aware of the user manual and tell them how to read it.

It can be a user manual which contains instructions for the installation of a software/hardware or it may be a help book giving solutions to common problems that may arise with an equipment. The following figure lists the steps for reading a manual:

<b>Step 1: Determine information</b>	One must be able to determine and read as per the specified requirement rather than reading the entire document.
<b>Step 2: Scan the document</b>	Scan the document to determine its layout style and get a better idea about the manner in which the content is presented.
<b>Step 3: Find information</b>	Look up for the required information using headings, index or the table of contents.
<b>Step 4: Take notes</b>	It is essential to take notes for any important topic that one may come across while reading the document. Tips and warnings mentioned in the manual should also be noted.
<b>Step 5: Use glossary</b>	A person may come across technical terms while reading the document. Meanings of such terms can be looked up in the glossary section at the end of the manual.

*Fig. 4.3.5: Steps to read a manual*

Customers can have varied queries and issues. It is the core responsibility of the field technician to respond to them.

#### **Take Feedback from Customer**

Just like it is essential to address issues within the facility, it is also important to get feedback of the customer. The customer is always special and the customer's feedback is the most important thing for an organization.

The procedure as shown in the following figure should be followed:



*Fig. 4.3.6: Procedure to be followed for taking customer feedback*

The time taken to resolve an issue and the difficulties that a customer encountered while communicating the problem should be understood. The misunderstandings observed during the interaction should be clearly documented.

The methods of interaction and behavioural aspects also need to be considered in drawing conclusions after each task or problem handling routine. Getting honest feedback from the clients helps to improve the organizational functioning.

The field technician can get a feedback form filled by the customer at the facility.

The following figure shows a typical template for a customer feedback form:

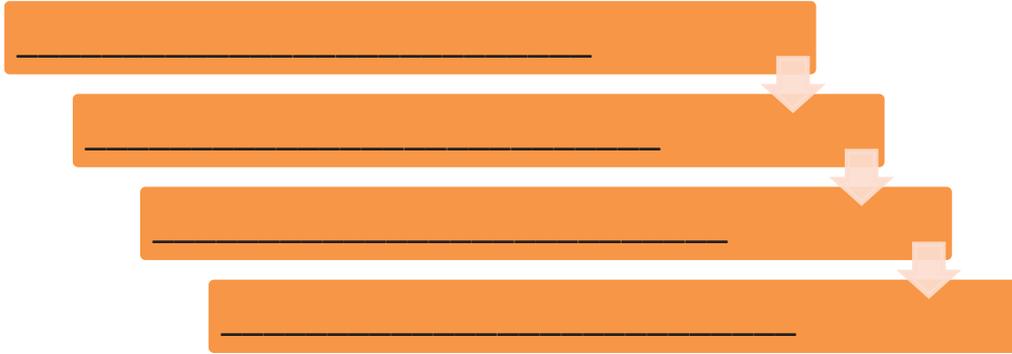
<b>Customer Feedback Form</b>			
<i>Please fill the form. We value your feedback.</i>			
Date: _____		Location: _____	
Service:	Complaint	<input type="checkbox"/>	New Connection
1. How would you rate our service?			
<input type="checkbox"/>		Very Good	
<input type="checkbox"/>		Good	
<input type="checkbox"/>		Poor	
2. Did the technician come with all the necessary tools and equipment to do the job?			
<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
3. Did the technician behave politely with you?			
<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
4. Did the wireman have knowledge of the work to be done?			
<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
5. Any suggestion which you would like to share.			
_____			
_____			
_____			

customer feedback form

Fig. 4.3 .7: A sample customer

## Exercise

1. What rules should be followed to prepare an effective demo?



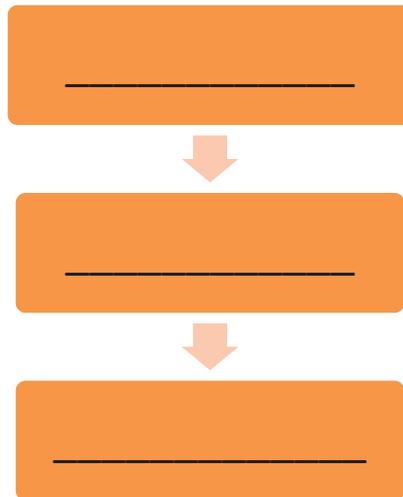
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2. What procedure should be followed for taking the customer feedback?



\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Practical

1. Perform the steps to install a printer and connect it to a desktop. Test its functioning after installation.

Equipment:

- Working system/Desktop
- Printer and cartridges
- Paper

2. Perform the steps to install Microsoft Office (MS Office) 2016 on Windows 10.

Equipment:

- Working system/Desktop
- Printer and cartridges
- Paper

3. While testing the laptop you realize that it is not giving audio output. How would you troubleshoot the problem?

Equipment:

- System with faulty sound card
- Flat/Phillips screwdrivers
- Screws
- Sound card
- Correct drive cables [Integrated Drive Electronics (IDE) or Small Computer System Interface (SCSI)]
- Audio cable to attach CD-ROM drive to sound card
- Installation disk for the new sound card

4. Perform the steps to set automatic updates of an antivirus.

Equipment:

- Desktop/laptop
- An older version of an installed antivirus





## 5. Repairing and Replacing Faulty Modules

- Unit 5.1 – Understanding Customer Complaints
- Unit 5.2 – Identifying System Level Problem on Field
- Unit 5.3 – Replacing Faulty Module
- Unit 5.4 – Completing Repairs
- Unit 5.5 – Reporting to Superior



## Key Learning Outcomes



**At the end of this module, you will be able to:**

1. Classify customer complaints
2. Identify system level problem on field
3. Replace faulty module
4. Complete the repairs
5. Report to superior

## UNIT 5.1: Understanding Customer Complaints

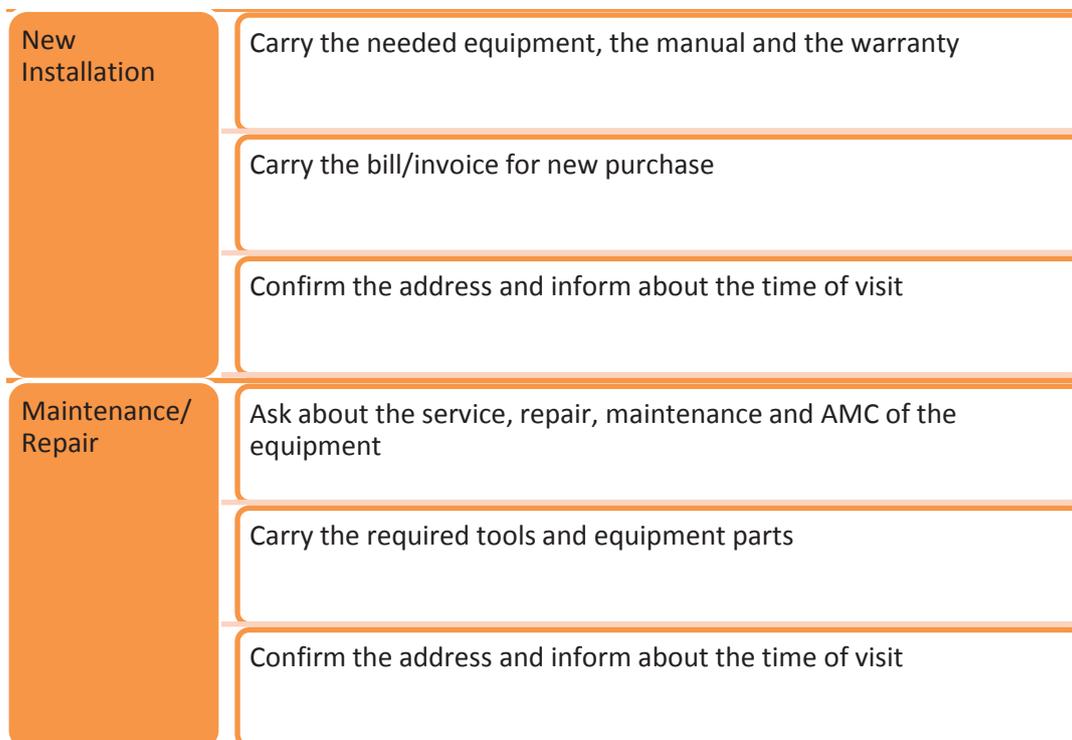
### Unit Objectives

**At the end of this unit, you will be able to:**

1. Identify the concerns of the customers
2. Interact with the customers on phone
3. Commence field trip based on the type of complaint
4. Explain product warranty, terms and conditions
5. Identify the type of problem and carry relevant tools and equipment
6. Assess the issue to decide between replacement and repair
7. Carry approved and verified replaceable parts

### 5.1.1. Identify the Concerns of the Customers

A field technician is responsible for the installation or repair/maintenance of the computer and its peripherals. When work is allocated, it is important to understand and analyse the requirement before going ahead with the plan of action or visiting the customer's site. The following figure shows the main tasks involved in the role of a field technician:



*Fig. 5.1.1: Workflow for installation and repair*

Before visiting the customer for installation or repair, it is important to understand the requirement of the customer.

The following figure represents the various activities which should be done before a visit to the customer's site is scheduled:

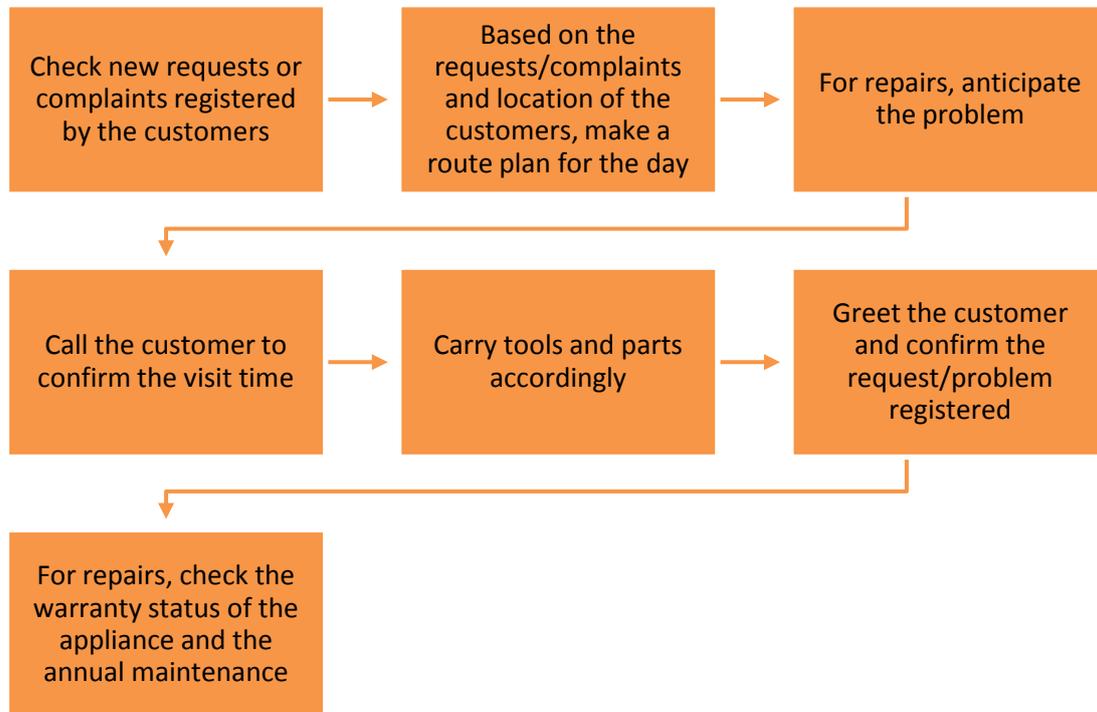


Fig. 5.1.2: To-do list for a technician

### 5.1.2. Interact with the Customers on Phone

Prior to visiting a customer's premises for repairing/servicing a computer, it is important to know the details of the problem and accordingly suggest a corrective measure. This can be achieved by calling the customer and asking about the problem in detail and then suggesting a possible solution. It is also important that the customer should be satisfied with the suggested solution.

The following figure highlights the to-do list to be followed when on a call with a customer before visiting the premises:

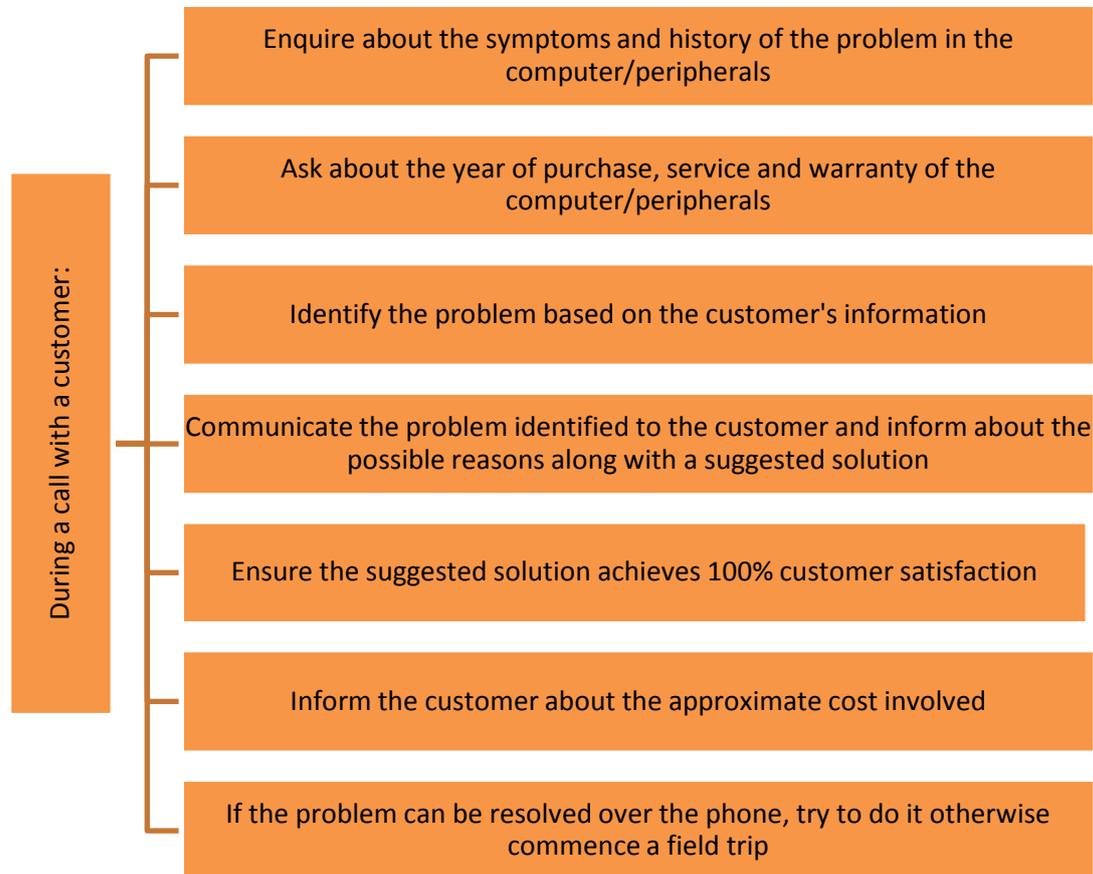


Fig. 5.1.3: To-do list to be followed when on a call with a customer

### 5.1.3. Troubleshooting

Troubleshooting refers to repair of faulty products or processes. It begins with searching for the source of a problem and ends with finding the solution for that problem to ensure that the product or process functions properly. Good troubleshooting consists of the following four steps:

- Identification of the symptoms
- Elimination of the causes of a problem
- Verification of the solution
- Restoration of the product or process

In other words, the first thing to do is to identify the symptoms that are causing a failure in the system. The next step is to diagnose the cause of that malfunction, till a solution is reached. This is followed by returning the product to its original state.

Proper knowledge and understanding of the behaviour of each of the components that make up a computer system is necessary.

A field technician should follow some simple steps for troubleshooting as shown in the following figure:

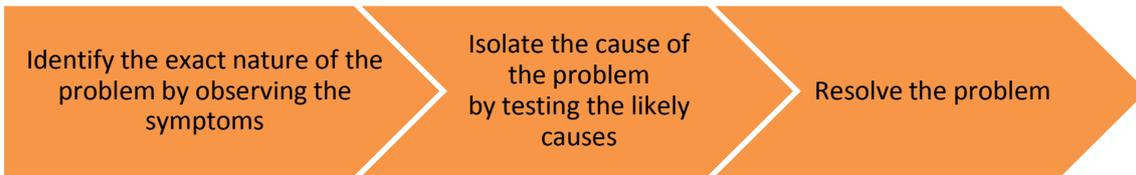


Fig. 5.1.4: Steps for troubleshooting

#### 5.1.4. Understanding Product Warranty and ID

A field technician should know the terms and conditions at which a product has been bought and should be able to read and understand the warranty provided. The technician should search for information such as shown in the following figure:

Tenure of the warranty

Time of beginning and expiring

The conditions that may void the coverage

The contact details to get warranty service

Action the company will take if the product fails—replace the product or refund the cost

Parts and issues covered

Coverage of consequential damage

Conditions or limitations of the warranty (some warranties provide coverage only if the product is maintained or used as directed)

Fig. 5.1.5: Required warranty information

In addition, the field technician should be able to make the customer understand about the warranty details.

### Reading Serial Number and Product ID

A field technician should have knowledge of product labelling of all software or hardware components. Serial number and product id give a unique identity to a component. The format of the serial number varies with the type of product and its manufacturers. The series of letters and numbers in a serial number may give information about the manufacturer, country of origin, year of production and number of unit. The following image shows the serial number of a product:



Fig. 5.1.6: Serial number of a product

The following image lists some examples of serial number and product id of different products:



Fig. 5.1.7: Serial number and product id of different products

The field technician should be able to find the product identification label for different products. For a notebook, the identification label may be at different locations, depending upon the manufacturer, as shown in the following images:



At the back



Inside the battery compartment



Under a cover on the back

Fig. 5.1.8: Identification label at different locations

Software serial numbers, also known as product keys, are included with the CD inside its packaging.

### 5.1.5. Problem Identification

The most important step of identifying a problem is to determine whether the problem is caused by a failure of hardware or software.

#### **Software Problems**

A software problem manifests itself as freezing of the computer, pages not getting loaded or glitches during playing games or watching movies on the computer. A computer needs device drivers to perform these functions. If the correct drivers are not installed, it will lead to software issues. The only way to resolve such a situation is to install correct drivers followed by re-installing the software or upgrading the Windows program.

#### **Hardware Problems**

Hardware failures are responsible for problems such as the computer not getting switched on by the user, it getting overheated or appearance of a blue screen. A computer can function only when all the components work well together. Consider a scenario where there is a broken hard drive. This implies that the computer could stop working. Alternatively, it could also mean that the computer becomes slow or gives an error message on the screen informing that one of the hardware components is having an issue.

As compared to software issues, hardware issues are harder to tackle as a process is needed to find out exactly which component is not working properly.

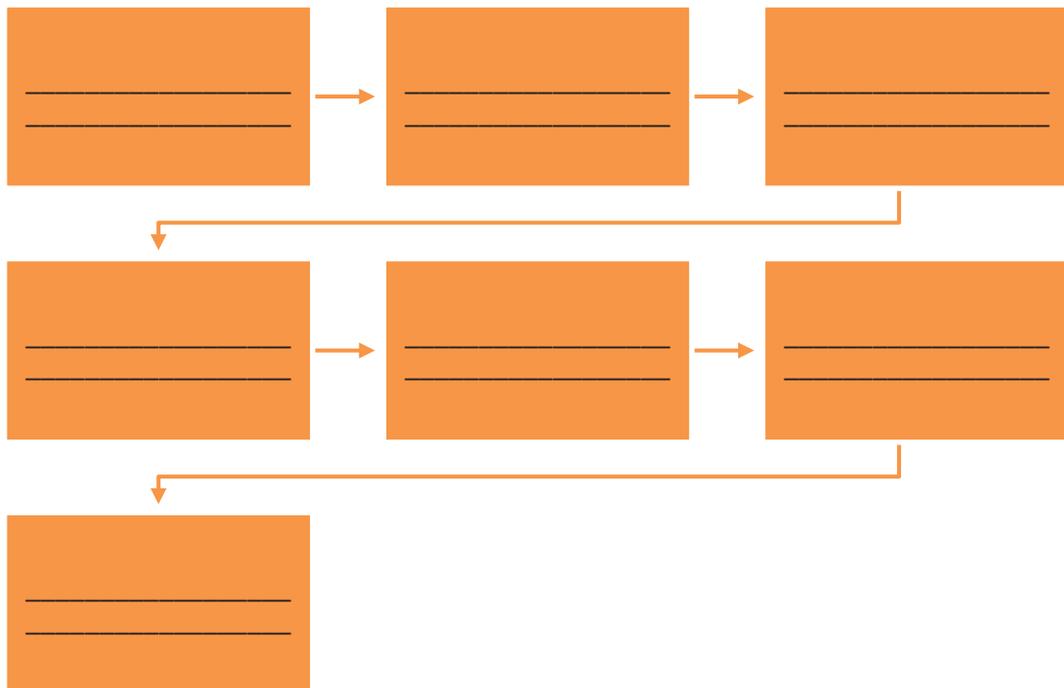
After identifying the type of the problem, the field technician must do replacement or repair of the faulty part. It is also important to carry approved and verified replaceable parts.

**Exercise** 

1. Write down the main tasks involved in the role of a field technician.

New Installation	_____
	_____
	_____
Maintenance/Repair	_____
	_____
	_____

2. various activities which should be done before a visit to the customer's site is scheduled:



## UNIT 5.2: Identifying System Level Problem on Field

### Unit Objectives



**At the end of this unit, you will be able to:**

1. Identify customer problems at their premises
2. Use appropriate tool and equipment
3. Perform root-cause analysis
4. Disassemble and check each part of a computing system
5. Follow standard operating procedures
6. Identify the solution design

#### 5.2.1. Identify the Customer Problems

Within an organization, customers' issues are reported to the field technician either through an email or through a telephone call. These issues are logged into the system by the technician or by the reporting person. Depending on the severity of the issue, the issues are resolved by the field technician.

There are many cases where the issues cannot be resolved remotely and need the field technician to visit the customer's facility for resolution. When the technician visits a customer's facility there are certain work processes that need to be adhered to.

The following figure lists these work processes:

Read and understand the service request to know the problem of the customer.

Be aware of the policy and restrictions to be followed at the customer's facility.

Seek details of the problem/issue.

Understand the configuration of different systems, architecture and layout.

Check the IT hardware such as storage, network devices, computers and server systems.

Resolve the issue by replacing the faulty module. If any external support is required, contact the appropriate person.

Fill the required documents such as service bill, service report, log book and so on.

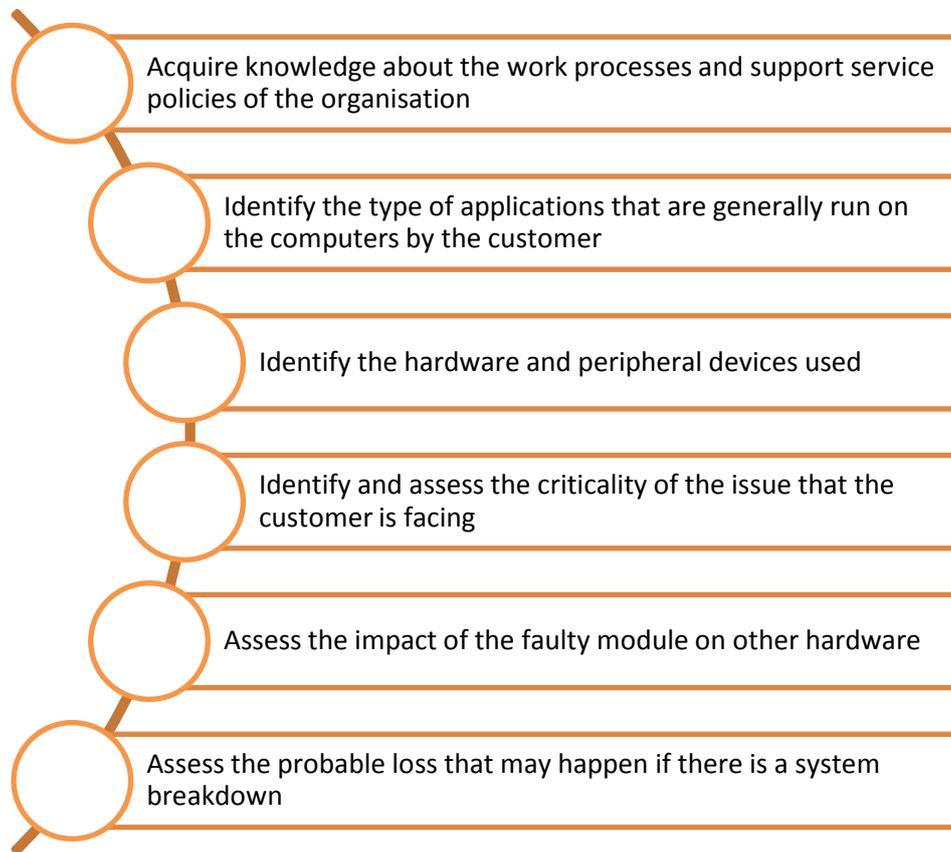
Take feedback from the customer in the organization's feedback form.

*Fig. 5.2.1: Common work processes at the customer's facility*

### 5.2.2. Assess Applications and Equipment in Use

The field technician should be aware of the types of applications that run on the systems of the customers and the importance of these applications to them. Furthermore, they also need to be aware of the critical hardware used at a customer's facility. Typically, server systems and network configurations are the most critical equipment and hardware in any organisation.

To analyse and identify the critical applications and hardware at a customer's site, the field technician should follow some key points, as shown in the following figure:



*Fig. 5.2.2: Key points for assessing critical issues*

Also, the field technician should check the call log database to be aware of similar problems faced by other customers. This helps in faster resolution of issues and thus saves time and effort. Therefore, it is imperative that based on the log database, the technician should stock replacement spares for regularly occurring problems.

For example, a customer reports that the printer is not printing anything on the paper. The customer has also tried switching the printer on/off and unplugging it. The field technician has tried to resolve the issue remotely by suggesting to the customer to check the print queue. But the problem has not resolved. The print queue shows that the file is printing, but the paper is blank.

In this case, the field technician would typically check the log database and from there the person would come to know that the primary issue in such cases is that the ink cartridge is empty and the printer driver is not able to identify this problem. Therefore, when the technician visits the customer's site to resolve this issue, it would be ideal to carry new cartridges for the printer along with the invoice. Since, this is a very common problem and the possible resolution is to replace the cartridges with new ones, therefore, the field technician should keep the spare ready and take them along for site visits.

### 5.2.3. Perform Root Cause Analysis

A field technician needs to identify whether the root cause of the problem lies in hardware or software. Hence, they need to troubleshoot the related components to look into the details of the problem.

For example, the client's printer is not working properly. To resolve the problem, the field technician should check:

- Whether there is problem in the connection
- Or in the printer
- Or in the driver installation

In addition, a field technician should be aware of fault tolerance and fault handling techniques. It becomes easy to troubleshoot a device when the system is equipped with these techniques.

Fault tolerance means the ability of a system to continue working in the event of a fault that may be due to hardware or software.

Fault handling means that once the fault has been identified, the field technician should be aware of all the possible causes and their corresponding resolutions.

The overall action plan for handling software faults is shown in the following figure:

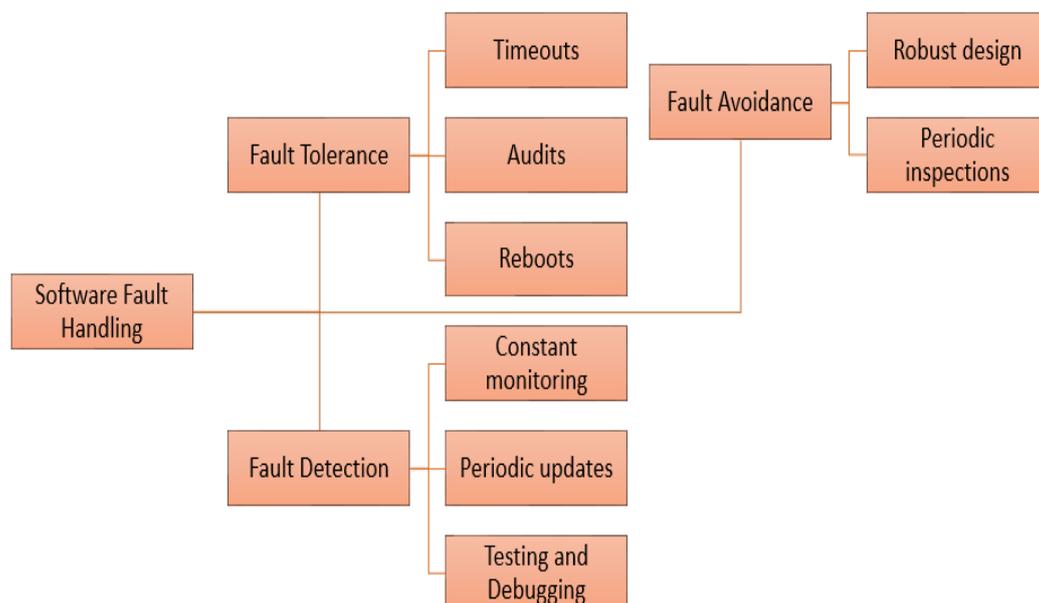


Fig. 5.2.3: Action plan for handling software faults

The overall action plan for handling hardware faults is shown in the following figure:

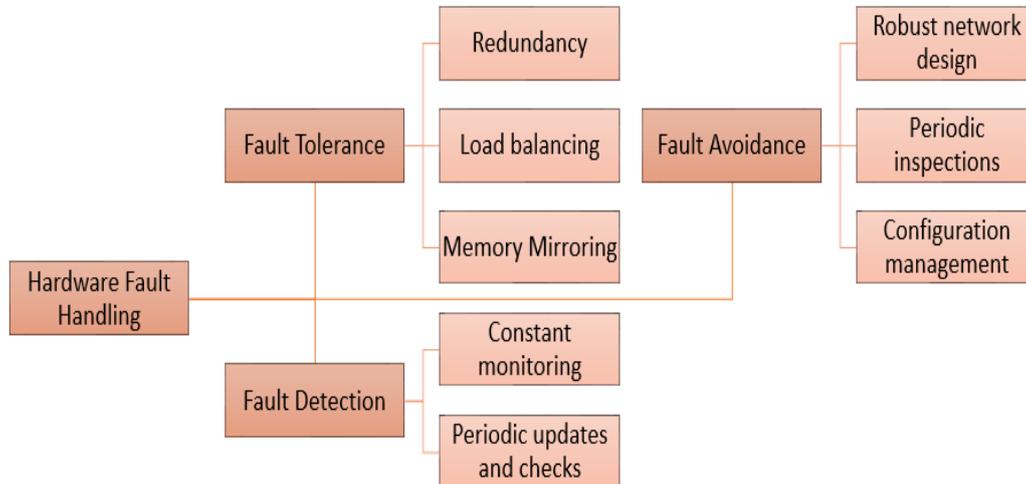


Fig.5.2.4: Action plan for handling hardware faults

### Software Fault Tolerance

Software fault tolerance refers to the ability of a software to continue operation even if there are system or hardware faults present in the system. It provides the software the ability to detect a fault while it is occurring, or which has already occurred, and recover from it.

Software fault tolerance techniques can be used to lessen the impact of the software faults. The objective of these techniques is to nullify the damage that is caused by them.

A field technician should be aware of these techniques so that it becomes easy for him/her to troubleshoot issues at the customer's facility. The following figure lists some techniques of software fault tolerance which a field technician should know:

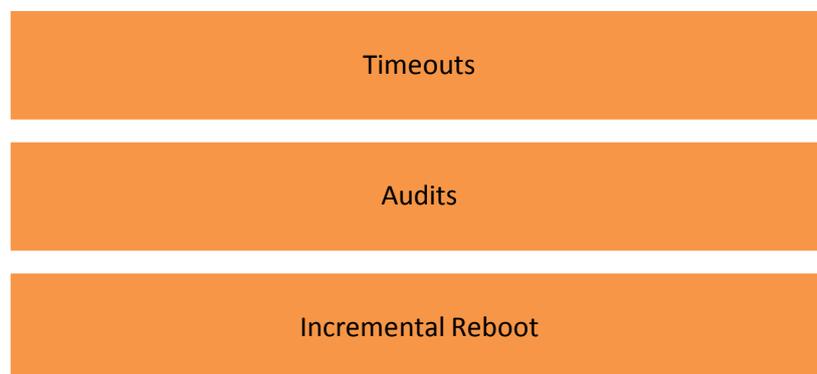


Fig. 5.2.5: Software fault tolerance techniques

## Timeouts

Timeout is used by most of the real-time systems that process data which comes in without any buffering. A timeout signals that some components which are involved in the process have faulted and a fix is required. There are two possible actions for this process, Retry or Abort (cancel).

The following figure shows how Retry and Abort work:

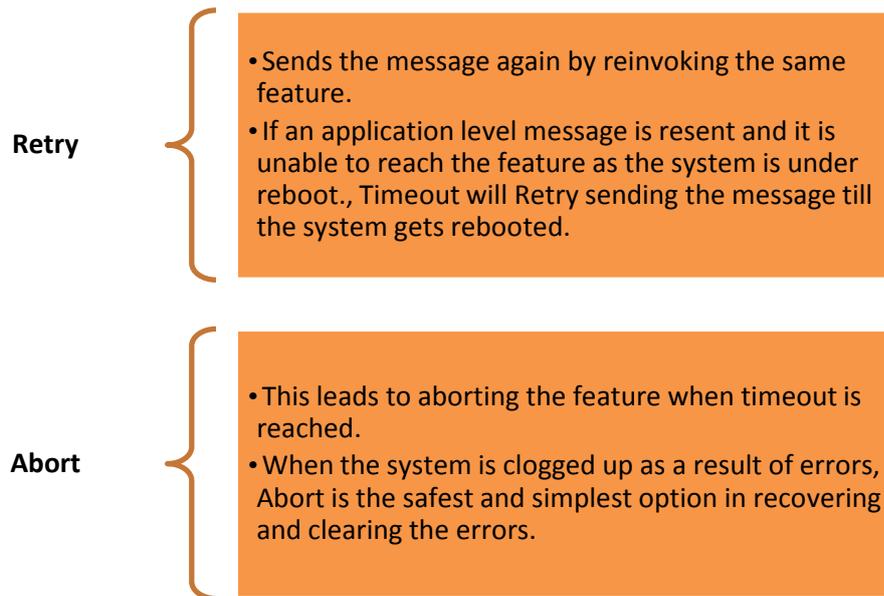


Fig. 5.2.6: How Retry and Abort work

The Timeout messages vary from one platform to another. The following images show typical timeout messages on different platforms:



Fig. 5.2.7: Timeout messages on different platforms

Whether a request should be cancelled or retried depends on several factors. The following figure lists a few of these factors:

How important is system stability	<p>When system stability is important, the Retry option should be used.</p> <p>For example, one should not abort a system startup feature on a single timeout.</p>
How important is system performance	<p>When system performance is the main concern, starting and stopping of operations frequently may lower it.</p> <p>So, aborting the feature is the better option on timeout of the feature.</p>
Implementation of complexity level	<p>If the user keeps on retrying without considering the abort option, the whole design may go beyond debugging because of the code getting complicated.</p> <p>So, aborting is the better option</p>

*Fig. 5.2.8: Factors for choosing Retry or Cancel*

Most of the times the two options, Retry and Cancel, are used together. If no response is received after retrying a feature a certain number of times, then it might be aborted.

### **Audits**

An audit is a method of checking the consistency of data structures across multiple processors in a system.

A field technician should be able to read the audit log files. These files are the output of the Audit programs that are defined in a system. For example, an Enterprise Resource Planning (ERP) system has more than one layer and contains multiple processors. Hence, any break in signals because of hardware failures, software bugs, protocol failures or any independent processor reboot may lead to data inconsistency.

The following screenshots show some sample audit log files:

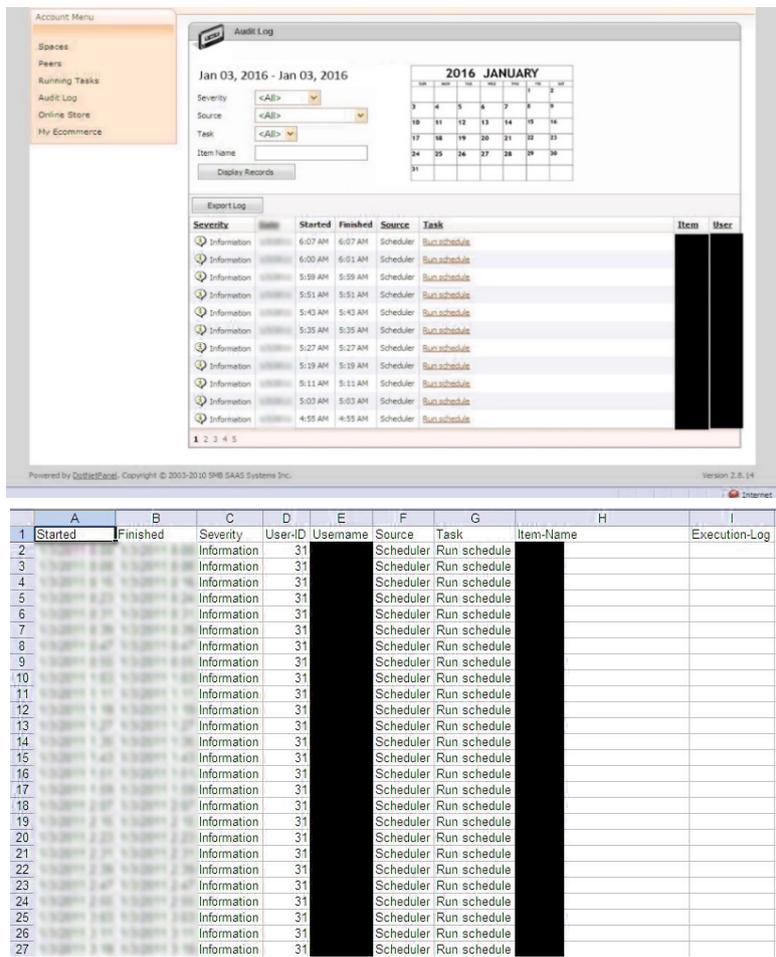


Fig. 5.2.9: Sample audit log files

### Incremental Reboot

Rebooting the software processors repeatedly is time consuming. To save time, as well as work disruptions, real-time systems use incremental reboot procedures. The following figure shows the system reboot levels:

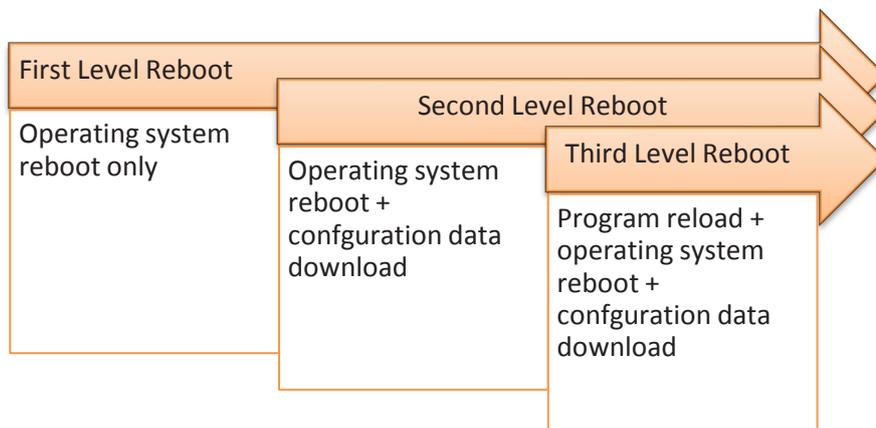


Fig. 5.2.10: System reboot levels

Generally, first level reboot resolves the issue. However, sometimes, the processor keeps first level rebooting of the system due to some hardware fault. This results in overflowing of the first level reboot counter, which in turn leads to second level reboot.

Typically, second level reboot resolves the issue. In case, even the second level reboot is unable to resolve the issue, then the processor keeps second level rebooting of the system. This results in overflowing of the second level reboot counter, which in turn leads to third level reboot.

### **Hardware Fault Tolerance Techniques**

Hardware fault tolerance provides a real-time system the ability to run even when there is hardware failure. Critical systems, such as servers, should have this arrangement incorporated to nullify loss. The techniques used to incorporate hardware fault tolerance are redundancy, load balancing and memory mirroring.

#### **Redundancy**

Real-time systems are installed with redundant hardware so that whenever a fault takes place, they takeover and thus prevent downtime and loss. Some methods of hardware redundancy are:

- **One for One redundancy** – Each hardware module contains a redundant module, the Passive module. The primary module (Active module) and the secondary module (Passive, redundant module) are exact replica of each other. The Passive module monitors the Active one and takes over if there is an Active module failure. The probability of failing of both the modules at the same time is very low.
- **N+X Redundancy** – Similar to the One for One Redundancy method, this method uses a specific number (say, X) of Passive modules for N number of Active modules. Moreover, there is also a main hardware module which monitors and tracks the Active N modules. This main module decides which Passive module will take over in case an Active module fails.

#### **Load Balancing**

In ideal conditions, the hardware modules share the load. There is a top-level module, the main module, which distributes the load evenly and maintains the health status of the hardware modules simultaneously.

If any hardware module fails, the main module enables the distribution of the load among the rest of the modules. This setup makes a compromise with the system performance but ensures availability of system at all times.

#### **Memory Mirroring**

In this technique, the system setup contains two parity based memories and two CPUs – one active and one passive. The passive CPU does not have any memory and the active CPU keeps writing on both the memories. The passive CPU monitors the active CPU continuously. If a fault is detected, it takes over. When the memory is read, both the memories are compared. If there is any mismatch, the processor considers the output of the correct memory and tags the other one as faulty.

### 5.2.4. Disassembling the System

A desktop or a laptop needs to be disassembled and then again assembled if the components inside either of them need to be repaired or cleaned. The steps to disassemble a desktop are shown in the following figure:

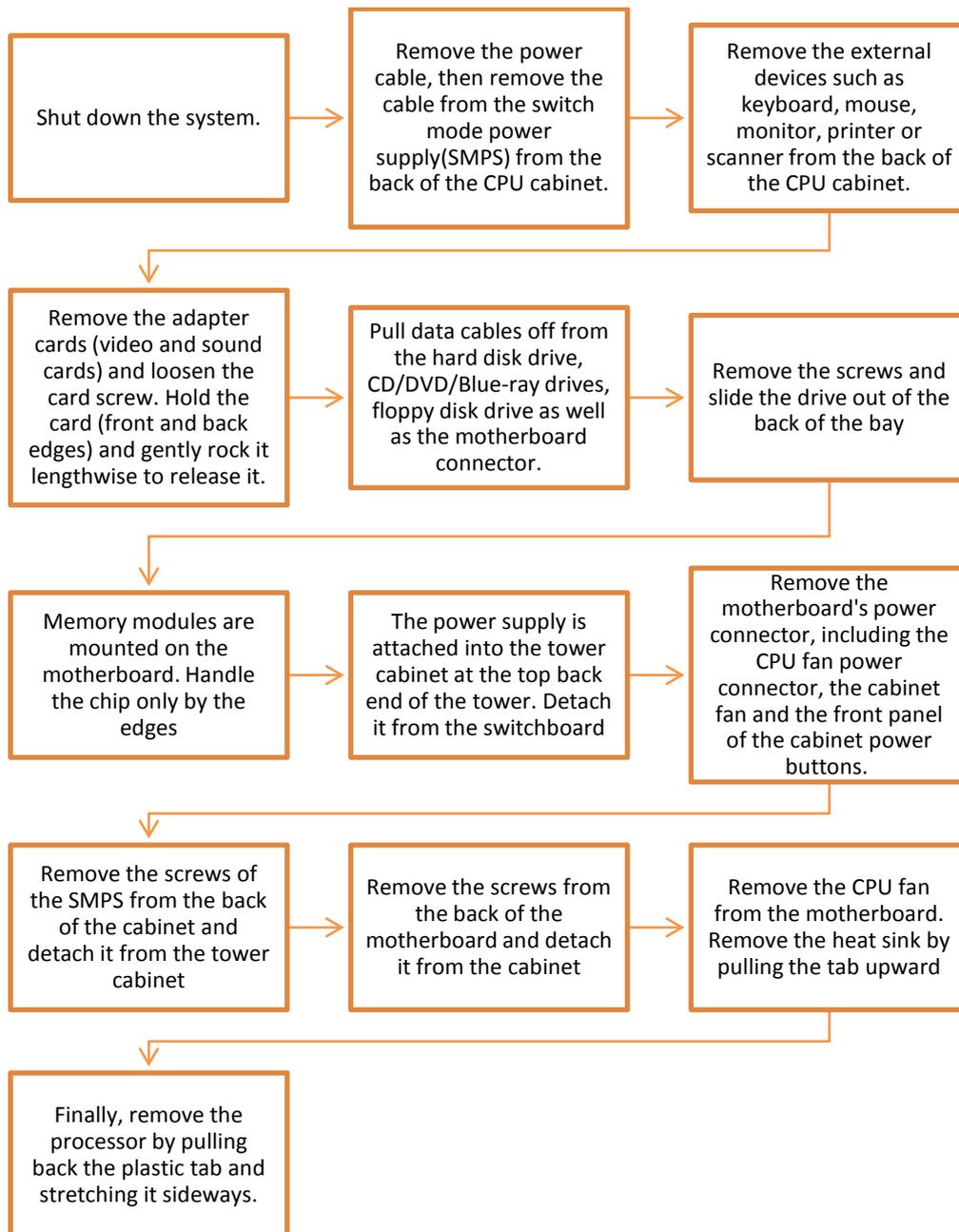


Fig. 5.2.11: Steps for disassembling a desktop

The steps to disassemble a laptop are shown in the following figure:

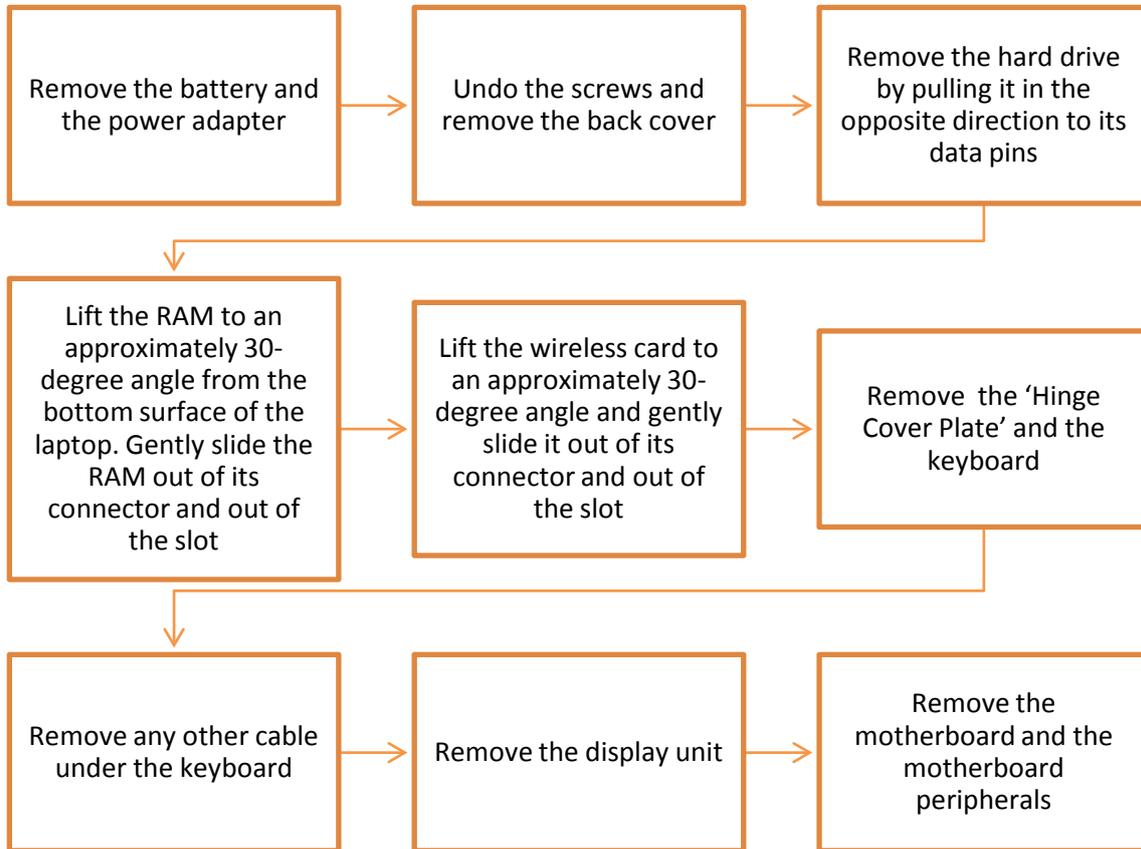


Fig. 5.2.12: Steps for disassembling a laptop

### 5.2.5. Identify the Faulty Module and Perform Troubleshooting

The following table lists some common hardware problems and their solutions:

Issue	Diagnosis	Solution
Printer Error (Orange or Blinking Light)	No Light in Power Indicator of Printer	<ul style="list-style-type: none"> <li>• Ensure that the printer is switched on.</li> <li>• Reconnect all the printer cables.</li> <li>• Switch off the printer and turn it on again.</li> </ul>

	No Paper or Paper Jam	<ul style="list-style-type: none"> <li>• Ensure that the printer has paper.</li> <li>• Remove any paper stuck in the roller.</li> <li>• Restart the printer.</li> <li>• Try printing again.</li> </ul>
No Flashing Light but Cables Properly Connected	No Printer Driver	<ul style="list-style-type: none"> <li>• Check the printer driver.</li> <li>• If needed, update the driver.</li> <li>• Check the connectivity of the printer using the print manager.</li> <li>• If the printer is a parallel port printer, verify the following settings: <ul style="list-style-type: none"> <li>• Enter the computer's CMOS setup.</li> <li>• Enable the parallel port.</li> <li>• Ensure that the printer is on parallel port mode.</li> </ul> </li> <li>• Disconnect devices such as scanner or zip drive if they are parallel with the printer to ensure that they are not causing issues with the printer.</li> </ul>
A Program is Not Responding.	The Computer is Frozen	<ul style="list-style-type: none"> <li>• Press the Ctrl +Alt and Delete keys simultaneously.</li> <li>• Open the Task Manager and highlight the program's name. Then press the End Task button.</li> <li>• Manually turn=off the computer by pressing the on/off button.</li> <li>• Once the computer responds again, run a virus check.</li> </ul>
The Keyboard is Not Working	Improper Connection	<ul style="list-style-type: none"> <li>• Ensure that the keyboard is connected to the computer.</li> <li>• In case of a wireless keyboard, try changing the batteries.</li> </ul>

	Key Got Stuck	<ul style="list-style-type: none"> <li>• Switch off the computer.</li> <li>• Clean the keyboard with a damp cloth.</li> <li>• Restart the computer using the mouse.</li> </ul>
New Hardware or Software is Working Incorrectly.	Incompatibility Issue with System Configuration	<ul style="list-style-type: none"> <li>• Check that the computer meets the requirements of the program or utility.</li> <li>• Uninstall the program and then reinstall it.</li> </ul>
The Mouse is Not Working Correctly.	Improper Connection	<ul style="list-style-type: none"> <li>• Ensure that the mouse is securely plugged into the computer.</li> <li>• Ensure that the cord is not damaged.</li> <li>• If the mouse is plugged into a USB hub or USB switch box, remove it and plug it directly into the computer.</li> <li>• In case of a cordless mouse, re-establish the connection by pushing the connection button on the underside of the mouse.</li> <li>• Clean the mouse thoroughly.</li> </ul>
The Computer has No Sound.	<p>Problem in the Sound Card or the Audio Driver</p> <p>Improper Sound Settings</p>	<ul style="list-style-type: none"> <li>• Go to the volume control in the system tray and check the volume and the mute check boxes.</li> <li>• Check the input and output wires of the speakers.</li> <li>• Check the functioning of audio drivers.</li> <li>• Check the functioning of the sound card.</li> </ul>

PC Not Connecting to the Network through LAN	Problem in Network Configuration	<ul style="list-style-type: none"> <li>• Go to the network setting and check if the Ethernet is enabled.</li> <li>• Check the working of the modem.</li> <li>• Check all the wires and connections.</li> <li>• Check the LAN card.</li> <li>• Check the IP Address and DNS settings.</li> </ul>
No Power	Improper Connection Faulty PSU or SMPS Unit	<ul style="list-style-type: none"> <li>• Ensure that the power cord is plugged into the supply.</li> <li>• Check whether PSU is putting out enough voltage.</li> <li>• Switch off the computer and detach all devices.</li> <li>• Reinstall each device one by one.</li> <li>• Switch on the computer after each device.</li> <li>• If the system does not switch on after installing a particular component, replace it.</li> <li>• Check the SMPS unit.</li> <li>• If the system does not switch on after reinstalling all the devices, it may be a motherboard or CPU problem.</li> </ul>

Blank Screen (Nothing Appears on the Screen)	Improper Connection or Display Settings	<ul style="list-style-type: none"> <li>• Check if the monitor and the CPU power is in On position.</li> <li>• Check if the monitor is plugged into the CPU.</li> <li>• Ensure that the power cable is plugged into the monitor and is not loose.</li> <li>• Some CPUs have multiple ports for display. Check each port by plugging in securely.</li> <li>• When the power button on the monitor is pressed, some status is displayed. This means that the power to the monitor is in On position and the screen display is okay.</li> <li>• Check the cable running from the CPU to the monitor.</li> <li>• Check the brightness level using the menu button on the monitor. It may have been set to dark.</li> <li>• Check that the computer is not in the screensaver or sleep mode.</li> </ul>
Computer Doesn't Show Power		<ul style="list-style-type: none"> <li>• Ensure that the power cable is connected to the CPU and to the monitor.</li> <li>• Check the power socket.</li> <li>• Replace the power socket with a different one or if power extension board is used, plug the power directly into the socket.</li> <li>• Replace the power cable.</li> <li>• Check if the LED at the front of the monitor is in On position. If yes, then the CPU must be at fault.</li> <li>• If LED at CPU is in On position then it might be a monitor issue.</li> <li>• If none of the LED is in On position, then it may be a local power issue.</li> </ul>

Fig. 5.2.13: Hardware problem and their solutions

The following table lists some common system problems and their solutions:

Problem/ Symptoms	Action
Devices Not Listed in BIOS	<ul style="list-style-type: none"> <li>• Ensure that the drive is installed properly</li> <li>• Ensure that the cables are connected properly.</li> </ul>
No Operating System(OS) Found or Similar Message	<ul style="list-style-type: none"> <li>• Ensure that the system is set to boot from the right device.</li> <li>• Ensure that the proper boot order is listed under the Boot menu.</li> <li>• Remove any non-bootable DVD from the drive.</li> <li>• Ensure that the boot drive is the first option.</li> <li>• Once boot drive is found, the OS begins to load it.</li> </ul>
Non-Working Devices/Device Not Recognized	<ul style="list-style-type: none"> <li>• Ensure that the cables are plugged in.</li> <li>• Ensure that the cables are firmly connected to the device.</li> <li>• Check that the add-on cards are seated in their slots.</li> <li>• Check the device drivers.</li> <li>• Try to reinstall the device driver or download the latest version.</li> <li>• Try to uninstall and reinstall the device.</li> </ul>
Problems After Installing New Software or Device Driver	<ul style="list-style-type: none"> <li>• Uninstall the software or driver</li> <li>• Return the system to a previous working state by using System Restore.</li> <li>• Try to boot to Safe Mode and then perform a restore.</li> <li>• Restart the system.</li> <li>• Press the F8 key continuously.</li> <li>• Select Safe Mode from the menu displayed and press enter.</li> <li>• Start system restore.</li> </ul>
Spontaneous Reboots	<ul style="list-style-type: none"> <li>• A computer that reboots often is an indication of a bad power supply.</li> <li>• Check PSU and SMPS unit.</li> <li>• Check if there is a loose connection.</li> </ul>

System Time Keeps Changing	<ul style="list-style-type: none"> <li>• If the time/date clock needs to be set constantly, replace the CMOS battery.</li> </ul>
Nothing Happens when Power Button is pressed	<ul style="list-style-type: none"> <li>• Check the power connection.</li> <li>• Ensure that the wire from the case power button is connected to the right connector on the motherboard.</li> <li>• Check all the power connections to the motherboard.</li> <li>• Check the floppy power cable.</li> <li>• Unplug everything from the motherboard except the power cable, the power button wire, video card, memory and the processor.</li> <li>• If it does not show power it means that the motherboard or the case power supply is defective.</li> </ul>
System Turns On, but Begins to Boot Up	<ul style="list-style-type: none"> <li>• Double check all connections and try again.</li> <li>• Unplug everything from the motherboard except the power button wire, video card, memory and the processor,</li> <li>• Test again.</li> <li>• If the computer starts, turn the power off and reconnect the components one by one.</li> <li>• If it does not boot up, one or more parts are defective.</li> </ul>
System Turns On, Beeps Irregularly, Does Not Boot	<ul style="list-style-type: none"> <li>• Ensure that the random access memory (RAM) chip is installed correctly.</li> <li>• Try to remove and re-install it.</li> </ul>
System Turns On, Gives Quick Beeps, Does Not Boot	<ul style="list-style-type: none"> <li>• Check that the video card is inserted properly in its AGP or PCI slot.</li> </ul>
System Freezes Intermittently while Installing the OS	<ul style="list-style-type: none"> <li>• Verify that the heat sink fan is spinning.</li> <li>• Ensure that the heat sink is firmly mounted.</li> <li>• Check that the heat sink is parallel to the surface of the processor.</li> </ul>
Problems in Installing OS, Blue Screens	<ul style="list-style-type: none"> <li>• Check the memory (RAM).</li> <li>• Check the hard-drive.</li> </ul>

Fig. 5.2.13: System problem and their solutions

### Some Basic Troubleshooting Tips

The following table lists some basic troubleshooting tips after installing new components:

New Component	Issue	Actions
Monitor	Picture is not visible	<ul style="list-style-type: none"> <li>• Check the signal cable connections.</li> <li>• Ensure that the computer is switched on.</li> <li>• Check the brightness control.</li> </ul>
	Screen not in the centre position	<ul style="list-style-type: none"> <li>• Adjust the H-Size, H-Phase or V-Size, V-Centre controls.</li> <li>• Check the signal timing of the computer</li> </ul>
	Too bright or too dark screen	<ul style="list-style-type: none"> <li>• Check the brightness or contrast control.</li> <li>• Check the specified voltage.</li> <li>• Check the signal timing of the computer system.</li> <li>• Check the horizontal frequency.</li> </ul>
	The screen is shaking	<ul style="list-style-type: none"> <li>• Move all objects such as a motor or transformer, which emit magnetic field, away from the monitor.</li> <li>• Check the specified voltage.</li> <li>• Check the signal timing of the computer system.</li> </ul>

Hard Drive	Computer does not boot and no error message appears on the screen	<ul style="list-style-type: none"> <li>• Check whether the BIOS supports drives.</li> <li>• Turn off the computer and remove the new drive.</li> <li>• Shift the jumper onto the alternate-capacity jumper.</li> <li>• Remount the drive in the computer.</li> <li>• Insert a bootable system diskette into drive A and turn on the computer.</li> <li>• Insert the Disc Wizard diskette into drive A.</li> <li>• Type A: XDM and press ENTER.</li> <li>• Follow the Disk Manager instructions.</li> <li>• Install the dynamic drive overlay and partition and format the new drive</li> <li>• Reboot the system.</li> </ul>
	Blank screen when the system is powered	<ul style="list-style-type: none"> <li>• Plug-in the monitor.</li> <li>• Check all the cards.</li> <li>• Ensure the video card is in its slot.</li> <li>• Secure it with mounting screws.</li> <li>• Turn off the computer.</li> <li>• Remove the drive host adapter.</li> <li>• If the screen turns on after reboot, the host adapter may be incompatible or defective.</li> </ul>

	The system does not recognize the drive	<ul style="list-style-type: none"><li>• Check all the cables.</li><li>• Check the power supply.</li><li>• Reboot the computer.</li><li>• Check whether the drive motor starts up.</li><li>• If the drive motor does not start up, recheck all drive cables.</li><li>• Check the drive-type listed in the system setup program for each drive.</li><li>• Press the CTRL+ALT and DELETE keys simultaneously to reboot the computer.</li><li>• If the computer has a turbo switch, set it to slow speed before turning the computer on.</li><li>• If there is no turbo switch, use keyboard commands.</li><li>• Return the processor to fast speed after the computer is running,</li><li>• Alternatively, warm-boot the computer after every power-on.</li><li>• Check for input/output address conflicts.</li><li>• Ensure that the drive and host adapter are compatible with the computer.</li><li>• Turn off the computer</li><li>• Take out the peripheral adapter cards except for the video card and host adapter.</li><li>• If the computer recognizes the drive after rebooting, turn off the computer.</li><li>• Reinstall the other peripheral cards, one at a time, until the conflict reoccurs.</li><li>• Isolate the source of the address conflict.</li></ul>
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		<ul style="list-style-type: none"> <li>• Resolve the conflict by changing the I/O address of the peripheral that appears to cause the conflict.</li> <li>• Check that there is no diskette in drive A and reboot.</li> </ul>
	The system hangs in FDISK or fails to create/save the partition record	<ul style="list-style-type: none"> <li>• Check all the cables.</li> <li>• Ensure that the setup system diskette is not corrupted.</li> <li>• Use a backup diskette.</li> <li>• Make smaller partitions.</li> <li>• Change the interrupt jumper setting on the host adapter.</li> <li>• Disable the Track 0 protection feature in the system setup program before using FDISK.</li> <li>• Re-enable this feature when FDISK is done.</li> </ul>
	The disk operating system(DOS) message "Disk Boot Failure," "Non-System Disk" or "No ROM Basic - SYSTEM HALTED" appears	<ul style="list-style-type: none"> <li>• Use the DOS SYS utility to reinstall the DOS system files.</li> <li>• Check all the cables.</li> <li>• Use FDISK to verify that the primary partition is active.</li> <li>• Check for viruses.</li> </ul>
	The system error message, "HDD controller failure" appears	<ul style="list-style-type: none"> <li>• Confirm the jumper settings on the drive.</li> <li>• Verify the drive-type settings in the system setup program.</li> </ul>
	System in-operative. Keyboard lights are on, power indicator lights are lit and hard drive is spinning.	<ul style="list-style-type: none"> <li>• Expansion card is partially dislodged from expansion slot on the motherboard. <ul style="list-style-type: none"> <li>○ Turn off the computer.</li> <li>○ Ensure all expansion cards are securely seated in slots.</li> <li>○ Press down firmly on expansion card, using even</li> </ul> </li> </ul>

		<ul style="list-style-type: none"> <li>• pressure on both ends of the expansion card.</li> <li>• Defective floppy disk drive or tape drive.</li> <li>• Turn off the system.</li> <li>• Disconnect the cables from one of the floppy drives. Turn on the system and check to see if the keyboard operates normally.</li> <li>• Repeat until the defective unit has been located.</li> </ul>
	<p>System does not boot from the hard disk drive and can be booted from the floppy disk drive</p>	<ul style="list-style-type: none"> <li>• Check the connector between the hard drive and the system board</li> <li>• Check the cable running from the disk to the disk controller on the board.</li> <li>• Check that both ends are securely plugged in.</li> <li>• Check the drive type in the Standard CMOS Setup.</li> <li>• Damaged Hard Disk or Disk Controller.</li> <li>• Format the hard disk.</li> <li>• If unable to do so, the hard disk may be defective.</li> <li>• Hard Disk directory or FAT is scrambled.</li> <li>• Run the FDISK program</li> <li>• Format the hard drive.</li> <li>• Copy the backup data back onto the hard drive.</li> </ul>

	System only boots from floppy disk. Hard Disk can be read and applications can be used, but booting from the hard disk is impossible	<ul style="list-style-type: none"> <li>• Hard Disk boot program has been damaged. <ul style="list-style-type: none"> <li>○ Create back up of the data and the applications files.</li> <li>○ Reformat the hard drive.</li> <li>○ Re-install applications and data using backup disks.</li> <li>○ Check the cable running from disk to disk controller on the board.</li> <li>○ Make sure both ends are securely plugged in.</li> <li>○ Check the drive type in the Standard CMOS Setup</li> </ul> </li> </ul>
	Screen message says "Invalid Configuration" or "CMOS Failure"	<ul style="list-style-type: none"> <li>• Check the configuration program.</li> <li>• Replace any incorrect information.</li> </ul>
	Cannot boot the system after installing another hard drive.	<ul style="list-style-type: none"> <li>• Ensure that the master /slave jumpers are set correctly.</li> <li>• Run SETUP program and select correct drive types.</li> </ul>
New Network Card	Unable to connect to a server	<ul style="list-style-type: none"> <li>• Load the driver and ensure that the protocols are bound.</li> <li>• Check the Device Properties list.</li> <li>• Use the diagnostic utilities to test the NIC adapter.</li> <li>• Check if additional networking software needs to be installed.</li> </ul>

Fig. 5.2.14: Basic troubleshooting tips

## Exercise

1. Write down the solutions of some common system problems given in the table:

Problem/ Symptoms	Action
Devices Not Listed in BIOS	•
No Operating System(OS) Found or Similar Message	•
Non-Working Devices/Device Not Recognized	•
Problems After Installing New Software or Device Driver	•
Spontaneous Reboots	•

2. Write down the steps of disassembling a laptop.

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_
- e. \_\_\_\_\_
- f. \_\_\_\_\_
- g. \_\_\_\_\_
- h. \_\_\_\_\_
- i. \_\_\_\_\_

## UNIT 5.3: Replacing Faulty Module

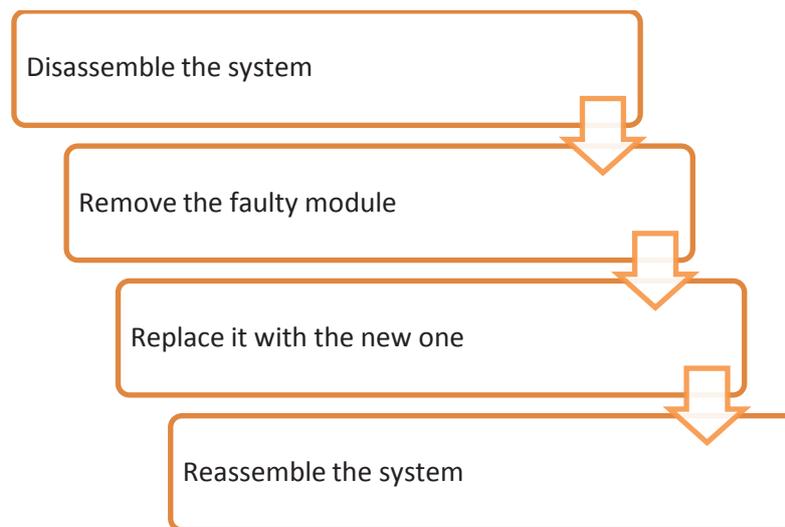
### Unit Objectives

**At the end of this unit, you will be able to:**

- Replace the faulty modules
- Perform soldering
- Identify and fix the errors

### 5.3.1. Replacing Faulty Modules

A field technician provides service and maintenance of hardware and the related software. This may include installation or repair of hardware equipment or associated software by monitoring, troubleshooting and replacing faulty modules. While replacing faulty modules, it is the responsibility of the field technician to check their warranty and also to ensure that the other hardware is undamaged. The following figure lists the steps to be followed in order to replace a faulty module:



*Fig. 5.3.1: Steps for replacing a faulty module*

#### **New Product Models**

Since IT industry evolves at a very fast pace, the field technicians need to be updated with the latest products, their software ecosystem and methods to operate the technologically advanced machines. New tech savvy hardware comes with a specific set of rules and operating methods. Therefore, field technicians need to acquire complete knowledge about their functioning.

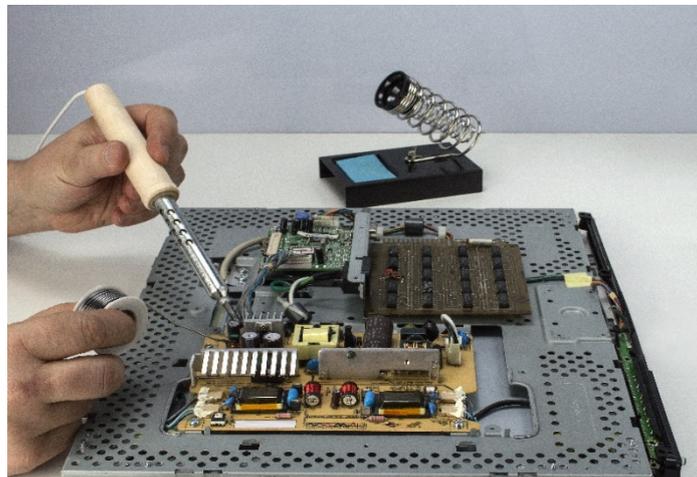
A field technician should do the following when working with a new product:

- Keep in mind the constraints related to the use of the new product to avoid any hardware or software failure.
- Comply with the codes put in place for the use of any machine or software.

### Soldering

Soldering is a process of joining two or more objects that are usually metals by melting and pouring a filler metal, called solder, into the joint. The solder component has a lower melting point than the other two metals that are to be joined.

While replacing the faulty parts, soldering of some components may be required. So, a field technician should have a basic knowledge of how to use manual hand soldering iron unit to solder the components or parts. The following image shows a typical soldering process:



*Fig. 5.3.2: Soldering process*

### Soldering Procedure

The steps of the soldering technique are as follows:

- **Step 1:** Heat up the soldering iron sufficiently.
- **Step 2:** Clean the soldering iron with a damp sponge, if it is dirty. If a soldering station is used, adjust its temperature.
- **Step 3:** Apply suitable flux to remove any type of oxide while soldering.
- **Step 4:** Coat the soldering iron's tip with a thin layer of solder. This process of tinning helps in transferring heat between the tip and the component to be soldered.
- **Step 5:** Use pliers for bending the lead of the component being soldered so that it can easily be embedded.

- **Step 6:** Hold the soldering iron and place the iron tip in such a way that it touches both the surface and the lead of the component on the board.
- **Step 7:** Touch the solder to the iron tip and move that around the joint by keeping the iron tip fixed. Let the solder melt and flow till the joint is covered.
- **Step 8:** Remove the iron after removing the solder and make sure the joint is kept stationary till it cools down.

### Tips



When the soldering iron gets hot, it becomes dirty because of oxidization. Clean the tip with a wet sponge until it shines.

- While soldering, the iron tip should not be touched.
- The soldering iron should be placed at an angle of 45 degree.

### 5.3.2. Identifying and Fixing Errors/Issues

A computer functions using a combination of two important components – hardware and software. Usually, a computer hardware is reliable but it may get damaged over a period of time. It is essential to maintain the hardware system to keep the system functional. In addition, the software also needs to be maintained periodically. For example, an organized and clean hard disk helps the computer system to perform better. Deleting unused, unwanted and temporary files is the easiest way to help the system give better results.

There may be certain circumstances when a computer is not maintained properly and various hardware and software issues are faced by the operator. When a field technician is called up for the repair, then he/she should be efficient enough to find the issue and fix them accurately.

#### Hardware Diagnostics

Hardware diagnostics is run on most computers. It is used to check the health of the system and detect faults during normal operations of the computers. The different types of tests are listed in the following figure:

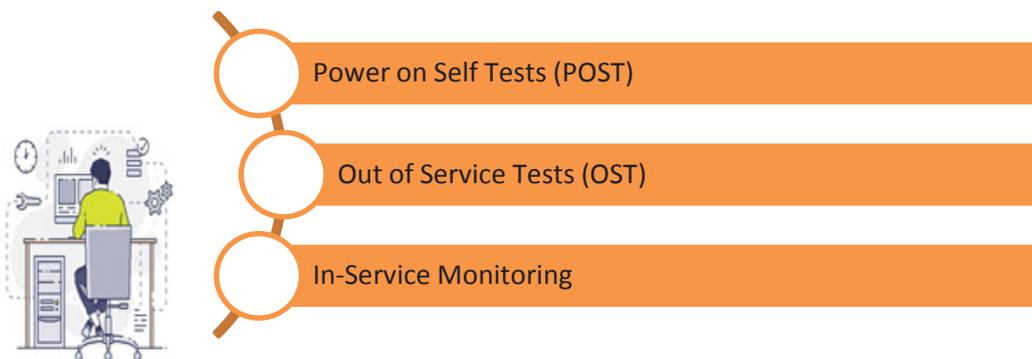


Fig. 5.3.3: Different tests

**POST**

POST is an in-built diagnostic tool that begins to operate as soon as the processor of a computer starts. It verifies that the various hardware components of a computer such as the keyboard, RAM and disk drives are functioning properly. If POST is successful, then the computer begins to boot; otherwise, the BIOS issues an error message.

The error message is in form of a series of beeps. These beeps may have a pattern of long beeps or short beeps or a combination of the two depending on the nature of the problem. The pattern of beep conveys information about the type of the fault detected. For example, if the POST is unable to detect the processor, it will stop the boot process and convey the message through a particular code of beeps.

**OST**

POST can only test the internal functioning of the card and not its external interface logic. There are two types of tests that can be used to test the external card interfaces. These are shown in the following figure:

**Interface Tests**

- The card is labelled as out of service. The neighboring cards are then configured to work in the interface test mode. The card under test is instructed to run the test. The neighboring cards are then restored by bringing them out of the test mode.

**Echo Back Test**

- The card is configured in echo back mode. The interface receives the data and echoes it back by transmitting it to the card under test. The card under test receives back the data that it had transmitted.

*Fig. 5.3.4: OST tests*

### In-Service Monitoring

In this method, the health of the card is verified using any of the following two ways:

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**Transient error monitoring**      Transient errors are caused by power fluctuations, spikes and interference from other cards. They can occur even when the hardware is functioning normally. In case of frequent errors, complete hardware diagnostics of the system is needed to isolate the issue.

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**Link monitoring**      This method monitors the bit rate on the links in order to get advance warning. When a certain threshold is exceeded by the bit error rate, a diagnostics may be triggered.

---

*Fig. 5.3.5: In-service monitoring*

### Understanding Error Messages

The following table lists the common error codes faced while using Windows and its basic components. Some solutions have been provided to solve them:

Error Code	Error Message
Code 1	Incorrect device configuration
Code 3	Corrupt device driver, or low system memory
Code 10	The device not able to start
Code 12	Not enough free resources for the device to use so disable one of the other devices on this system
Code 14	Restart the computer for the device to work
Code 16	Windows unable to identify resources used by the device
Code 18	Reinstall the device driver

Code 19	Incomplete or damaged configuration information Reinstall the hardware device
Code 21	Device removed
Code 22	Device disabled
Code 24	Device not present or driver not installed
Code 28	Device driver not installed
Code 29	Device disabled
Code 31	Windows unable to load the device drivers
Code 32	Device driver disabled
Code 33	Windows unable to determine the resources required by the device
Code 34	Unable to determine device settings
Code 35	Not enough information to configure and use this device
Code 36	Reconfigure the interrupt for this device
Code 37	Unable to initialize the device driver for this hardware
Code 38	Previous device driver is still in memory
Code 39	Device driver corrupted or missing

Code 40	Incorrect or missing service key information in the registry
Code 41	Windows unable to find the hardware device
Code 42	Duplicate device running in the system
Code 43	Device stopped
Code 44	Device shut down by an application
Code 45	Device not connected to the computer
Code 46	Operating system shutting down
Code 47	Device prepared for safe removal, but not been removed
Code 48	Software for this device blocked
Code 49	Windows unable to start new hardware devices as the system hive is too large
Code 52	Windows unable to verify the digital signature for the device driver

*Fig. 5.3.6: Error code and messages*

### **Handling Issues Not within Scope**

There may be certain circumstances when a field technician is unable to resolve the software or hardware problems at the customer sites. Some of the typical examples of such cases are:

- In some systems, such as ERP or data management systems, a lot of customization could be done for the client by the service provider or the implementation partner. This customization is like a black box for an IT service engineer. This is because its code/program may not be shared. Also, there might be a separate team to support these systems.

- There are some hardware servers or systems which are under control and support of an external vendor. Thus, the service engineer may not have any role to play in this scenario.

In both the scenarios, one may take external support or escalate the issue. However, if it is not sure under whose preview the issue lies, a senior person should be consulted before approaching the problem.

#### **Escalate Problems to the Vendor**

Software developers write a code to meet the client's requirement in such a way that only they can understand the system's behaviour. Hence, it is difficult to troubleshoot such a system and it can be time consuming also. It is always recommended to take external support of the developer to solve such issues.

#### **Escalate Problems to a Senior**

If the field technician is not aware of the developer of a particular system, then it becomes difficult to contact and resolve an issue. In most of the organizations, there is a list of all software and systems that are being used. This list also contains a point of contact for each software or system. To refer to this list, a senior person should be consulted.

## Exercise

1. Choose the correct answer for the following questions:
  - a When a processor is turned on, a diagnostic tool tests if the computer hardware components are working properly or not. The tool is \_\_\_\_\_
    - i POST
    - ii OST
    - iii IST
  - b Which command opens a Task Manager?
    - i Shift+Ctrl+F1
    - ii Ctrl + Alt + Delete
    - iii Ctrl +Alt
- 3 5 Beeps at the time of running POST means \_\_\_\_\_
  - i Processor Failure
  - ii Timer Failure
  - iii Memory Error

## UNIT 5.4: Completing Repairs

### Unit Objectives

**At the end of this unit, you will be able to:**

1. Report percentage of call closure in multiple visits against a benchmark
2. Ensure no sub-standard or unverified parts are used in replacement
3. Complete the function within the agreed Turn Around Time (TAT)
4. Meet the given monthly or daily target

#### 5.4.1. Report Percentage of Call Closure

The job of a field technician does not end at just examining or maintaining the equipment. Once an equipment, for example a computer, is worked upon, the technician is required to create a detailed report. It should include the details of the changes made; the next supposed date when the hardware or the software on the system may require a repair or an update; and the number of days in which the assigned task was completed.

For example, a task was to be completed in two visits but the technician took three visits to complete it. They need to report why they took more time to complete the task. In addition, they also need to specify the reason of delay, such as appropriate tools missing, spare part unavailable at the store and so on.

#### 5.4.2. Use Only Verified Parts

As the cost of verified parts/modules is greater than that of sub-standard and unverified ones, many people prefer the unverified parts. These parts can stop working at any time. In addition, they can cause damage to the system's performance. So, it is the responsibility of the field technician to make use of only verified parts while replacing the faulty parts and also make the customers aware of their advantages.

#### 5.4.3. Complete the Work in TAT

In most organizations, conflicts between co-workers occur due to tight schedules and deadlines. Employees working on deadlines are required to work on short turnaround times, resulting in frustration and stress. Strategic planning in advance is the best way to avoid such circumstances. Irrespective of the team size, this can be achieved by deploying tools like Google Calendar to communicate deadlines.

The following figure shows some points which ensure that the work is always completed within the expected time period:

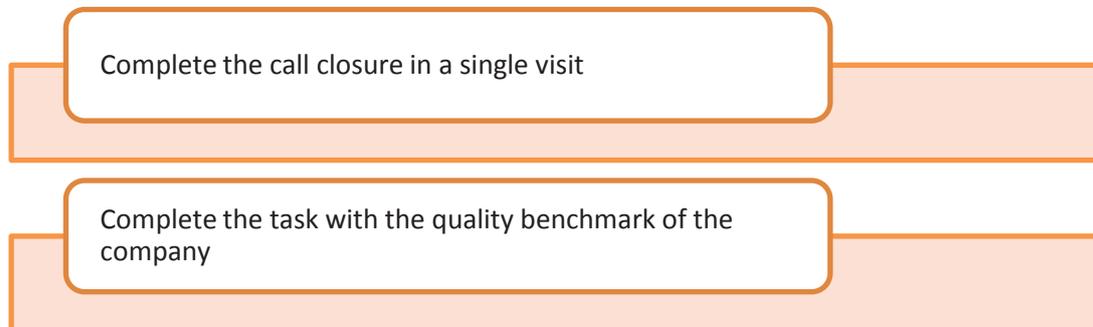


Fig. 5.4.1: Key points for timely completion of work

#### 5.4.4. Meet the Targets

Just like any other employee of an organization, meeting the targets set by the supervisor is very important. A technician needs to be clear about the goals and visions of the organization to achieve all the designated targets. The following figure shows the key points which will help a field technician to meet the expected targets:

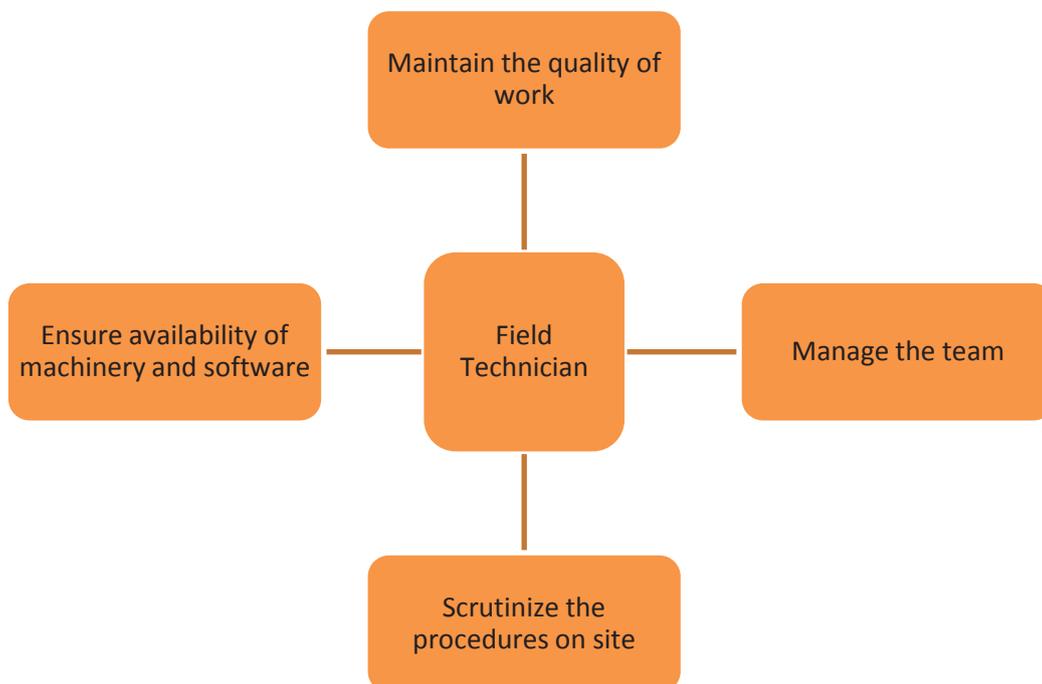


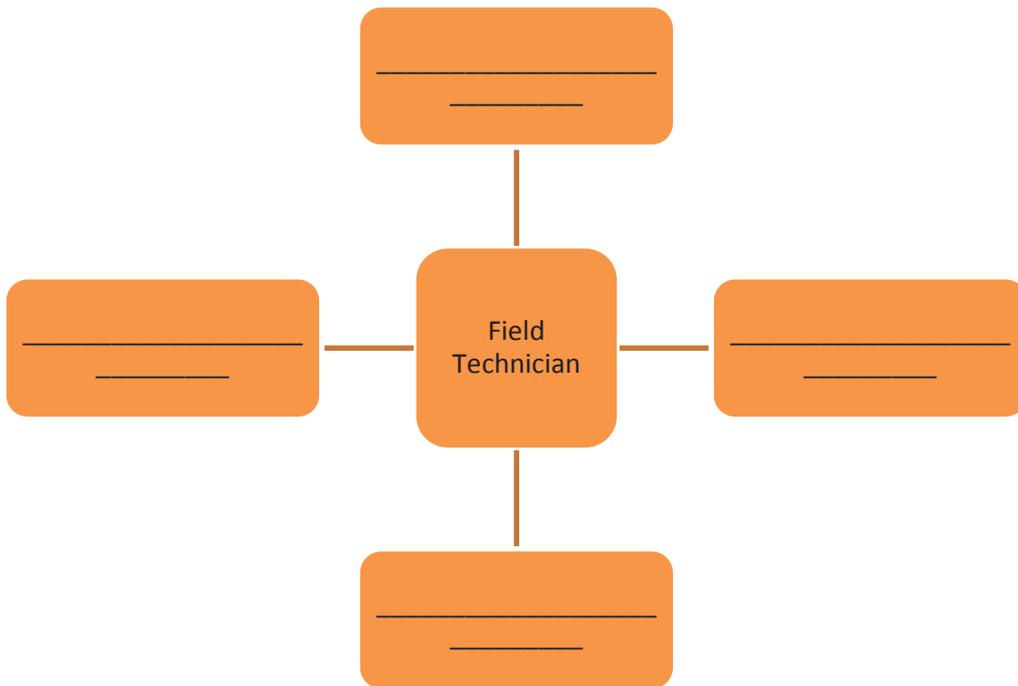
Fig. 5.4.2: Key points to remember for meeting targets

The quality of work needs to be maintained at all times in compliance with the referral handbook of the company. Making sure that individual roles and responsibilities are understood by the personnel is vital. Timely check of the machinery and software systems needs to be done to avoid any bottlenecks in achieving weekly or monthly targets.

**Exercise** 

1. Write down few key points for timely completion of work.

2. Write down the key points for meeting the targets on time.



## UNIT 5.5: Reporting to Superior

### Unit Objectives

**At the end of this unit, you will be able to:**

1. Take work order from the Supervisor
2. Report 100% on time completion
3. Submit the feedback form
4. Report work status accurately
5. Create knowledge bank

### 5.5.1. Understand the Work Requirement

For a person to work, it is important to understand the work requirements. The work requirements for a field technician include certain responsibilities as shown in the following figure:

---

Take work order from the supervisor or customer care about the complaint registered

---

Understand the work requirements

---

Follow the line of authority

---

Issue on time the tools and the equipment

---

Keep upto date with new products and developments

---

Plan, organize and control work for efficiency

---

Report on the work load and completion status

---

Find solutions to customer complaints and queries that are unresolved in the field or escalate issues of concern to the supervisor

*Fig. 5.5.1: Meaning of work requirement*

Work requirement is also a document which has the date, location and the details of a particular task, which has to be done. It is the record of the task which is to be performed. The technician should be able to understand the task assigned and its requirement.

### 5.5.2. Quality and Timely Completion of Work

A few simple principles, if adhered to, can ensure production of quality work. As a field technician, maintenance of quality and timely completion of work can be done in the following ways:

- Ensure that work is done as per the guidelines and standard of the company.
- Plan and organize the allocated work for the day.
- Follow the proposed plan of action.
- Inform the supervisor in case of any deviation or emergency.
- Work to ensure 100% customer satisfaction.

The field technician would get a job sheet or work allocation from the supervisor. The supervisor would also share a plan of action with the field technician to ensure adherence to timelines and quality for the work assigned and an explanation if the target is not met. The following figure highlights the points which help a field technician in understanding the plan to achieve 100% quality and timely completion of work:



Fig. 5.5.2: Achieving quality and timely completion of work

### 5.5.3. Submit the Feedback Form

Once the issue/problem is solved, feedback from the customer is very important. It helps to create a reference guide for the field technician in an organization, if the same problem creeps up again. Having discussions with the supervisor in relation to the problem and its solution solves a lot of intangible problems in the organization.

A customer is always special for an organization and therefore, the customer's feedback is the most important aspect of providing service for an organization. A technician should take customer feedback in a feedback form provided by the company. The following figure represents a procedure to take feedback form the customer:

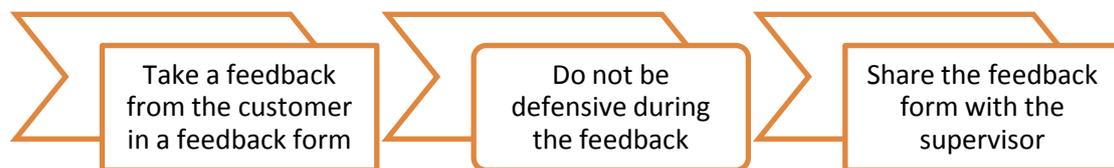


Fig. 5.5.3: Procedure for taking the customer's feedback

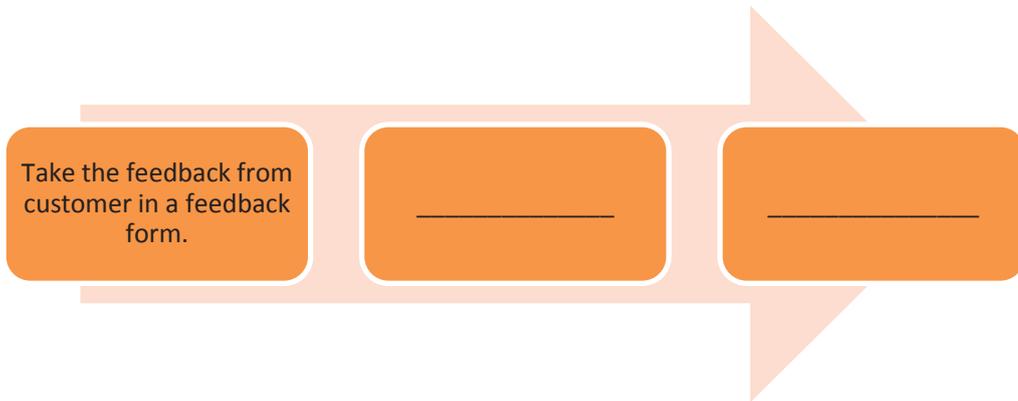
### 5.5.4. Documentation

After completing an installation at a site, the technician should complete the documentation to record the details related to the installation. A knowledge bank should be created on the complex repairs done through documentation. Along with completing the documentation, the field technician should tell the customer about some dos and don'ts for using the computer and its peripherals. The customer should also be told about the important pages to refer from the product manual, such as the webcam switch and its functionality. The documents may include the following:

- Work status report
- Customer hand over slip
- Customer feedback form
- Servicing date or period
- Warranty documents
- Tests performed on the computer/peripherals with results, in case there is a complaint or an issue in an already installed computer/peripheral

**Exercise** 

1. What is the procedure of taking the customer feedback?



2. Complete the plan to achieve timely and quality work.



## Practical

1. A customer has recently purchased a new hard disk for a computer since the old one had crashed. Perform a task of installation of the new hard disk on the computer.

### Components:

#### Hardware:

- Phillips and flat blade screwdrivers (small and medium size)
- A 3-claw part grabber
- A chip inserter and chip extractor
- A TORX head screwdriver
- A 1/4" and 3/16" nut driver
- A container to hold small parts and screws

#### Software:

- Operating system
- Bootable disk with FDISK.EXE and FORMAT.COM copied onto the disk
- Disk Manager

2. You received a customer complaint that a laptop is not giving audio output. How would you troubleshoot the problem?

### Components:

- System with faulty sound card
- Flat/Phillips screwdrivers
- Screws
- Sound card
- Correct drive cables (IDE or SCSI)
- Audio cable to attach CD-ROM drive to sound card
- Installation disk for the new sound card

3. You have gone to a customer site to solve an issue with a faulty computer that on start-up is repeatedly giving out four beeps at very short intervals and nothing appears on the screen. However, the fan running sound is there.

### Component:

- Screw driver set repair toolkit
- Spare RAM, Processor and Motherboard
- ESD wrist band
- A computer system with a faulty motherboard

4. There is an apparent failure of the motherboard or a system device on the motherboard.

**Component:**

- Screw driver set repair toolkit
  - Spare Motherboard as per the system compatibility
  - ESD wrist band
  - A computer system with a faulty motherboard.
5. Troubleshoot a system in which there is no POST.

**Component:**

- Screw driver set repair toolkit
  - ESD wrist band
  - Spare CMOS battery
  - A computer system with a faulty BIOS.
6. You have received a customer complaint that their computer loses its time and date settings on every restart. You have called the customer and after fixing a time to visit, you have gone to the customer's facility to fix the issue. How will you fix this issue?

**Component:**

- Screw driver set repair toolkit
  - Spare CMOS battery compatible to the system
  - ESD wrist band
  - A computer system with a faulty CMOS battery.
7. Perform the task of troubleshooting of 5 beep POST error.

**Component:**

- Screw driver set repair toolkit
  - Spare CMOS battery compatible to the system
  - ESD wrist band
  - A computer system with a faulty motherboard.
8. Perform the task of upgrading RAM in a Laptop.

**Hardware:**

- DDR2, DDR3 RAM
- Screw driver
- ESD wrist band



## 6. Understanding Organizational Policies and Standards Modules



Unit 6.1 – Explain Company's Policies

Unit 6.2 – Identify Company's Product/Quality Standards

Unit 6.3 – Describe Company's Safety Policies and Standards

Unit 6.4 – Interact with Supervisor

Unit 6.5 – Interact with Colleagues



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ELE/N4603

## Key Learning Outcomes



**At the end of this module, you will be able to:**

1. Explain Company's Policies
2. Identify Company's Product/Quality Standards
3. Describe Company's Safety Policies and Standards
4. Interact with Supervisor
5. Interact with Colleagues

## UNIT 6.1: Company's Policies

### Unit Objectives

At the end of this unit, you will be able to:

1. Identify the company's customer care policies
2. Identify the company's code of conduct policies
3. Describe the organisation culture and typical customer profile
4. Explain the company's reporting structure
5. Define company's policy on product's warranty
6. Identify the company's line of business and product portfolio and competitors

### 6.1.1. Customer Care Policies

The customer care centre is designed to meet the requirements, needs and expectations of the users. It is done by providing timely resolutions to queries and complaints. The goal is to minimize downtime and improve the learner's overall experience. The team comprises of experienced software personnel. They help a user by answering questions and guiding them about using the tools. They are solely committed to collaborating and communicating with the users. The following figure lists the role of a technical:

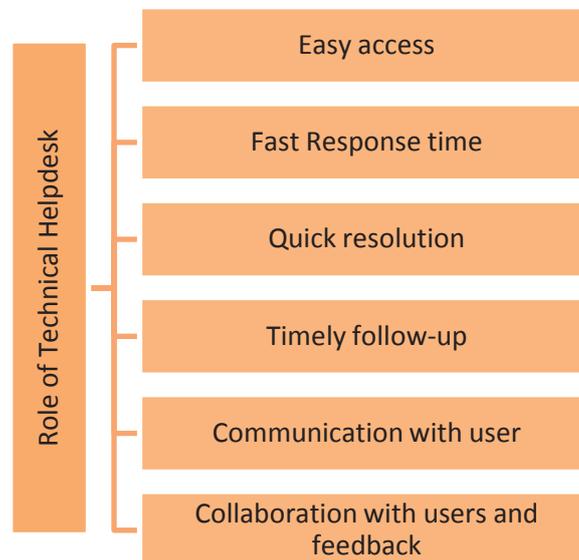


Fig. 6.1.1: Role of a technical helpdesk

### 6.1.2. Code of Conduct Policies

In organizations, the code of conduct means the core values, ethics, responsibilities, commitments and virtues that every employee of that organization needs to comply with. It lays down the general guidelines that the organizations expect from its people in specific situations. Thus, it is necessary to follow a proper code of conduct in terms of behaviour and work output delivered.

### 6.1.3. Organisation Culture

Organizational culture is defined as the shared values, beliefs and norms within an organization and the demands of a job role. A field technician's job is a customer facing role, representing the face of the organization. The following figure represents the characteristics of organizational culture which every employee should reflect:

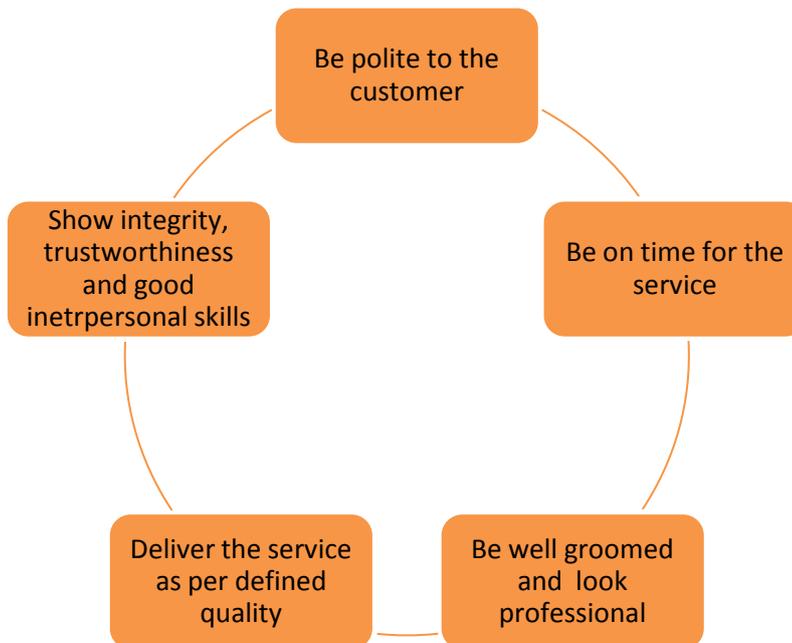


Fig 6.1.2: Characteristics of organizational culture

As a field technician, you may need to cater to different set of customers, from different backgrounds.

The following figure represents the broad classification of customer profiles:

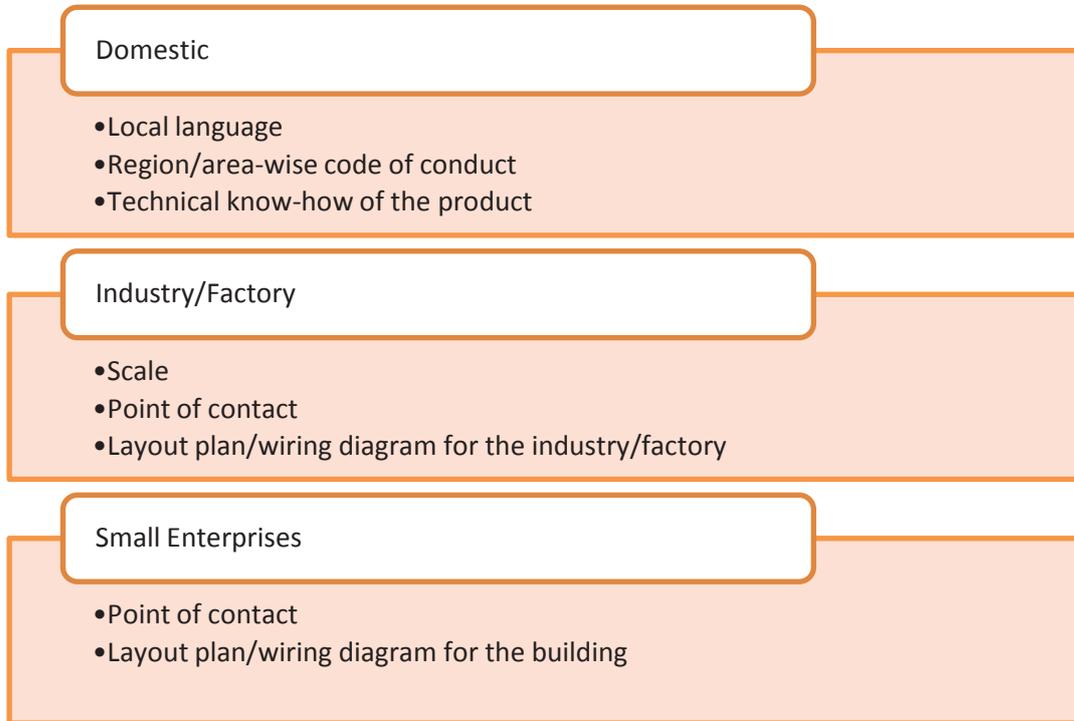


Fig 6.1.3: Classification of customer profiles

**Company's Policies and Rules**

If the company’s policies and rules are not defined clearly, then the employees may not comply with the disciplinary standards wholeheartedly. The following figures are a few examples of company policies:

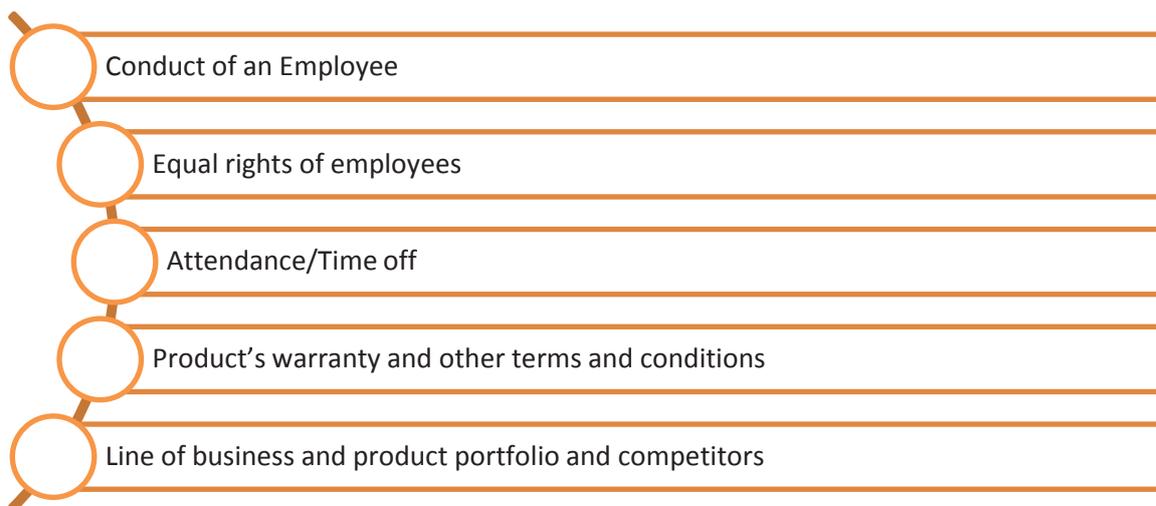


Fig. 6.1.4: Common company policies

### Reporting Structure

There are set rules and regulations within an organization which an employee needs to follow. These outline responsibilities of both the employers and the employees.

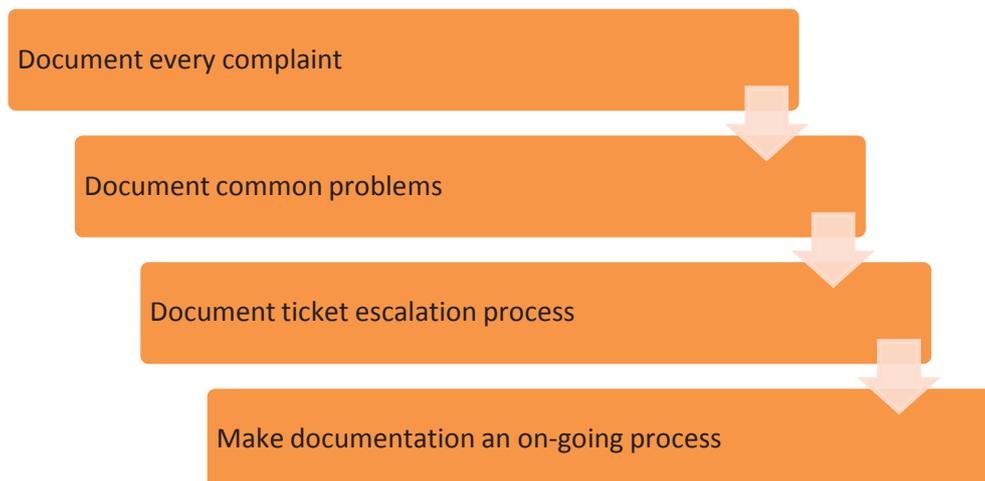
The following figure explains what working in an organization requires a field technician to ensure:



*Fig. 6.1.4: Reporting and documentation process*

### Documentation

Right documentation can make a lot of the difference in getting quick resolutions. To achieve this, certain steps need to be taken as shown in the following figure:



*Fig. 6.1.5: Steps for right documentation*

### Document Every Complaint

The field technicians need to document issues as they come in. In addition to recording the symptoms described by the customers, they should probe for the right symptoms. For example, if a customer says that his computer is running slow, the help desk needs to

differentiate whether the problem is caused by a virus or a malfunctioning hardware or an unpatched system.

The field technician should know how to ask the right questions to try and resolve an issue within the first call.

#### **Document Common Problems**

Majority of the issues can be reduced to a handful of common problems. If there is a good documentation process that has resolution paths for all common problems, then the field technician does not have to reinvent the wheel for every ticket. He can use the internal help desk knowledge base and time tested processes to resolve the issues quickly.

A well organised process enables the field technician to respond to a ticket quickly and resolve most of the customers' problems immediately.

#### **Document Ticket Escalation Process**

A good escalation process makes sure that when the field technician is not able to resolve a problem, he addresses ticket escalation promptly. The ticket gets send to the next level of customer support and the customer does not have to wait for days for it to get resolved.

#### **Documentation should be an on-going effort**

Documentation is not a onetime effort; it needs to be an on-going process. The field technicians should regularly optimize the issue resolution procedures and processes. This ensures that the customer issues are resolved promptly.

## Exercise

1. Which one among the following is not a step of right documentation?
  - a. Document every complaint
  - b. Make documentation an ongoing process
  - c. Give the crucial documents to everyone
  - d. Document common problems
2. Which one among the following is not an organization culture?
  - a. Be well groomed and look professional
  - b. Be on time for service
  - c. Always show integrity
  - d. Talk harshly to customers

## UNIT 6.2: Company's Product/ Quality Standards

### Unit Objectives

At the end of this unit, you will be able to:

1. Identify the company's products and recurring problems reported

### 6.2.1. Company's Products and Recurring Problems Reported

The Computer and Peripherals industry produces a wide range of products for sale to just about all businesses and consumers. It can consist of products like printer, scanner, mouse, monitor and other devices as mentioned in the above modules.

The overview of company's product is as shown in the image:

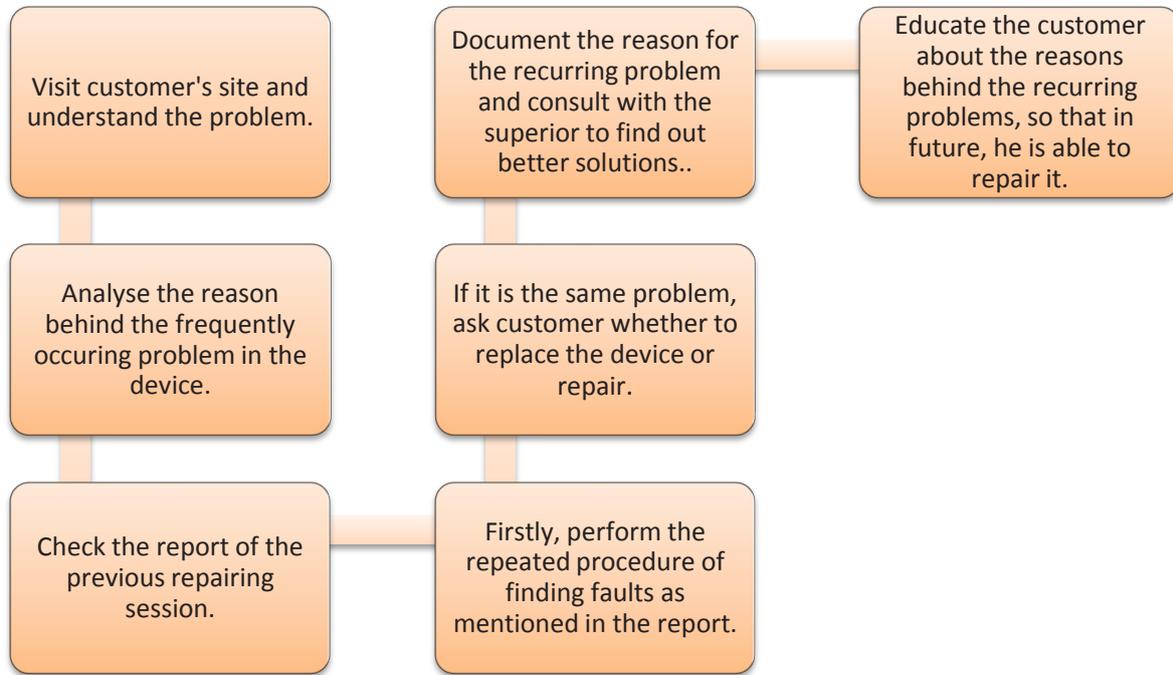


*Fig 6.2.1 Overview of company's product*

#### Recurring Problems Occurred

When a field technician visit a customer's site for repairing or replacing faulty modules, he should kept a record of the visit and educate customer about the procedure of repairing, so that in future problem persists, he can tackle that. But, sometimes these problems occurred frequently.

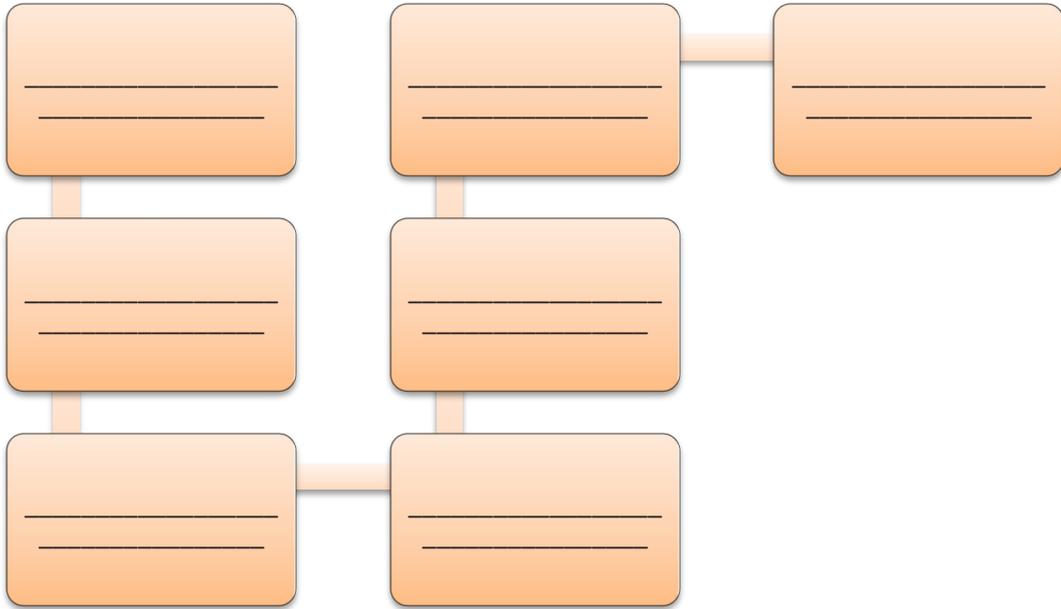
In this case a field technician should perform the following steps to troubleshoot the recurring problems in device as shown in the following figure:



*Fig 6.2.2 Steps to troubleshoot the recurring problems in device*

**Exercise** 

1. Identify the steps to identify the recurring problems in a device?



## UNIT 6.3: Company's Safety Policies and Standards

### Unit Objectives

**At the end of this unit, you will be able to:**

1. Identify the safety procedures to follow
2. Identify the quality standards to be followed
3. Explain the ESD

### 6.3.1. Safety Procedures

As a field technician, there are certain guidelines that must be followed to ensure own safety, and that of the co-workers. These guidelines provide a sound, safe and flexible environment to work. The following figure represents the general safety guidelines to be followed at workplace:

Always follow the correct procedures to ensure zero accidents at work.

Always use an appropriate tool for the respective task.

Always read labels and instructions given on the components.

Always wear appropriate clothing and remove metal objects before working.

Use prescribed protective safety equipment only.

Always follow Electrical Safety Rules when working with electrical machinery or equipment.

Report all unsafe acts or unsafe conditions to the supervisor.

*Fig 6.3.1. Safety guidelines*

The following table represents the dos and don'ts of safety measures at a customer's home:

Dos	Don'ts
Place the inverter in a well aerated place	Never place the battery in a closed container
Installation should be done on a flat surface	Never keep batteries close to water or other chemicals
Battery terminals should be tightened	Never load the connection with more than the mentioned capacity
All battery cables should be connected in right direction	Do not operate device with damaged cables
Keep the batteries connected when the device is in 'ON' state	Never connect the inverter to an incoming power supply

Fig 6.3.2. Dos and don'ts of safety measures at a customer's home

### 6.3.2. Quality Standards

A few simple principles, if adhered to, can ensure production of quality work. As a field technician, maintenance of quality and timely completion of work can be done in the following ways:

- Ensure that work is done as per the guidelines and standard of the company.
- Plan and organize the allocated work for the day.
- Follow the proposed plan of action.
- Inform the supervisor in case of any deviation or emergency.
- Work to ensure 100% customer satisfaction.

The field technician would get a job sheet or work allocation from the supervisor. The supervisor will also share a plan of action with field technician to ensure adherence to timelines and quality for the work assigned.

The following figure highlights the points which help a field technician in understanding the plan to achieve 100% quality and timely completion of work:

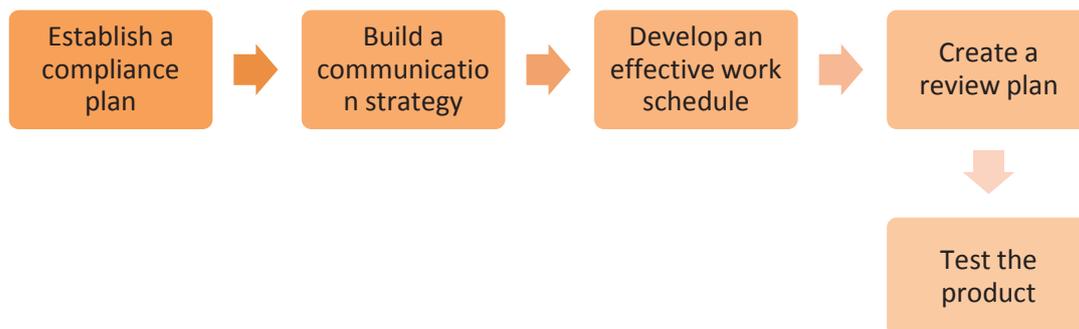


Fig 6.3.2: Achieving quality and timely completion of work

### 6.3.3. ESD Protection

ESD protection is essential for sensitive components, during and after production, while shipping, during assembly of the device and in the finished device. ESD can cause severe damage to components such as microchips. Grounding is imperative for ESD prevention. An ESD Simulator having special output circuit called human body model (HBM), is generally utilized to test the vulnerability of electronic devices to ESD from human contact.

The following protective gears should be used while handling components that are prone to ESD:



*Fig. 6.3.3: Safety gears for prevention from ESD*

## Exercise



1. What is among not to do measures at a customer home?
  - a. Operate device with damaged cables.
  - b. Battery terminals should be tightened.
  - c. Place the inverter in a well aerated place.
  - d. Installation should be done on a flat surface.
2. Which protective gears should be used to handle ESD prone components?
  - a. Gloves
  - b. Wire strap
  - c. Safety clothes
  - d. All of the above

## UNIT 6.4: Interacting with Supervisor

### Unit Objectives

**At the end of this unit, you will be able to:**

1. Understand and assess work requirements
2. Identify the targets and incentives
3. Documentation of work on enterprise resource planning (ERP) software
4. Resolve personnel issues
5. Communicate any potential hazards at a particular location
6. Deliver work of expected quality despite constraints

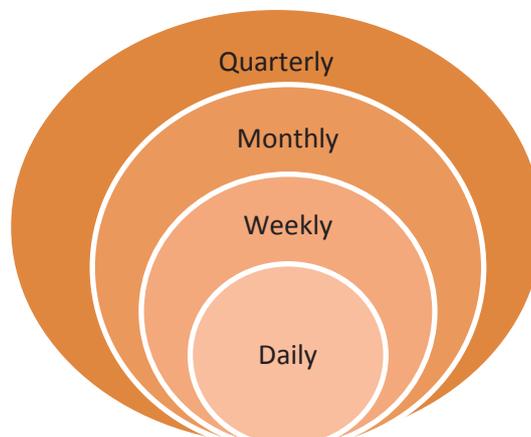
### 6.4.1. Work Requirement

As a field technician, one of the major roles and responsibilities is to understand the work requirements. The major roles of the field technician are as follows:

- With any issues in hardware and software, a field technician needs to come-up with solutions as soon as possible to eliminate any bottlenecks in terms of productivity. It is an integral part of maintaining a smoothly running working environment having zero tolerance for even major delays.
- Coordinating with customers, co-workers, subordinates and superiors is also defined as one of the major roles of a field technician.
- Having a clear picture about the work requirements determines the smooth functioning of an organization.

#### Understand Work Requirements and Targets

The targets and short-term goals set by the organization determine the targets for the personnel. The field technician needs to understand the goals set by the superiors. The goals may be set with respect to timespan as listed in the following figure:



*Fig. 6.4.1: Goals set by superiors*

These goals then further define the targets to be assigned to the team responsible for all hardware related personnel. The incentive policy should be clear so that the employees can understand the policy well. It will motivate them to put maximum effort in maintaining hardware facility of an organization.

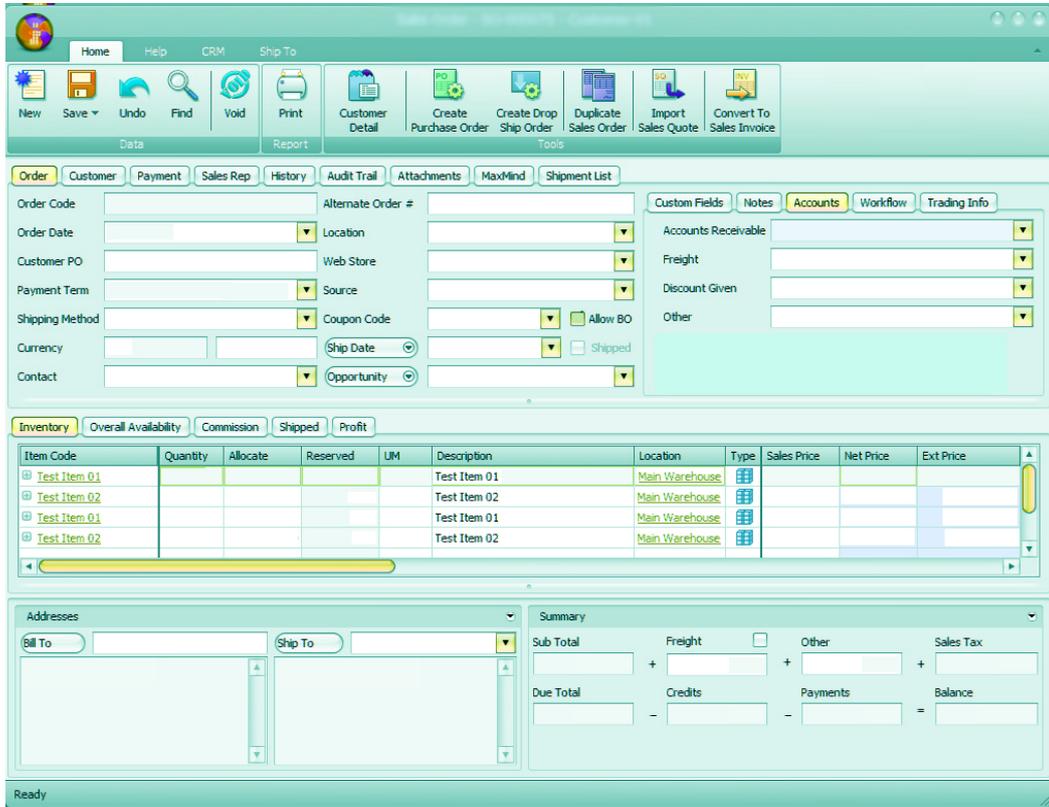
Any ambiguity in understanding the work requirements defined by the supervisor results in time delays and confusions. A field technician needs to avoid such instances at all costs. For example, failing to understand the priority of jobs or tasks assigned by the supervisor for the day. Understanding the technical requirement is also equally important. So, while replacing faulty modules, a field technician should check the warranty on the faulty module while replacing it and also ensure that no damage to the other hardware is done.

### 6.4.2 Documentation of Work on ERP Software

One of the most important parts of good customer service is maintaining accurate records, containing details of dealings with the customers. Customer records can help gather information about how best to market a company's services and also help to ensure that the organisation runs smoothly. Most records are stored electronically on a database.

ERP software is used in company to maintain the records of work performed by the field technician. It is defined as the business management software consist of integrated applications required to manage the documentation process and control back office related functions such as human resources and other technologies.

The following figure shows sample of ERP software used in an organisation:



Functional Processes	ERP Function - Asset Management	Customer Perform/Use Today	Customization	Notes/Comments
<b>General</b>				
1	Configuration	Yes	Yes	This is often more difficult. We have a more stable process.
2	Financial Assets	Yes	Yes	
3	Manufacturing	Yes	Yes	Finance needs - Customer has been talking about integration of ERP with CRM. Success for CRM.
4	Asset Assets	Yes	Yes	currently implementing - starting from 1 to 4 weeks. Current ERP is not working. ERP is not working. ERP is not working. ERP is not working.
5	Self Service (Customer Service, Billing)	Yes/Partial	Yes	Asset Assets & Billing
<b>Adding and Maintaining Assets</b>				
6	Finance Add Assets	Yes	Yes	Finance has used this in the past. Not sure if it is still used.
7	Event to CR (Depreciation Costs)	Yes	Yes	ERP is not available for us. ERP number did not provide us correct results for Asset Assets 20% of what we do.
8	General Information	Yes	Yes - custom setting	Other fields are visible - which ones should not be visible?
9	Asset Information	Yes/Partial	Yes	
10	Manufacturing (Customer Management)	Yes	Yes	
11	Shipping Costs	Yes	Yes	
12	Asset Assets	Yes	Yes	We created our own system.
<b>Asset Budgeting</b>				
13	Manufacturing Asset Management (ERP)	Yes/Partial	Yes	
14	Manufacturing Asset Management (ERP)	Yes/Partial	Yes	
15	Manufacturing Asset Management (ERP)	Yes/Partial	Yes	
16	Manufacturing Asset Management (ERP)	Yes/Partial	Yes	
<b>Reporting &amp; Analysis</b>				
17	General Reporting and Analysis	Yes	Yes	Customer needs to use ERP.

Fig 6.4.2: Sample of ERP software used in an organisation

### 6.4.3 Work Ethics

Work ethics means differentiating between the right and the wrong way of doing a job and adopting the right conduct. Work ethics involve certain principles as shown in the following figure:



Fig 6.4.3: Work ethics

*Consider an example: Pawan finished the task assigned to him. He has done the work on time and in an efficient manner. He also informed his supervisor regarding a major safety breach which helped in preventing an accident situation. Pawan was awarded an incentive for the best work done in that month. Later on, for his alertness and proactive stance he was also awarded by the MD of the company.*

#### Resolve Personnel Issues

Resolving personnel issues involves the followings:

- Communicating effectively with the personnel ensures positive feedback in the organization. Two-way communication within and beyond the facility is also advised for field technician in any organization.
- All conflicts of interest, misunderstandings and personnel grievances need to be understood and then reported to the higher authority.
- Suggestions on resolving the problems is important as it helps the facility staff to concentrate on the job at hand.

Any personal issue or grievance also needs to be attended to by the field technician himself before pushing the issue through to the supervisors. Managing the personnel is the most important part of team effort towards a unified goal.

#### Delivery of Work of Expected Quality

Delivery of work as per expected quality should be maintained in the following ways:

- Ensure the work done is as per the guidelines and standard of the company.

- Plan and organize work for the day.
- Follow the plan.
- Inform supervisor in case of any deviation or emergency.

The following figure highlights the points which help the employers in developing a plan to achieve 100% quality and timely work completion:

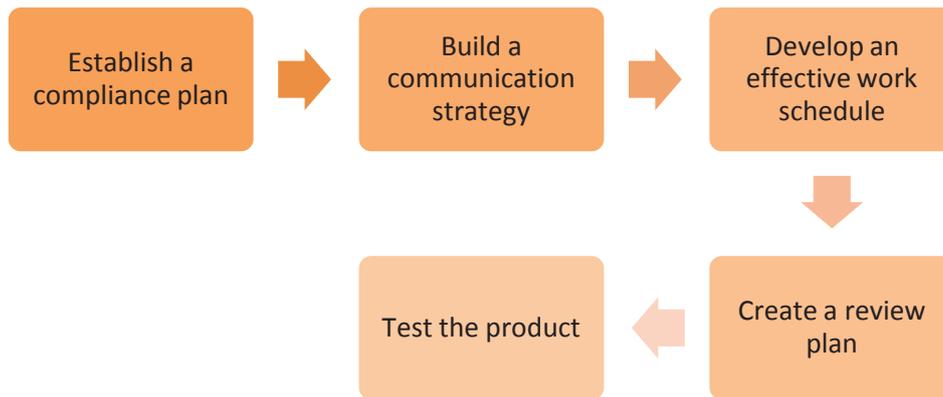


Fig. 6.4.4: Achieving quality and timely work completion

#### Inform Superior about Potential Hazards

Understanding all the possible hazards that can happen in a facility are the responsibilities of a field technician. One possible cause of hazard could be the lack of clear understanding about the company's code of conduct or reference handbook which puts constraints on the use of equipment for purpose that is against the code of conduct. A field technician can handle the hazard by:

- Communicating any such hazard to the supervisor can prevent unaffordable downtimes which could hamper critical functioning of the organization.
- Having clear communication with the other staff members and getting in place early warning systems for potential threats in another dimension.
- Making risk assessment is an integral part of a field technician job description. Potential hazards should be assessed with precision and supported with practical evidence.
- Adopting a systematic approach is one dimension of communicating potential hazards.

The following figure shows a systematic approach for handling hazards:

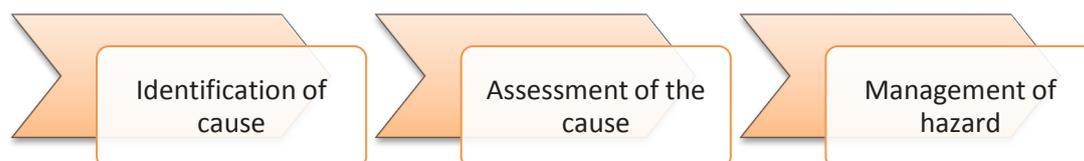


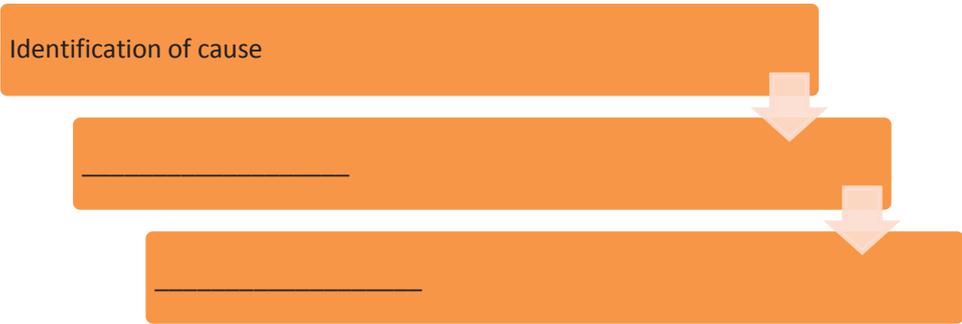
Fig. 6.4.5: Systematic approach for handling hazards

**Exercise** 

1. Tick the actions which can prove to be a threat to the health and safety of a field technician.

- Smoking near combustible substances
- Oil spill near customer interaction area
- Tools lying on a table of a technician
- Tools lying on the floor
- Entering a 'No Entry' zone at customer site
- Touching a live wire hanging out of a panel
- Working in dim light
- Walking on a wet floor

2. Complete the systematic approach for handling hazards?



## UNIT 6.5: Interacting with Colleagues

### Unit Objectives

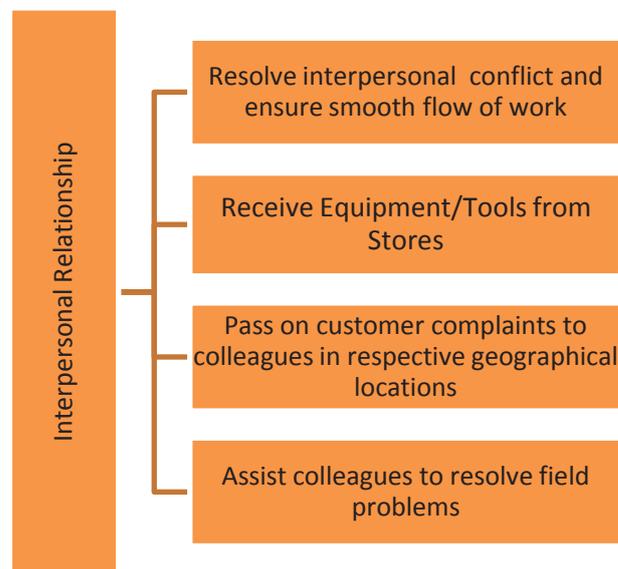
**At the end of this unit, you will be able to:**

1. Receive spares from tool room or stores or deposit faulty modules and tools to stores
2. Pass on customer complaints to colleagues
3. Assist colleagues with resolving field problems
4. Resolve conflicts and achieve smooth workflow

### 6.5.1 Interpersonal Relationship

Every worker works towards a common goal in an organization, still all of them are divided by certain roles and activities and the way they accomplish that objective. Inter-personnel communication – whether formal or informal - is the most common and important key to accomplish productivity and perform social functions in an organization.

The primary objective of a field technician is to understand the process and the health of the communication taking place among the co-workers in order to improve its quality. To maintain a healthy interpersonal relationship, it is important to adhere to the points shown in the following figure:



*Fig 6.5.1: Managing interpersonal relationship*

#### **Resolve Conflicts**

As discussed earlier, individuals are divided by roles and responsibilities in an organization despite working towards a common goal. Hence possibility of conflicts is nearly unavoidable.

Here are a few tips to reinstate better communication among co-workers in such quandary.

- **Clarify role and responsibilities**

Going to basics is the best way to resolve a problem. Role of a field technician is to ensure a glitch-free workflow in an organization. He and his team will participate in addressing IT issues, whether small or big. Providing a more rounded perspective of job roles and responsibilities offers inculcation of a positive and resolute approach for problems among co-workers. Also, this enables people with less job experience take up things in a more constructive manner.

- **Plan strategically**

In most organizations, conflicts between co-workers occur due to tight schedules and deadlines. Employees working on deadlines are required to work on short turnaround times, resulting in causing frustration and stress. Strategic planning in advance is the best way to avoid such circumstances. Irrespective of the team size, this can be achieved by deploying tools like Calendar to communicate deadlines. The following image shows planning using a calendar:



*Fig. 6.5.2: Planning using a calendar*

### **Receive Equipment/Tools from Stores**

Getting the job done in a process depends on information communication. Furthermore, accuracy of the end result entirely depends on effective inter-personnel communication. For example, the IT department of an organization wants to replace old computers with the new ones, accurately and smoothly. The entire exchange process depends on how effectively the IT department communicated with the person in charge at the store, the requirement for infrastructure upgrade.

### **Customer Complaints in the Respective Geographical Area**

Serving customers at an organization with a wide spectrum of consumer base poses additional challenges. Maintaining service quality in such cases can be a challenging task, owing to cultural and social diversity. However, such barriers can be overcome in a better way by giving the opportunity to a worker hailing from the respective geographical area. Addressing such problems in this way can improve the ability of an organization to implement strategies aimed at improving the service quality.

The following images show the segmentation of the customer base to collect their complaints accordingly:



*Fig. 6.5.3: Segmentation of customer base*

### **Assist Colleagues**

Be it work allocation, manpower distribution or identification of areas of high responsiveness, healthy communication is the key to improve service quality. Informal communication is what is usually seen to be dominant in most workplaces. People asking for help from the person sitting at the adjacent desk to troubleshoot a hardware issue, rather than consulting a field technician, is one of the most common examples of informal communication. The communication is spontaneous and successful in achieving the goal, paving the way to formal inter-personnel communication. Despite having established communication procedures, the informal communications occur in every organization and help in resolving problems and conflicts in real time. Hence, the role of a field technician is to understand potential of this form of communication and further it with the help of modern-day technologies.

The following image shows colleagues assisting each other:



*Fig. 6.5.4: Colleagues assisting each other*

**Activity: Role Play**

You are assigned the task to install a hardware at a customer's site. You reach the customer's site along with your colleague. Your colleague starts arguing and shouting at you in front of the customer. What will you do?

Perform the role play.

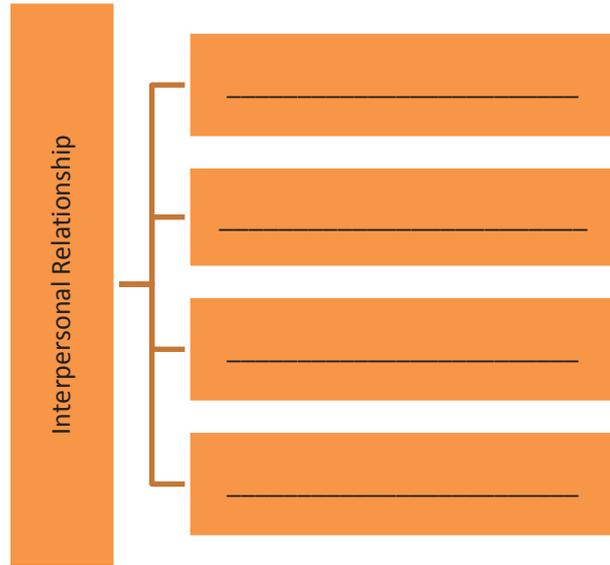
**Hints:**

Ask one participant to play the role of the technician and the other will play the role of the colleague who is shouting. Ask a third participant to be the customer.

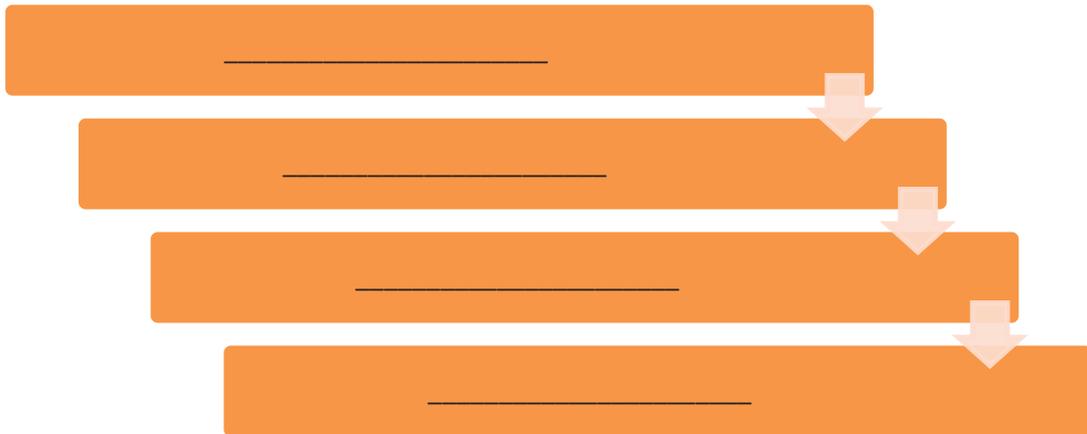
After the role play, discuss with other participants/viewers about what the players could have done better or if they missed a step/process.

## Exercise

1. Write down the points to maintain healthy interpersonal skills.



2. Write down few points for better communication with the colleagues.





## 7. Work effectively at the workplace

**Unit 7.1** Effective Communication and Coordination of work

**Unit 7.2** Work Effectively and Maintain discipline at work.

**Unit 7.3** Maintain social diversity at work



## Key Learning Outcomes



**By the end of this unit, participants will be able to:**

1. State the importance of work ethics and workplace etiquette
2. State the importance of effective communication and interpersonal skills
3. Explain ways to maintain discipline in the workplace
4. Discuss the common reasons for interpersonal conflict and ways of managing them effectively.

## UNIT 7.1: Effective Communication and Coordination at Work

### Unit Objectives

**By the end of this unit, participants will be able to:**

1. Work effectively at the workplace.
2. Demonstrate practices related to gender and PwD sensitization.

### 7.1.1 Importance of Work Ethics and Workplace Etiquette

Workplace ethics are a set of moral and legal guidelines that organizations follow. These guidelines influence the way customers and employees interact with an organization. Workplace ethics essentially guide how an organization serves its clients and treats its employees.

For example, if a company seeks to fulfil the promises it makes, it may develop processes and set up a robust support system to address this policy and build customer/client loyalty. To achieve this goal, the company may implement specific incentive programs for employees to encourage them to produce high-quality work and ensure the organization fulfils the promises it makes to its clients/ customers.

Many organizations, often the large ones, set detailed ethical codes to guide their operations and control how the organizational processes impact the stakeholders. These ethics usually help organizations maintain certain standards of responsibility, accountability, professionalism and among others, as they navigate through different challenges and day-to-day circumstances. By following these guidelines, organizations often experience several benefits that improve the lives of stakeholders, such as customers, employees, leaders, etc.

#### Examples of Common Workplace Ethics



*Fig. 7.1.1 Examples of Common Workplace Ethics*

Workplace ethics are essential for a successful organization with a satisfied and loyal team. High ethical standards help in ensuring all stakeholders, such as customers, investors, employees, and other individuals involved in the workplace operations, feel the organization is safeguarding their interests. By creating and implementing ethical guidelines, organizations can keep the best interests of their employees in mind while maintaining a positive influence on those they impact through their processes. As a result, employees maintain the organization's best interests by being ethical in their daily work duties. For example, fairly-treated employees of an organization who understand the organization's commitments to environmental sustainability are usually less likely to behave in a manner that causes harm to the environment. Thus, they help maintain a positive public image of the organization. It means that workplace ethics help in maintaining reciprocal relationships that benefit organizations at large and the individuals associated with and influenced by the organizational policies.

### Benefits of Workplace Ethics

There are various benefits of implementing workplace ethics. When organizations hold themselves to high ethical standards, leaders, stakeholders, and the general public can experience significant improvements. Following are some of the key benefits of employing ethics in the workplace:



Fig. 7.1.2 Benefits of Workplace Ethics

## 7.1.2 Interpersonal Communication

Interpersonal communication is a process that involves sharing ideas and emotions with another person, both - verbally and non-verbally. It is essential to interact effectively with others in both personal and professional lives. In professional life or the workplace, strong interpersonal skills play a crucial role in achieving effective collaboration with colleagues.

### Interpersonal Skills

Interpersonal skills, in other terms, are known as people skills, which are used to communicate and interact with others effectively. These are soft skills one uses to communicate with others and understand them. One uses these skills in daily life while interacting with people

### Examples of Interpersonal Skills



Fig 7.1.3 Examples of Interpersonal Skills

Numerous interpersonal skills involve communication. Communication can be verbal, such as persuasion or tone of voice — or non-verbal, such as listening and body language.

### Importance of Interpersonal Skills

Interpersonal skills are essential for communicating and collaborating with groups and individuals in both personal and professional life. People with strong interpersonal skills often are able to build good relationships and also tend to work well with others. Most people often enjoy working with co-workers who have good interpersonal skills.

Among other benefits of good interpersonal skills is the ability to solve problems and make the best decisions. One can use the ability to understand others and good interpersonal communication skills to find the best solution or make the best decisions in the interest of everyone involved. Strong interpersonal skills help individuals work well in teams and collaborate effectively. Usually, people who possess good interpersonal skills also tend to be good leaders, owing to their ability to communicate well with others and motivate the people around them.

Interpersonal communication is the key to working in a team environment and working collectively to achieve shared goals. Following are the interpersonal

### **Verbal Communication**

The ability to speak clearly, appropriately and confidently can help one communicate effectively with others. It is vital to select the appropriate vocabulary and tone for the target audience.

For example – one should speak formally and professionally in the work environment, while informal language is acceptable in an intimate environment with close friends and family. Also, one should avoid using complex or technical language while communicating with an audience that may not be familiar with it. Using simple language in a courteous tone helps achieve better communication, irrespective of the audience.

### **Active Listening**

Active listening is defined as the ability to pay complete or undivided attention to someone when they speak and understand what they are saying. It is important for effective communication because without understanding what the speaker is saying, it becomes difficult to carry forward a conversation. One should ensure to use appropriate verbal and non-verbal responses, e.g. eye contact, nodding, or smiling, to show interest in what the speaker says. Active listening is also about paying attention to the speaker's body language and visual cues. Asking and answering questions is one of the best ways to demonstrate an interest in conversing with the other person.

Active listening is critical for communicating effectively without ambiguity. It helps one understand the information or instructions being shared. It may also encourage co-workers to share their ideas, which ultimately helps achieve collaboration.

### **Body Language**

One's expression, posture, and gestures are as important as verbal communication. One should practice open body language to encourage positivity and trust while communicating. Open body language includes - maintaining eye contact, nodding, smiling and being comfortable. On the other hand, one should avoid closed body language, e.g. crossed arms, shifting eyes and restless behaviour.

### **Empathy**

Empathy is the ability to understand the emotions, ideas and needs of others from their point of view. Empathy is also known as emotional intelligence. Empathetic people are good at being aware of others' emotions and compassionate when communicating with them. Being empathetic in the workplace can be good to boost the morale of employees and improve productivity. By showing empathy, one can gain the trust and respect of others.

### **Conflict Resolution**

One can use interpersonal communication skills to help resolve disagreements and conflicts in the workplace. This involves the application of negotiation and persuasion skills to resolve arguments between conflicting parties. It is also important to evaluate and understand both sides of the argument by listening closely to everyone involved and finding an amicable solution acceptable to all.

Good conflict resolution skills can help one contribute to creating a collaborative and positive work environment. With the ability to resolve conflicts, one can earn the trust and respect of co-workers. Interpersonal communication skills that are vital for success at work:

## Teamwork

Employees who communicate and work well in a team often have better chances of achieving success and common goals. Being a team player can help one avoid conflicts and improve productivity. One can do this by offering to help co-workers when required and asking for their feedback and ideas. When team members give their opinions or advice, one should positively receive and react to the opinions/advice. One should be optimistic and encouraging when working in groups.

## Improving Interpersonal Skills

One can develop interpersonal skills by practising good communication and setting goals for improvement. One should consider the following tips to improve their interpersonal skills:

- One should ask for feedback from co-workers, managers, family or friends to figure out what needs improvement concerning their interpersonal skills.
- One can identify the areas of interpersonal communication to strengthen by watching others.
- One can learn and improve interpersonal skills by observing co-workers, company leaders and professionals who possess good interpersonal skills. This includes watching and listening to them to note how they communicate and the body language used by them. It is vital to note their speed of speaking, tone of voice, and the way they engage with others. One should practice and apply such traits in their own interactions and relationships.
- One should learn to control their emotions. If stressed or upset, one should wait until being calm to have a conversation. One is more likely to communicate effectively and confidently when not under stress.
- One can reflect on their personal and professional conversations to identify the scope of improvement and learn how to handle conversations better or communicate more clearly. It helps to consider whether one could have reacted differently in a particular situation or used specific words or positive body language more effectively. It is also vital to note the successful and positive interactions to understand why they are successful.
- One should practice interpersonal skills by putting oneself in positions where one can build relationships and use interpersonal skills. For example, one can join groups that have organized meetings or social events. These could be industry-specific groups or groups with members who share an interest or hobby.
- Paying attention to family, friends and co-workers and making efforts to interact with them helps a lot. One should complement their family, friends and co-workers on their good ideas, hard work and achievements. Trying to understand someone's interests and showing interest in knowing them can help one build strong interpersonal skills. Offering to help someone, especially in difficult situations, helps build stronger and positive workplace relationships.
- One should avoid distractions, such as a mobile phone, while interacting with someone. Giving someone full attention while avoiding distractions helps achieve a clear exchange of ideas. By listening with focus, one can understand and respond effectively.

- One can attend appropriate courses on interpersonal skills or sign up for workshops at work to improve interpersonal skills. One can find many resources online also, such as online videos.
- For personal mentoring, one can approach a trusted family member, friend, co-worker, or current/former employer. A person one looks up to with respect and admires is often a good choice to be selected as a mentor. One can even hire a professional career or communication coach.

Interpersonal communication skills often help one boost their morale, be more productive in the workplace, complete team projects smoothly and build positive and strong relationships with co-workers.



## UNIT 7.2: Working Effectively and Maintaining Discipline at Work

### Unit Objectives

**By the end of this unit, participants will be able to:**

- Discuss the importance of following organizational guidelines for dress code, time schedules, language usage and other behavioural aspects
- Explain the importance of working as per the workflow of the organization to receive instructions and report problems
- Explain the importance of conveying information/instructions as per defined protocols to the authorised persons/team members
- Explain the common workplace guidelines and legal requirements on non-disclosure and confidentiality of business-sensitive information
- Describe the process of reporting grievances and unethical conduct such as data breaches, sexual harassment at the workplace, etc.
- Discuss ways of dealing with heightened emotions of self and others.

### 7.2.1 Discipline at Work

Discipline is essential for organizational success. It helps improve productivity, reduce conflict and prevent misconduct in the workplace. It is important to have rules concerning workplace discipline and ensure that all employees comply with them. In the absence of discipline, a workplace may experience conflicts, bullying, unethical behaviour and poor employee performance. An efficient workplace disciplinary process helps create transparency in the organization. Benefits of disciplinary standards:

All employees follow the same rules which helps establish uniformity and equality in the workplace

Managers and supervisors have defined guidelines on what actions to take while initiating disciplinary action

With well-defined and enforced disciplinary rules, an organization can avoid various safety, security, reputational risks

*Fig 7.2.1 Benefits of Disciplinary Standards*

Maintaining an organized and cohesive workforce requires maintaining discipline in both personal and professional behaviour. It is important to follow the appropriate measures to keep employees in line without affecting their morale.

### Defining Discipline

The first and crucial step in maintaining workplace discipline is to define what is meant by discipline. It helps to evaluate common discipline problems and devise guidelines for handling them effectively.

Among a number of areas, discipline usually covers:

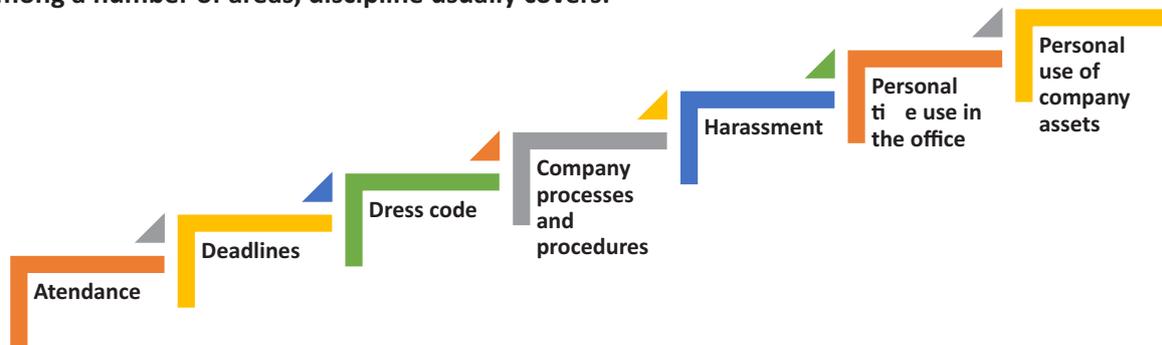


Fig 7.2.2 Examples of Workplace Discipline

According to demography and local issues, it may also include substance use and related issues.

It is vital for a workplace to have an employee handbook or company policy guide, to serve as a rulebook for employees to follow. The employee handbook/ company policy guide should be reviewed and updated periodically according to any issues or areas, or concerns identified concerning workplace discipline. Such manuals should also cover all the laws and regulations governing workplace behaviour.

Defining and documenting workplace rules aids in their implementation, ensuring little or no ambiguity. All employees in a workplace should also have easy access to the workplace guidelines so that they can refer to them to get clarity whenever required. To maintain discipline at work, it is also critical to ensure uniform application of workplace guidelines to all employees without exception.

## 7.2.2 Employee Code of Conduct

The employee code of conduct manual serves as a guide for employees to inform them regarding the behaviour expected from them at work. It helps create a good work environment with consistent behaviour from employees. The manual should list examples of acceptable and not acceptable behaviours at work. The code of conduct should be discussed with employees so that they have the clarifications required.

For example, an organization may create guidelines concerning the conduct with clients to ensure no contact is made with them except for business purposes, also prescribing the use of appropriate means of communication.

Employees should have a clear understanding concerning their job responsibilities and the behaviour expected from them with all stakeholders, e.g. company personnel, clients and associated third parties. It is critical to have documented guidelines for employees to follow concerning all aspects of work. It should also document the disciplinary action to be followed in case of non-compliance, e.g. verbal and

then written warning, temporary suspension or eventual termination of service in case of repeated non-compliance with the employee code of conduct. Employees should know what the company rules are and what will happen if they break the rules. However, disciplinary action should be initiated only when reasonably required to avoid its misuse for employee harassment.

There should also be an effective mechanism for employees to raise their concerns/ grievances and have them addressed while maintaining privacy, as required, e.g. raising concerns regarding the behaviour of a co-worker.

The employee code of conduct manual must be duly reviewed and approved by the concerned stakeholders, such as the Human Resources (HR) department and company executives.

### 7.2.3 Interpersonal Conflicts

Interpersonal conflict is any type of conflict between two or more people. These are found in both - personal and professional relationships - among friends, family, and co-workers. In the workplace, interpersonal conflict is often observed when a person or group of people interfere with another person's attempts at completing assignments and achieving goals. It is critical to resolve conflicts in the workplace to boost the morale of employees, repair working relationships among them, and improve customer satisfaction.

#### Reasons for Workplace Conflicts

Workplace conflicts are often observed when two or more people have different points of view. This can happen between managers, co-workers, or clients and customers. In general, interpersonal conflicts are caused by a lack of communication or unclear communication.

Some of the leading reasons for workplace conflicts are:

- Difference in values
- Personality clashes
- Poor communication

Example of poor communication – if a manager reassigns a task to another employee without communicating with the employee to whom it was originally assigned, interpersonal conflict can arise among them. This may potentially make the first employee, i.e. who was originally assigned the task, feel slighted and mistrusted by the manager. It may even cause animosity in the first employee toward the employee who has now been assigned the task.

### Types of Interpersonal Conflict

Following are the four types of interpersonal conflicts:

**a. Policy-related interpersonal conflict**

When a conflict relates to a decision or situation that involves both parties, it can be called a policy-related interpersonal conflict. Example – two people or groups working on the same project, trying to adopt different approaches. To resolve policy-related interpersonal conflicts, the parties involved should try to look for a win-win situation or make a compromise. This is especially critical to resolve trivial issues so that work is not affected and common goals are achieved.

**b. Pseudo-conflicts**

Pseudo-conflict arises when two people or groups want different things and cannot reach an agreement. Pseudo-conflicts usually involve trivial disagreements that tend to hide the root of the issue.

**c. Ego-related interpersonal conflicts**

In ego conflicts, losing the argument may hurt or damage a person's pride. Sometimes ego conflicts arise when a number of small conflicts pile up on being left unresolved. To resolve ego-related conflicts, it's best to find the root of the issue and work towards a resolution.

**d. Value-related interpersonal conflicts**

Sometimes conflicts may occur between people when they have different value systems. Such conflicts can be difficult to identify initially, making the people involved think the other party is being disagreeable or stubborn, wherein they just have different values. Some co-workers may highly value their personal/ family time after office that they may be unreachable to clients during non-office hours, while others may place a high value on client satisfaction and may still be available for clients during non-office hours. Conflict may arise among such people when they may be required to coordinate to help a client during after-office hours. Value-related interpersonal conflicts are often difficult to settle since neither party likes to compromise.

### Resolving Interpersonal Conflicts

Conflicts are usually likely in the workplace; they can, however, be prevented. Often resolving interpersonal conflicts through open communication helps build a stronger relationship, paving the way for effective coordination and success. Some ways to resolve interpersonal conflict:

- **Communication** - A great way to resolve interpersonal conflicts is for the opposing parties to listen to one another's opinions and understand their viewpoints. Meeting in person and keeping the conversation goal-oriented is important. One can have effective communication by following some measures, e.g. staying on the topic, listening actively, being mindful of the body language, maintaining eye contact, etc.

- **Active Listening** - One should patiently listen to what the other person is saying without interrupting or talking over them. It helps one display empathy and get to the root of the issue. Asking questions to seek clarification when required helps in clear communication and conveys to the other person that one is listening to them. Practising active listening is a great way to improve one's communication skills.
- **Displaying Empathy** - Listening attentively and identifying the anxieties/ issues of co-workers is a great way to show empathy and concern. It is essential to understand their feelings and actions to encourage honesty and avoid future conflict.
- **Not Holding Grudges** - With different types of people and personalities in a workplace, it is common for co-workers to have conflicts. It is best to accept the difference in opinions and move on. Being forgiving and letting go of grudges allows one to focus on the positive side of things and perform better at work.

Work-related interpersonal conflicts can be complicated because different people have different leadership styles, personality characteristics, job responsibilities and ways in which they interact. One should learn to look above interpersonal conflicts, resolving them to ensure work goals and environment are not affected.

## 7.2.4 Importance of Following Organizational Guidelines

Policies and procedures or organizational guidelines are essential for any organization. These provide a road map for the operations of the organization. These are also critical in ensuring compliance with the applicable laws and regulations by guiding the decision-making process and business operations.

Organizational guidelines help bring uniformity to the operations of an organization, which helps reduce the risk of unwanted and unexpected events. These determine how employees are supposed to behave at work, which ultimately helps the business achieve its objectives efficiently.

However, organizational guidelines are ineffective and fail to serve their purpose if they are not followed. Many people don't like the idea of following and abiding by specific guidelines. Such people should be made to understand the benefits of following the organizational guidelines. Some of the key benefits are given below:

With well-defined organizational guidelines in place, no individual can act arbitrarily, irrespective of their position in the organization. All individuals will know the pros and cons of taking certain actions and what to expect in case of unacceptable behaviour. Benefits of following organizational guidelines:

- Consistent processes and structures - Organization guidelines help maintain consistency in operations, avoiding any disorder. When all employees follow the organizational guidelines, an organization can run smoothly. These ensure that people in different job roles operate as they are supposed to, knowing what they are responsible for, what is expected of them, and what they can expect from their supervisors and co-workers. With clarity in mind, they can do their jobs with confidence and excellence. With every person working the way intended, it's easy to minimise errors.

With all the staff following organizational guidelines, the organization has a better scope of using time and resources more effectively and efficiently. This allows the organization to grow and achieve its objectives.

- **Better quality service** - By following organizational guidelines, employees perform their duties correctly as per the defined job responsibilities. It helps enhance the quality of the organization's products and services, helping improve the organization's reputation. Working with a reputable organization, employees can take pride in their work and know they are contributing to the reputation.
- **A safer workplace** - When all employees follow organizational guidelines, it becomes easy to minimise workplace incidents and accidents. It reduces the liabilities associated with risks for the organization and limits the interruptions in operations. Employees also feel comfortable and safe in the workplace, knowing their co-workers are ensuring safety at work by following the applicable guidelines.

Different organizations may have different guidelines on dress code, time schedules, language usage, etc. For example – certain organizations in a client-dealing business requiring employees to meet clients personally follow a strict dress code asking their employees to wear formal business attire. Similarly, organizations operating in specific regions may require their employees to use the dominant regional language of the particular region to build rapport with customers and serve them better. Certain organizations, such as banks, often give preference to candidates with knowledge of the regional language during hiring.

Working hours may also differ from one organization to another, with some requiring employees to work extra compared to others. One should follow the organizational guidelines concerning all the aspects of the employment to ensure a cohesive work environment.

## 7.2.5 Workflow

Workflow is the order of steps from the beginning to the end of a task or work process. In other words, it is the way a particular type of work is organised or the order of stages in a particular work process.

Workflows can help simplify and automate repeatable business tasks, helping improve efficiency and minimise the room for errors. With workflows in place, managers can make quick and smart decisions while employees can collaborate more productively.

Other than the order that workflows create in a business, these have several other benefits, such as:

- **Identifying Redundancies** - Mapping out work processes in a workflow allows one to get a clear, top-level view of a business. It allows one to identify and remove redundant or unproductive processes.

Workflow gives greater insights into business processes. Utilizing such useful insights, one can improve work processes and the bottom line of the business. In many businesses, there are many unnecessary and redundant tasks that take place daily. Once an organization has insight into its processes while preparing workflow, it can determine which activities are really necessary.

Identifying and eliminating redundant tasks creates value for a business. With redundant tasks and processes eliminated, an organization can focus on what's important to the business.

- **Increase in Accountability and Reduction in Micromanagement** - Micromanagement often causes problems in a business setting as most employees don't like being micromanaged, and even many managers don't like the practice. Micromanagement is often identified as one of the reasons why people quit their job.

However, the need for micromanagement can be minimized by clearly mapping out the workflow. This way, every individual in a team knows what tasks need to be completed and by when and who is responsible for completing them. This makes employees more accountable also.

With clearly defined workflow processes, managers don't have to spend much time micromanaging their employees, who don't have to approach the manager to know what the further steps are. Following a workflow, employees know what is going on and what needs to be done. This, in turn, may help increase the job satisfaction of everyone involved while improving the relationships between management and employees.

- **Improved Communication** - Communication at work is critical because it affects all aspects of an organization. There are instances when the main conflict in an organization originates from miscommunication, e.g. the management and employees disagreeing on an aspect, despite pursuing the same objectives. Poor communication is a common workplace issue that is often not dealt with.
- This highlights why workflow is important. Workplace communication dramatically can increase with the visibility of processes and accountability. It helps make the daily operations smoother overall.

- **Better Customer Service** - Customers or clients are central to a business. Therefore, it is imperative to find and improve ways to improve customer experience. Relying on outdated manual systems may cause customer requests or complaints to be overlooked, with dissatisfied customers taking their business elsewhere. However, following a well-researched and defined workflow can help improve the quality of customer service.

By automating workflows and processes, an organization can also reduce the likelihood of human error. This also helps improve the quality of products or services over time, resulting in a better customer experience.

### 7.2.6 Following Instructions and Reporting Problems

All organizations follow a hierarchy, with most employees reporting to a manager or supervisor. For organizational success, it is vital for employees to follow the instructions of their manager or supervisor. They should ensure they perform their duties as per the given instructions to help achieve the common objectives of the organization and deliver quality service or products. This consequently helps maintain the reputation of the organization.

It is also important to be vigilant and identify problems at work or with the organizational work processes. One should deal with the identified within their limits of authority and report out of authority problems to the manager/ supervisor or the concerned person for a prompt resolution to minimise the impact on customers/clients and business.

### 7.2.7 Information or Data Sharing

Information or data is critical to all organizations. Depending on the nature of its business, an organization may hold different types of data, e.g. personal data of customers or client data concerning their business operations and contacts. It is vital to effective measures for the appropriate handling of different types of data, ensuring its protection from unauthorized access and consequent misuse.

One should access certain data only if authorised to do so. The same is applicable when sharing data which must be shared only with the people authorised to receive it to use it for a specific purpose as per their job role and organizational guidelines. For example – one should be extra cautious while sharing business data with any third parties to ensure they get access only to the limited data they need as per any agreements with them. It is also critical to monitor how the recipient of the data uses it, which should strictly be as per the organizational guidelines. It is a best practice to share appropriate instructions with the recipient of data to ensure they are aware of the purpose with which data is being shared with them and how they are supposed to use and handle it. Any misuse of data must be identified and reported promptly to the appropriate person to minimise any damage arising out of data misuse.

These days most organizations require their employees and business partners or associated third parties to sign and accept the relevant agreement on the non-disclosure of business-sensitive information. In simple terms, business-sensitive information is confidential information. It is proprietary business information collected or created during the course of conducting business, including information about the business, e.g. proposed investments, intellectual property, trade secrets, or plans for a merger and information related to its clients. Business-sensitive information may sometimes also include information regarding a business's competitors in an industry.

The release of business-sensitive information to competitors or the general public poses a risk to a business. For example, information regarding plans for a merger could be harmful to a business if a competitor gets access to it.

### 7.2.8 Reporting Issues at Work

Most organizations have defined guidelines on appropriate reporting processes to be followed for reporting different types of issues. For example – one can report any grievances or dissatisfaction concerning co-workers to their manager/supervisor, e.g. data breaches or unethical conduct. If the concern is not addressed, then the employee should follow the organizational guidelines and hierarchy for the escalation of such issues that are not addressed appropriately.

For example – any concern related to sexual harassment at the workplace should be escalated to the concerned spokesperson, such as Human Resources (HR) representative, and if not satisfied with the action taken, it should be reported to the senior management for their consideration and prompt action.

### 7.2.9 Dealing with Heightened Emotions

Humans are emotional beings. There may be occasions when one is overwhelmed by emotions and is unable to suppress them. However, there may be situations when one must manage emotions well, particularly at work.

Stress in one's personal and professional life may often cause emotional outbursts at work. Managing one's emotions well, particularly the negative ones, is often seen as a measure of one's professionalism. Anger, dislike, frustration, worry, and unhappiness are the most common negative emotions experienced at work.

#### **Ways to manage negative emotions at work:**

- **Compartmentalisation** – It's about not confining emotions to different aspects of one's life. For example, not letting negative emotions from personal life affect work-life and vice versa. One should try to leave personal matters and issues at home. One should train their mind to let go of personal matters before reaching work. Similarly, one can compartmentalise work-related stresses so that negative emotions from work don't affect one's personal life.

- **Deep breathing and relaxation** – Deep breathing helps with anxiety, worry, frustration and anger. One should take deep breaths, slowly count to ten - inhaling and exhaling until one calms down. One can also take a walk to calm down or listen to relaxing music. Talking to someone and sharing concerns also helps one calm down.
- **The 10-second rule** - This is particularly helpful in controlling anger and frustration. When one feels their temper rising, they should count to 10 to calm down and recompose. If possible, one should move away to allow temper to come down.
- **Clarify** - It is always good to clarify before reacting, as it may be a simple case of misunderstanding or miscommunication.
- **Physical activity** - Instead of losing temper, one should plan to exercise, such as running or going to the gym, to let the anger out. Exercise is also a great way to enhance mood and release any physical tension in the body.
- **Practising restraint** - One should avoid replying or making a decision when angry, not allowing anger or unhappiness to cloud one's judgement. It may be best to pause any communication while one is angry, e.g. not communicating over email when angry or upset.
- **Knowing one's triggers** - It helps when one is able to recognise what upsets or angers them. This way, one can prepare to remain calm and plan their reaction should a situation occur. One may even be able to anticipate the other party's reaction.
- **Be respectful** - One should treat their colleagues the same way one would like to be treated. If the other person is rude, one need not reciprocate. It is possible to stay gracious, firm and assertive without being aggressive. Sometimes, rude people back away when they don't get a reaction from the person they are arguing with.
- **Apologise for any emotional outburst** – Sometimes, one can get overwhelmed by emotions, reacting with an emotional outburst. In such a case, one should accept responsibility and apologise immediately to the affected persons without being defensive.
- **Doing away with negative emotions** - It is recommended to let go of anger, frustration and unhappiness at the end of every workday. Harboring negative emotions affects one emotionally, affecting their job performance also. Engaging in enjoyable activities after work is a good stress reliever.



## UNIT 7.3: Maintaining Social Diversity at Work

### Unit Objectives

**By the end of this unit, participants will be able to:**

1. Explain the concept and importance of gender sensitivity and equality.
2. Discuss ways to create sensitivity for different genders and Persons with Disabilities (PwD).

### 7.3.1 Gender Sensitivity

Gender sensitivity is the act of being sensitive towards people and their thoughts regarding gender. It ensures that people know the accurate meaning of gender equality, and one's gender should not be given priority over their capabilities.



Fig 7.3.1 Gender Equality

Women are an important source of labour in many sectors, yet they have limited access to resources and benefits. Women should receive the same benefits and access to resources as men. A business can improve its productivity and quality of work by providing better support and opportunities to women.

#### Important Terms

- **Gender Sensitivity-** Gender sensitivity is the act of being sensitive to the ways people think about gender.
- **Gender Equality** - It means persons of any gender enjoy equal opportunities, responsibilities, and rights in all areas of life.
- **Gender Discrimination** – It means treating an individual unequally or disadvantageously based on their gender, e.g. paying different wages to men and women for similar or equal job positions.

**Strategies for Enhancing Gender Equity**

To enhance gender equity, one should:

- Follow gender-neutral practices at all levels at work.
- Participate together in decision-making.
- Help in promoting women's participation in different forums.
- Assist women in getting exposure to relevant skills and practices.
- Assist women in capacity building by mentoring, coaching or motivating them, as appropriate.
- Assist in the formation and operation of women support groups.
- Assist in the implementation of women-centric programmes.
- Combine technical training with reproductive health and nutrition for coffee farming households.
- Assist in making a work environment that is healthy, safe, and free from discrimination.

**Bridging Gender Differences**

Men and women react and communicate very differently. Thus, there are some work differences as both genders have their style and method of handling a situation.

Although, understanding and maturity vary from person to person, even between these genders, based on their knowledge, education, experience, culture, age, and upbringing, as well as how one's brain functions over a thought or problem.

**In order to bridge the gap, one should:**

- Not categorize all men and women in one way.
- Be aware of the verbal and non-verbal styles of communication of every gender to avoid any miscommunication and work better.
- Be aware of partial behaviour and avoid it.
- Encourage co-workers of different genders to make room by providing space to others.

**Ways to reduce Gender Discrimination**

- Effective steps against sexual harassment by the concerned authorities and general public.
- Gender stereotypes are how society expects people to act based on their gender. This can only be reduced by adopting appropriate behaviour and the right attitude.
- Objectification of females must be abolished.

### Ways to Promote Gender Sensitivity in the Workplace

Practices that promote gender diversity should be adopted and promoted.

- All genders should receive equal responsibilities, rights, and privileges.
- All genders should have equal pay for similar or the same job roles/ positions.
- Strict and effective workplace harassment policies should be developed and implemented.
- An open-minded and stress-free work environment should be available to all the employees, irrespective of their gender.
- Women should be encouraged to go ahead in every field of work and assume leadership roles.
- Follow appropriate measures for women's empowerment.
- Men should be taught to be sensitive to women and mindful of their rights.

## 7.3.2 PwD Sensitivity

Some individuals are born with a disability, while others may become disabled due to an accident, illness or as they get old. People with Disabilities (PwD) may have one or more areas in which their functioning is affected. A disability can affect hearing, sight, communication, breathing, understanding, mobility, balance, and concentration or may include the loss of a limb. A disability may contribute to how a person feels and affect their mental health

### Important Terms

• **Persons with Disabilities (PwD)** – Persons with Disabilities means a person suffering from not less than 40% of any disability as certified by a medical authority.

### •Types of Disability:

- a. Blindness – Visually impaired
- b. Low Vision
- c. Leprosy Cured
- d. Hearing impairment
- e. Locomotor disability
- f. Mental retardation
- g. Mental illness

### PwD Sensitivity

PwD sensitivity promotes empathy, etiquette and equal participation of individuals and organizations while working with individuals with a disability, e.g. sensory, physical or intellectual.

### Ways to be PwD Sensitive

#### To be sensitive to PwD, one should:

- Be respectful to all Persons with Disabilities (PwD) and communicate in a way that reflects PwD sensitivity.
- Always be supportive and kind towards a PwD with their daily chores.
- Be ready to assist a PwD to help them avail of any benefit/ livelihood opportunity/ training or any kind that helps them grow.
- Encourage and try to make things easier and accessible to PwD so that they can work without or with minimum help.
- Protest where feasible and report any wrong act/behaviour against any PwD to the appropriate authority.
- Learn and follow the laws, acts, and policies relevant to PwD.

### Appropriate Verbal Communication

As part of appropriate verbal communication with all genders and PwD, one should:

- Talk to all genders and PwD respectfully, maintaining a normal tone of voice with appropriate politeness. It is important to ensure one's tone of voice does not have hints of sarcasm, anger, or unwelcome affection.
- Avoid being too self-conscious concerning the words to use while also ensuring not to use words that imply one's superiority over the other.
- Make no difference between a PwD and their caretaker. Treat PwD like adults and talk to them directly.
- Ask a PwD if they need any assistance instead of assuming they need it and offering assistance spontaneously.

### Appropriate Non-verbal Communication

Non-verbal communication is essentially the way someone communicates through their body language.

These include:

- **Facial expressions** - The human face is quite expressive, capable of conveying many emotions without using words. Facial expressions must usually be maintained neutral and should change according to the situation, e.g. smile as a gesture of greeting.
- **Body posture and movement** - One should be mindful of how to sit, stand, walk, or hold their head. For example - one should sit and walk straight in a composed manner. The way one moves and carries self, communicates a lot to others. This type of non-verbal communication includes one's posture, bearing, stance, and subtle movements.

- **Gestures** - One should be very careful with their gestures, e.g. waving, pointing, beckoning, or using one's hands while speaking. One should use appropriate and positive gestures to maintain respect for the other person while being aware that a gesture may have different meanings in different cultures.
- **Eye contact** - Eye contact is particularly significant in non-verbal communication. The way someone looks at someone else may communicate many things, such as interest, hostility, affection or attraction. Eye contact is vital for maintaining the flow of conversation and for understanding the other person's interest and response. One should maintain appropriate eye contact, ensuring not to stare or look over the shoulders. To maintain respect, one should sit or stand at the other person's eye level to make eye contact.
- **Touch** - Touch is a very sensitive type of non-verbal communication. Examples are - handshakes, hugs, pat on the back or head, gripping the arm, etc. A firm handshake indicates interest, while a weak handshake indicates the opposite. One should be extra cautious not to touch others inappropriately and avoid touching them inadvertently by maintaining a safe distance.

### **Rights of PwD**

PwD have the right to respect and human dignity. Irrespective of the nature and seriousness of their disabilities, PwD have the same fundamental rights as others, such as:

- Disabled persons have the same civil and political rights as other people
- Disabled persons are entitled to the measures designed to enable them to become as self-dependent as possible
- Disabled persons have the right to economic and social security
- Disabled persons have the right to live with their families or foster parents and participate in all social and creative activities.
- Disabled persons are protected against all exploitation and treatment of discriminatory and abusive nature.

### **Making Workplace PwD Friendly**

- One should not make PwD feel uncomfortable by giving too little or too much attention
- One should use a normal tone while communicating with a PwD and treat them as all others keeping in mind their limitations and type of disability
- Any help should be provided only when asked for by a PwD
- One should help in ensuring the health and well-being of PwD.

### **Expected Employer Behaviour**

Some of the common behavioural traits that employees expect from their employers are:

- **Cooperation:** No work is successful without cooperation from the employer's side. Cooperation helps to understand the job role better and complete it within the given timeline.
- **Polite language:** Polite language is always welcomed at work. This is a basic aspect that everybody expects.
- **Positive Attitude:** Employers with a positive attitude can supervise the work of the employees and act as a helping hand to accomplish the given task. A person with a positive attitude looks at the best qualities in others and helps them gain success.
- **Unbiased behaviour:** Employers should always remain fair towards all their employees. One should not adopt practices to favour one employee while neglecting or ignoring the other. This might create animosity among co-workers.
- **Decent behaviour:** The employer should never improperly present oneself before the employee. One should always respect each other's presence and behave accordingly. The employer should not speak or act in a manner that may make the employee feel uneasy, insulted, and insecure.

## Exercise

1. List down three examples of workplace ethics.
2. List down three examples of interpersonal skills.
3. Identify two reasons for workplace conflicts.
4. Identify two ways of resolving interpersonal conflicts
5. List down two ways of dealing with heightened emotions at work.
6. List down two types of non-verbal communication.



## 8. Apply health and safety practices at the workplace



- Unit 8.1** Workplace Hazards
- Unit 8.2** Fire Safety
- Unit 8.3** First Aid
- Unit 8.4** Waste Management



## Key Learning Outcomes



**By the end of this module, participants will be able to:**

1. Discuss job-site hazards, risks and accidents
2. Explain the organizational safety procedures for maintaining electrical safety, handling tools and hazardous materials
3. Describe how to interpret warning signs while accessing sensitive work areas
4. Explain the importance of good housekeeping
5. Describe the importance of maintaining appropriate postures while lifting heavy objects
6. List the types of fire and fire extinguishers
7. Describe the concept of waste management and methods of disposing of hazardous waste
8. List the common sources of pollution and ways to minimize them
9. Elaborate on electronic waste disposal procedures
10. Explain how to administer appropriate first aid to victims in case of bleeding, burns, choking, electric shock, poisoning and also administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock

## UNIT 8.1: Workplace Hazards

### Unit Objectives

**By the end of this unit, participants will be able to:**

- Discuss job-site hazards, risks and accidents
- Explain the organizational safety procedures for maintaining electrical safety, handling tools and hazardous materials
- Describe how to interpret warning signs while accessing sensitive work areas
- Explain the importance of good housekeeping
- Describe the importance of maintaining appropriate postures while lifting heavy objects
- Explain safe handling of tools and Personal Protective Equipment to be used.

### 8.1.1 Workplace Safety

Workplace safety is important to be established for creating a safe and secure working for the workers. The workplace has to be administered as per the rules of the Occupational Safety and Health Administration (OSHA). It refers to monitoring the working environment and all hazardous factors that impact employees' safety, health, and well-being. It is important to provide a safe working environment to the employees to increase their productivity, wellness, skills, etc.

**The benefits of workplace safety are:**

- Employee retention increases if they are provided with a safe working environment.
- Failure to follow OSHA's laws and guidelines can result in significant legal and financial consequences.
- A safe environment enables employees to stay invested in their work and increases productivity.
- Employer branding and company reputation can both benefit from a safe working environment.

### 8.1.2 Workplace Hazards

A workplace is a situation that has the potential to cause harm or injury to the workers and damage the tools or property of the workplace. Hazards exist in every workplace and can come from a variety of sources. Finding and removing them is an important component of making a safe workplace.

#### **Common Workplace Hazards**

The common workplace hazards are:

·Biological: The threats caused by biological agents like viruses, bacteria, animals, plants, insects and also humans, are known as biological hazards.

- **Chemical:** Chemical hazard is the hazard of inhaling various chemicals, liquids and solvents. Skin irritation, respiratory system irritation, blindness, corrosion, and explosions are all possible health and physical consequences of these dangers.
- **Mechanical:** Mechanical Hazards comprise the injuries that can be caused by the moving parts of machinery, plant or equipment.
- **Psychological:** Psychological hazards are occupational hazards caused by stress, harassment, and violence.
- **Physical:** The threats that can cause physical damage to people is called physical hazard. These include unsafe conditions that can cause injury, illness and death.
- **Ergonomic:** Ergonomic Hazards are the hazards of the workplace caused due to awkward posture, forceful motion, stationary position, direct pressure, vibration, extreme temperature, noise, work stress, etc.

### Workplace Hazards Analysis

A workplace hazard analysis is a method of identifying risks before they occur by focusing on occupational tasks. It focuses on the worker's relationship with the task, the tools, and the work environment. After identifying the hazards of the workplace, organisations shall try to eliminate or minimize them to an acceptable level of risk.

### Control Measures of Workplace Hazards

Control measures are actions that can be taken to reduce the risk of being exposed to the hazard. Elimination, Substitution, Engineering Controls, Administrative Controls, and Personal Protective Equipment are the five general categories of control measures.

- **Elimination:** The most successful control technique is to eliminate a specific hazard or hazardous work procedure or prevent it from entering the workplace.
- **Substitution:** Substitution is the process of replacing something harmful with something less hazardous. While substituting the hazard may not eliminate all of the risks associated with the process or activity, it will reduce the overall harm or health impacts.
- **Engineering Controls:** Engineered controls protect workers by eliminating hazardous situations or creating a barrier between the worker and the hazard, or removing the hazard from the person.
- **Administrative Controls:** To reduce exposure to hazards, administrative controls limit the length of time spent working on a hazardous task that might be used in combination with other measures of control.
- **Personal Protective Equipment:** Personal protective equipment protects users from health and safety hazards at work. It includes items like safety helmets, gloves, eye protection, etc.

### 8.1.3 Risk for a Drone Technician

A drone technician may require to repair the propeller, motor and its mount, battery, mainboards, processor, booms, avionics, camera, sensors, chassis, wiring and landing gear. A technician may face some risks while repairing the drones' equipment.

- The technician is susceptible to being physically harmed by propellers.
- Direct contact with exposed electrical circuits can injure the person.
- If the skin gets in touch with the heat generated from electric arcs, it burns the internal tissues.
- Major electrical injuries can occur due to poorly installed electrical equipment, faulty wiring, overloaded or overheated outlets, use of extension cables, incorrect use of replacement fuses, use of equipment with wet hands, etc.

### 8.1.4 Workplace Warning Signs

A Hazard sign is defined as 'information or instruction about health and safety at work on a signboard, an illuminated sign or sound signal, a verbal communication or hand signal.'

There are four different types of safety signs:

- Prohibition / Danger Alarm Signs
- Mandatory Signs
- Warning Signs
- And Emergency

**1. Prohibition Signs:** A "prohibition sign" is a safety sign that prohibits behaviour that is likely to endanger one's health or safety. The colour red is necessary for these health and safety signs. Only what or who is forbidden should be displayed on a restriction sign.



Fig. 8.1.1. Prohibition Warning Signs

## 2. Mandatory Signs:

Mandatory signs give clear directions that must be followed. The icons are white circles that have been reversed out of a blue circle. On a white background, the text is black.



Fig. 8.1.2. Mandatory Signs

## 3. Warning Signs

Warning signs are the safety information communication signs. They are shown as a 'yellow colour triangle'.



Fig. 8.1.3. Warning Signs

#### 4. Emergency Signs

The location or routes to emergency facilities are indicated by emergency signs. These signs have a green backdrop with a white emblem or writing. These signs convey basic information and frequently refer to housekeeping, company procedures, or logistics.

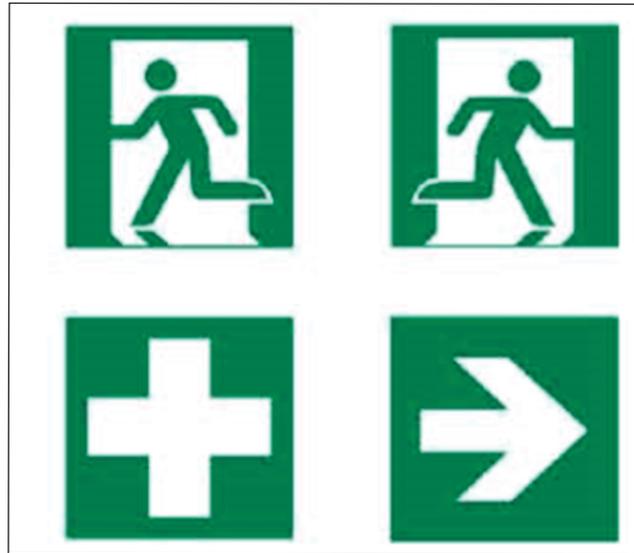


Fig. 8.1.4. Emergency Signs

### 8.1.5 Cleanliness in the Workplace

Workplace cleanliness maintenance creates a healthy, efficient and productive environment for the employees. Cleanliness at the workplace is hindered by some elements like cluttered desks, leftover food, waste paper, etc. A tidy workplace is said to improve employee professionalism and enthusiasm while also encouraging a healthy working environment.

#### Benefits of cleanliness in the workplace:

1. **Productivity:** Cleanliness in the workplace can bring a sense of belonging to the employees, also motivating and boosting the morale of the employees. This results in increasing their productivity.
2. **Employee Well-being:** Employee well-being can be improved by providing a clean work environment. Employees use fewer sick days in a workplace where litter and waste are properly disposed of, and surfaces are cleaned regularly, resulting in increased overall productivity.
3. **Positive Impression:** Cleanliness and orderliness in the workplace provide a positive impression on both employees and visitors.
4. **Cost saving:** By maintaining acceptable levels of cleanliness in the workplace, businesses can save money on cleaning bills and renovations, which may become necessary if the premises are not properly kept.

### Reasons for Cleaning the Workplace

- Cleaning of dry floors, mostly to prevent workplace slips and falls.
- Disinfectants stop bacteria in their tracks, preventing the spread of infections and illness.
- Proper air filtration decreases hazardous substance exposures such as dust and fumes.
- Light fixture cleaning improves lighting efficiency.
- Using environmentally friendly cleaning chemicals that are safer for both personnel and the environment.
- Work environments are kept clean by properly disposing of garbage and recyclable items.

## 8.1.6 Lifting and Handling of Heavy Loads

Musculoskeletal Injuries (MSIs), such as sprains and strains, can occur while lifting, handling, or carrying objects at work. When bending, twisting, uncomfortable postures and lifting heavy objects are involved, the risk of injury increases. Ergonomic controls can help to lower the risk of injury and potentially prevent it.

Types of injuries caused while lifting heavy objects:

- Cuts and abrasions are caused by rough surfaces.
- Crushing of feet or hands.
- Strain to muscles and joints

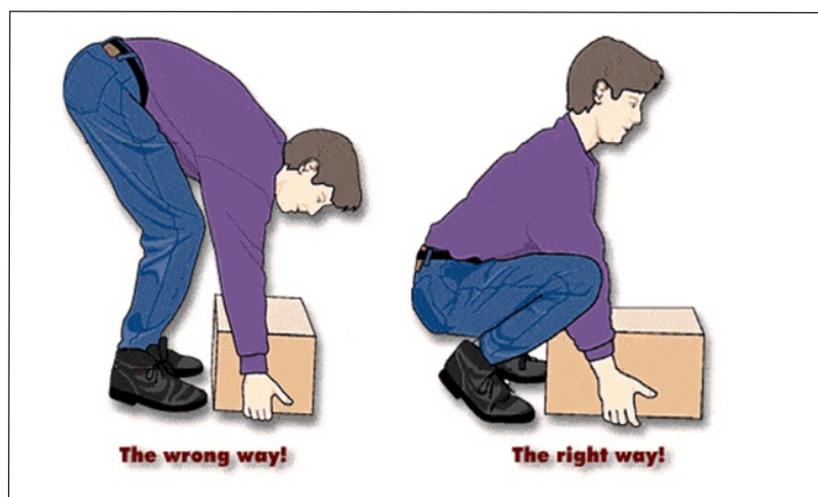


Fig. 8.1.5. Lifting loads technique

**Preparing to lift**

A load that appears light enough to bear at first will grow increasingly heavier as one carries it further. The person carrying the weight should be able to see over or around it at all times.

The amount of weight a person can lift, depends on their age, physique, and health. It also depends on whether or not the person is used to lifting and moving hefty objects.

**Common Causes of Back Injuries**

The Most Common Causes of Back Injuries are:

- 1) **Inadequate Training:** The individual raising the load receives no sufficient training or guidance.
- 2) **Lack of awareness of technique:** The most common cause of back pain is incorrect twisting and posture, which causes back strain.
- 3) **Load size:** The load size to consider before lifting. If the burden is too much for one's capacity or handling, their back may be strained and damaged.
- 4) **Physical Strength:** Depending on their muscle power, various persons have varied physical strengths. One must be aware of their limitations.
- 5) **Teamwork:** The operation of a workplace is all about working together. When opposed to a single person lifting a load, two people can lift it more easily and without difficulty. If one of two people isn't lifting it properly, the other or both of them will suffer back injuries as a result of the extra strain.

**Techniques for Lifting Heavy Objects**

Technique	Demonstraton
<p>1. Ensure one has a wide base of support before lifting the heavy object. Ensure one's feet are shoulder-width apart, and one foot is slightly ahead of the other at all times. This will help one maintain a good balance during the lifting of heavy objects. This is known as the Karate Stance.</p>	
<p>2. Squat down as near to the object as possible when one is ready to lift it, bending at the hips and knees with the buttocks out. If the object is really heavy, one may wish to place one leg on the floor and the other bent at a straight angle in front of them.</p>	

3. Maintain proper posture as one begin to lift upward. To do so, one should keep their back straight, chest out, and shoulders back while gazing straight ahead.



4. By straightening one's hips and knees, slowly elevate the thing (not the back). As one rises, they should extend their legs and exhale. Lift the heavy object without twisting the body or bending forward.



5. Do not lift bending forward.



6. Hold the load close to the body.



7. Never lift heavy objects above the shoulder	
8. Use the feet (not the body) to change direction, taking slow, small steps.	
9. Set down the heavy object carefully, squatting with the knees and hips only.	

**Table 8.1.1 Techniques for lifting heavy objects**

<sup>3</sup>Source: <https://www.braceability.com/blogs/articles/7-prop-heavy-lift-techniques>

### 8.1.7 Safe Handling of Tools

Workers should be trained on how to use tools safely. When tools are misplaced or handled incorrectly by workers, they can be dangerous. The following are some suggestions from the National Safety Council for safe tool handling when they are not in use:

- Never carry tools up or down a ladder in a way that makes it difficult to grip them. Instead of being carried by the worker, tools should be lifted up and down using a bucket or strong bag.
- Tools should never be tossed but should be properly passed from one employee to the next. Pointed tools should be passed with the handles facing the receiver or in their carrier.
- When turning and moving around the workplace, workers carrying large tools or equipment on their shoulders should pay particular attention to clearances.
- Pointed tools such as chisels and screwdrivers should never be kept in a worker's pocket. They can be carried in a toolbox, pointing down in a tool belt or pocket tool bag, or in hand with the tip always held away from the body.
- Tools should always be stored while not in use. People below are put in danger when tools are left sitting around on an elevated structure, such as a scaffold. In situations when there is a lot of vibration, this risk increases.

## 8.1.8 Personal Protective Equipment

Personal protective equipment, or "PPE," is equipment worn to reduce exposure to risks that might result in significant occupational injuries or illnesses. Chemical, radiological, physical, electrical, mechanical, and other job dangers may cause these injuries and diseases.

PPE used for protection from the following injuries are:

Injury Protection	Protection	PPE
Head Injury Protection	Falling or flying objects, stationary objects, or contact with electrical wires can cause impact, penetration, and electrical injuries. Hard hats can protect one's head from these injuries. A common electrician's hard hat is shown in the figure below. This hard hat is made of nonconductive plastic and comes with a set of safety goggles.	
Foot and Leg Injury Protection	In addition to foot protection and safety shoes, leggings (e.g., leather) can guard against risks such as falling or rolling objects, sharp objects, wet and slippery surfaces, molten metals, hot surfaces, and electrical hazards.	
Eye and Face Injury Protection	Spectacles, goggles, special helmets or shields, and spectacles with side shields can protect against the hazards of flying fragments, large chips, hot sparks, radiation, and splashes from molten metals. They also offer protection from particles, sand, dirt, mists, dust, and glare.	

<p>Protecton against Hearing Loss</p>	<p>Hearing protection can be obtained by wearing earplugs or earmuffs. High noise levels can result in permanent hearing loss or damage, as well as physical and mental stress. Self-forming earplugs composed of foam, waxed cotton, or fibreglass wool usually fit well. Workers should be fitted for moulded or prefabricated earplugs by a specialist.</p>	
<p>Hand Injury Protecton</p>	<p>Hand protection will aid workers who are exposed to dangerous substances by skin absorption, serious wounds, or thermal burns. Gloves are a frequent protective clothing item. When working on electrified circuits, electricians frequently use leather gloves with rubber inserts. When stripping cable with a sharp blade, Kevlar gloves are used to prevent cuts.</p>	
<p>Whole Body Protecton</p>	<p>Workers must protect their entire bodies from risks such as heat and radiation. Rubber, leather, synthetics, and plastic are among the materials used in whole-body PPE, in addition to fire-retardant wool and cotton. Maintenance staff who operate with high-power sources such as transformer installations and motor-control centres are frequently obliged to wear fire-resistant clothes.</p>	

**Table 8.1.2. Personal protective equipment**



## UNIT 8.2: Fire Safety

### Unit Objectives

**By the end of this unit, participants will be able to:**

1. List the types of fire and fire e extinguiss.

### 8.2.1 Fire Safety

Fire safety is a set of actions aimed at reducing the amount of damage caused by fire. Fire safety procedures include both those that are used to prevent an uncontrolled fire from starting and those that are used to minimise the spread and impact of a fire after it has started. Developing and implementing fire safety measures in the workplace is not only mandated by law but is also essential for the protection of everyone who may be present in the building during a fire emergency.

The basic Fire Safety Responsibilities are:

- To identify risks on the premises, a fire risk assessment must be carried out.
- Ascertain that fire safety measures are properly installed.
- Prepare for unexpected events.
- Fire safety instructions and training should be provided to the employees.

### 8.2.2 Respond to a Workplace Fire

- Workplace fire drills should be conducted on a regular basis.
- If one has a manual alarm, they should raise it.
- Close the doors and leave the fire-stricken area as soon as possible. Ensure that the evacuation is quick and painless.
- Turn off dangerous machines and don't stop to get personal items.
- Assemble at a central location. Ascertain that the assembly point is easily accessible to the employees.
- If one's clothing catches fire, one shouldn't rush about it. They should stop and descend on the ground and roll to smother the flames if their clothes catch fire.

## 8.2.3 Fire Extinguisher

Fire extinguishers are portable devices used to put out small flames or minimise their damage until fire-fighters arrive. These are maintained on hand in locations such as fire stations, buildings, workplaces, public transit, and so on. The types and quantity of extinguishers that are legally necessary for a given region are determined by the applicable safety standards.

Types of fire extinguishers are:

**There are five main types of fire extinguishers:**

1. Water.
2. Powder.
3. Foam.
4. Carbon Dioxide (CO<sub>2</sub>).
5. Wet chemical.

**1. Water:** Water fire extinguishers are one of the most common commercial and residential fire extinguishers on the market. They're meant to be used on class-A flames.



**2. Powder:** The L2 powder fire extinguisher is the most commonly recommended fire extinguisher in the Class D Specialist Powder category, and is designed to put out burning lithium metal fires.



**3. Foam:** Foam extinguishers are identified by a cream rectangle with the word "foam" printed on it. They're mostly water-based, but they also contain a foaming component that provides a quick knock-down and blanketing effect on flames. It suffocates the flames and seals the vapours, preventing re-ignition.



**4. Carbon Dioxide (CO<sub>2</sub>):** Class B and electrical fires are extinguished with carbon dioxide extinguishers, which suffocate the flames by removing oxygen from the air. They are particularly beneficial for workplaces and workshops where electrical fires may occur since, unlike conventional extinguishers, they do not leave any toxins behind and hence minimise equipment damage.



**5. Wet Chemical:** Wet chemical extinguishers are designed to put out fires that are classified as class F. They are successful because they can put out extremely high-temperature fires, such as those caused by cooking oils and fats.





## UNIT 8.3: First Aid

### Unit Objectives

**By the end of this unit, participants will be able to:**

1. Explain how to administer appropriate first aid to victims in case of bleeding, burns, choking, electric shock, poisoning
2. Explain how to administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock.

### 8.3.1 First Aid

First aid is the treatment or care given to someone who has sustained an injury or disease until more advanced care can be obtained or the person recovers.

The aim of first aid is to:

- Preserve life
- Prevent the worsening of a sickness or injury
- If at all possible, relieve pain
- Encourage recovery
- Keep the unconscious safe.

First aid can help to lessen the severity of an injury or disease, and in some situations, it can even save a person's life.

### 8.3.2 Need for First Aid at the Workplace

- In the workplace, first aid refers to providing immediate care and life support to persons who have been injured or become unwell at work.
- Many times, first aid can help to lessen the severity of an accident or disease.
- It can also help an injured or sick person relax. In life-or-death situations, prompt and appropriate first aid can make all the difference.

### 8.3.2 Need for First Aid at the Workplace

In the workplace, first aid refers to providing immediate care and life support to persons who have been injured or become unwell at work.

Many times, first aid can help to lessen the severity of an accident or disease.

It can also help an injured or sick person relax. In life-or-death situations, prompt and appropriate first aid can make all the difference.

### 8.3.3 Treating Minor Cuts and Scapes

**Steps to keep cuts clean and prevent infections and scars:**

- **Wash Hands:** Wash hands first with soap and water to avoid introducing bacteria into the cut and causing an infection. One should use the hand sanitiser if one is on the go.
- **Stop the bleeding:** Using a gauze pad or a clean towel, apply pressure to the wound. For a few minutes, keep the pressure on.
- **Clean Wounds:** Once the bleeding has stopped, clean the wound by rinsing it under cool running water or using a saline wound wash. Use soap and a moist washcloth to clean the area around the wound. Soap should not be used on the cut since it may irritate the skin. Also, avoid using hydrogen peroxide or iodine, as these may aggravate the wound.
- **Remove Dirt:** Remove any dirt or debris from the area. Pick out any dirt, gravel, glass, or other material in the cut with a pair of tweezers cleaned with alcohol.

### 8.3.4 Heart Attack

When the blood flow carrying oxygen to the heart is blocked, a heart attack occurs. The heart muscle runs out of oxygen and starts to die.

Symptoms of a heart attack can vary from person to person. They may be mild or severe. Women, older adults, and people with diabetes are more likely to have subtle or unusual symptoms.

**Symptoms in adults may include:**

- Changes in mental status, especially in older adults.
- Chest pain that feels like pressure, squeezing, or fullness. The pain is most often in the centre of the chest. It may also be felt in the jaw, shoulder, arms, back, and stomach. It can last for more than a few minutes or come and go.
- Cold sweat.
- Light-headedness.
- Nausea (more common in women).
- Indigestion.

- Vomiting.
- Numbness, aching or tingling in the arm (usually the left arm, but the right arm may be affected alone, or along with the left).
- Shortness of breath
- Weakness or fatigue, especially in older adults and in women.

**First Aid for Heart Attack**

If one thinks someone is experiencing a heart attack, they should:

- Have the person sit down, rest, and try to keep calm.
- Loosen any tight clothing.
- Ask if the person takes any chest pain medicine, such as nitro-glycerine for a known heart condition, and help them take it.
- If the pain does not go away promptly with rest or within 3 minutes of taking nitro-glycerine, call for emergency medical help.
- If the person is unconscious and unresponsive, call 911 or the local emergency number, then begin CPR.
- If an infant or child is unconscious and unresponsive, perform 1 minute of CPR, then call 911 or the local emergency number.



## UNIT 8.4: Waste Management

### Unit Objectives

**By the end of this unit, participants will be able to:**

1. Describe the concept of waste management and methods of disposing of hazardous waste.
2. List the common sources of pollution and ways to minimize them.
3. Elaborate on electronic waste disposal procedures.

### 8.4.1. Waste Management and Methods of Waste Disposal

The collection, disposal, monitoring, and processing of waste materials is known as waste management. These wastes affect living beings' health and the environment. For reducing their effects, they have to be managed properly. The waste is usually in solid, liquid or gaseous form.

The importance of waste management is:

Waste management is important because it decreases waste's impact on the environment, health, and other factors. It can also assist in the reuse or recycling of resources like paper, cans, and glass. The disposal of solid, liquid, gaseous, or dangerous substances is the example of waste management.

When it comes to trash management, there are numerous factors to consider, including waste disposal, recycling, waste avoidance and reduction, and garbage transportation. Treatment of solid and liquid wastes is part of the waste management process. It also provides a number of recycling options for goods that aren't classified as garbage during the process.

### 8.4.2 Methods of Waste Management

Non-biodegradable and toxic wastes, such as radioactive remains, can cause irreversible damage to the environment and human health if they are not properly disposed of. Waste disposal has long been a source of worry, with population increase and industrialisation being the primary causes. Here are a few garbage disposal options.

1. **Landfills:** The most common way of trash disposal today is to throw daily waste/garbage into landfills. This garbage disposal method relies on burying the material in the ground.
2. **Recycling:** Recycling is the process of transforming waste items into new products in order to reduce energy consumption and the use of fresh raw materials. Recycling reduces energy consumption, landfill volume, air and water pollution, greenhouse gas emissions, and the preservation of natural resources for future use.

3. **Composting:** Composting is a simple and natural bio-degradation process that converts organic wastes, such as plant remnants, garden garbage, and kitchen waste, into nutrient-rich food for plants.
4. **Incineration:** Incineration is the process of combusting garbage. The waste material is cooked to extremely high temperatures and turned into materials such as heat, gas, steam, and ash using this technology.

### 8.4.3 Recyclable, Non-Recyclable and Hazardous Waste

1. **Recyclable Waste:** The waste which can be reused or recycled further is known as recyclable waste.
2. **Non-recyclable Waste:** The waste which cannot be reused or recycled is known as non-recyclable waste. Polythene bags are a great example of non-recyclable waste.
3. **Hazardous Waste:** The waste which can create serious harm to the people and the environment is known as hazardous waste.

### 8.4.4 Sources of Pollution

Pollution is defined as the harm caused by the presence of a material or substances in places where they would not normally be found or at levels greater than normal. Polluting substances might be in the form of a solid, a liquid, or a gas.

- **Point source of pollution:** Pollution from a point source enters a water body at a precise location and can usually be identified. Effluent discharges from sewage treatment plants and industrial sites, power plants, landfill sites, fish farms, and oil leakage via a pipeline from industrial sites are all potential point sources of contamination.

Point source pollution is often easy to prevent since it is feasible to identify where it originates, and once identified, individuals responsible for the pollution can take rapid corrective action or invest in longer-term treatment and control facilities.

- **Diffuse source of pollution:** As a result of land-use activities such as urban development, amenity, farming, and forestry, diffuse pollution occurs when pollutants are widely used and diffused over a large region. These activities could have occurred recently or in the past. It might be difficult to pinpoint specific sources of pollution and, as a result, take rapid action to prevent it because prevention often necessitates significant changes in land use and management methods.

#### Pollution Prevention

Pollution prevention entails acting at the source of pollutants to prevent or minimise their production. It saves natural resources, like water, by using materials and energy more efficiently.

**Pollution prevention includes any practice that:**

- Reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment, or disposal;
- Reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants (these practices are known as "source reduction");
- Improved efficiency in the use of raw materials, energy, water, or other resources, or Conservation is a method of safeguarding natural resources.
- Improvements in housekeeping, maintenance, training, or inventory management; equipment or technology adjustments; process or method modifications; product reformulation or redesign; raw material substitution; or improvements in housekeeping, maintenance, training, or inventory control.

### 8.4.5 Electronic Waste

Lead, cadmium, beryllium, mercury, and brominated flame retardants are found in every piece of electronic waste. When gadgets and devices are disposed of illegally, these hazardous compounds are more likely to contaminate the earth, pollute the air, and leak into water bodies.

When e-waste is dumped in a landfill, it tends to leach trace metals as water runs through it. The contaminated landfill water then reaches natural groundwater with elevated toxic levels, which can be dangerous if it reaches any drinking water bodies. Despite having an environmentally benign approach, recycling generally results in international shipment and dumping of the gadgets in pits.

**Some eco-friendly ways of disposing of e-waste are:**

- Giving back the e-waste to the electronic companies and drop-off points
- Following guidelines issued by the government
- Selling or donating the outdated technology-based equipment
- Giving e-waste to a certified e-waste recycler

## Exercise

1. Name all five types of fire extinguishers.
2. Explain PPE in brief.
3. List the common workplace hazards.
4. Fill in the blanks:
  - i. A "\_\_\_\_\_ sign" is a safety sign that prohibits behaviour that is likely to endanger one's health or safety.
  - ii. \_\_\_\_\_ entails acting at the source of pollutants to prevent or minimise their production.
  - iii. \_\_\_\_\_ is the treatment or care given to someone who has sustained an injury or disease until more advanced care can be obtained or the person recovers.
  - iv. The threats caused by biological agents like viruses, bacteria, animals, plants, insects and also humans, are known as \_\_\_\_\_.
  - v. The workplace has to be administered as per the rules of the \_\_\_\_\_.





## 9. Employability & Entrepreneurship Skills



Unit 9.1 – Personal Strengths & Value Systems

Unit 9.2 – Digital Literacy: A Recap

Unit 9.3 – Money Matters

Unit 9.4 – Preparing for Employment & Self-Employment

Unit 9.5 – Understanding Entrepreneurship

Unit 9.6 – Preparing to be an Entrepreneur



## Key Learning Outcomes



**At the end of this module, you will be able to:**

1. Explain the meaning of health
2. List common health issues
3. Discuss tips to prevent common health issues
4. Explain the meaning of hygiene
5. Discuss the purpose of Swacch Bharat Abhiyan
6. Explain the meaning of habit
7. Discuss ways to set up a safe work environment
8. Discuss critical safety habits to be followed by employees
9. Explain the importance of self-analysis
10. Discuss motivation with the help of Maslow's Hierarchy of Needs
11. Discuss the meaning of achievement motivation
12. List the characteristics of entrepreneurs with achievement motivation
13. List the different factors that motivate you
14. Discuss the role of attitude in self-analysis
15. Discuss how to maintain a positive attitude
16. List your strengths and weaknesses
17. Discuss the qualities of honest people
18. Describe the importance of honesty in entrepreneurs
19. Discuss the elements of a strong work ethic
20. Discuss how to foster a good work ethic
21. List the characteristics of highly creative people
22. List the characteristics of highly innovative people
23. Discuss the benefits of time management
24. List the traits of effective time managers
25. Describe effective time management technique
26. Discuss the importance of anger management
27. Describe anger management strategies
28. Discuss tips for anger management
29. Discuss the causes of stress
30. Discuss the symptoms of stress
31. Discuss tips for stress management
32. Identify the basic parts of a computer
33. Identify the basic parts of a keyboard
34. Recall basic computer terminology
35. Recall the functions of basic computer keys
36. Discuss the main applications of MS Office
37. Discuss the benefits of Microsoft Outlook
38. Discuss the different types of e-commerce
39. List the benefits of e-commerce for retailers and customers
40. Discuss how the Digital India campaign will help boost e-commerce in India

41. Describe how you will sell a product or service on an e-commerce platform
42. Discuss the importance of saving money
43. Discuss the benefits of saving money
44. Discuss the main types of bank accounts
45. Describe the process of opening a bank account
46. Differentiate between fixed and variable costs
47. Describe the main types of investment options
48. Describe the different types of insurance products
49. Describe the different types of taxes
50. Discuss the uses of online banking
51. Discuss the main types of electronic funds transfers
52. Discuss the steps to prepare for an interview
53. Discuss the steps to create an effective Resume
54. Discuss the most frequently asked interview questions
55. Discuss how to answer the most frequently asked interview questions
56. Discuss basic workplace terminology
57. Discuss the concept of entrepreneurship
58. Discuss the importance of entrepreneurship
59. Describe the characteristics of an entrepreneur
60. Describe the different types of enterprises
61. List the qualities of an effective leader
62. Discuss the benefits of effective leadership
63. List the traits of an effective team
64. Discuss the importance of listening effectively
65. Discuss how to listen effectively
66. Discuss the importance of speaking effectively
67. Discuss how to speak effectively
68. Discuss how to solve problems
69. List important problem-solving traits
70. Discuss ways to assess problem solving skills
71. Discuss the importance of negotiation
72. Discuss how to negotiate
73. Discuss how to identify new business opportunities
74. Discuss how to identify business opportunities within your business
75. Explain the meaning of entrepreneur
76. Describe the different types of entrepreneurs
77. List the characteristics of entrepreneurs
78. Recall entrepreneur success stories
79. Discuss the entrepreneurial process
80. Describe the entrepreneurship ecosystem
81. Discuss the purpose of the Make in India campaign
82. Discuss key schemes to promote entrepreneurs

83. Discuss the relationship between entrepreneurship and risk appetite
84. Discuss the relationship between entrepreneurship and resilience
85. Describe the characteristics of a resilient entrepreneur
86. Discuss how to deal with failure
87. Discuss how market research is carried out
88. Describe the 4 Ps of marketing
89. Discuss the importance of idea generation
90. Recall basic business terminology
91. Discuss the need for CRM
92. Discuss the benefits of CRM
93. Discuss the need for networking
94. Discuss the benefits of networking
95. Discuss the importance of setting goals
96. Differentiate between short-term, medium-term and long-term goals
97. Discuss how to write a business plan
98. Explain the financial planning process
99. Discuss ways to manage your risk
100. Describe the procedure and formalities for applying for bank finance
101. Discuss how to manage your own enterprise
102. List important questions that every entrepreneur should ask before starting an enterprise

## UNIT 9.1: Personal Strengths & Value Systems

### Unit Objectives

**At the end of this unit, participant will be able to:**

1. Explain the meaning of health
2. List common health issues
3. Discuss tips to prevent common health issues
4. Explain the meaning of hygiene
5. Discuss the purpose of Swacch Bharat Abhiyan
6. Explain the meaning of habit
7. Discuss ways to set up a safe work environment
8. Discuss critical safety habits to be followed by employees
9. Explain the importance of self-analysis
10. Discuss motivation with the help of Maslow's Hierarchy of Needs
11. Discuss the meaning of achievement motivation
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26. Discuss the importance of anger management
27. Describe anger management strategies
28. Discuss tips for anger management
29. Discuss the causes of stress
30. Discuss the symptoms of stress
31. Discuss tips for stress management

### 9.1.1 Health, Habits, Hygiene: What is Health?

As per the World Health Organization (WHO), health is a “State of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity.” This means being healthy does not simply mean not being unhealthy – it also means you need to be at peace emotionally and feel fit physically. For example, you cannot say you are healthy simply because you do not have any physical ailments like a cold or cough. You also need to think about whether you are feeling calm, relaxed and happy.

#### Common Health Issues

Some common health issues are:

- Allergies
- Asthma
- Skin Disorders
- Depression and Anxiety
- Diabetes
- Cough, Cold, Sore Throat
- Difficulty Sleeping
- Obesity

#### 9.1.1.1 Tips to Prevent Health Issues

Taking measures to prevent ill health is always better than curing a disease or sickness. You can stay healthy by:

- Eating healthy foods like fruits, vegetables and nuts
- Cutting back on unhealthy and sugary foods
- Drinking enough water everyday
- Not smoking or drinking alcohol
- Exercising for at least 30 minutes a day, 4-5 times a week
- Taking vaccinations when required
- Practicing yoga exercises and meditation

How many of these health standards do you follow? Tick the ones that apply to you.

1. Get minimum 7-8 hours of sleep every night.
2. Avoid checking email first thing in the morning and right before you go to bed at night.
3. Don't skip meals – eat regular meals at correct meal times.
4. Read a little bit every single day.
5. Eat more home cooked food than junk food.
6. Stand more than you sit.
7. Drink a glass of water first thing in the morning and have at least 8 glasses of water through the day.
8. Go to the doctor and dentist for regular check-ups.
9. Exercise for 30 minutes at least 5 days a week.
10. Avoid consuming lots of aerated beverages.

### 9.1.1.2 What is Hygiene?

As per the World Health Organization (WHO), “Hygiene refers to conditions and practices that help to maintain health and prevent the spread of diseases.” In other words, hygiene means ensuring that you do whatever is required to keep your surroundings clean, so that you reduce the chances of spreading germs and diseases.

For instance, think about the kitchen in your home. Good hygiene means ensuring that the kitchen is always spick and span, the food is put away, dishes are washed, and dustbins are not overflowing with garbage. Doing all this will reduce the chances of attracting pests like rats or cockroaches, and prevent the growth of fungus and other bacteria, which could spread disease.

How many of these health standards do you follow? Tick the ones that apply to you.

1. Have a bath or shower every day with soap – and wash your hair with shampoo 2-3 times a week.
2. Wear a fresh pair of clean undergarments every day.
3. Brush your teeth in the morning and before going to bed.
4. Cut your fingernails and toenails regularly.
5. Wash your hands with soap after going to the toilet.
6. Use an anti-perspirant deodorant on your underarms if you sweat a lot.
7. Wash your hands with soap before cooking or eating.
8. Stay home when you are sick, so other people don't catch what you have.
9. Wash dirty clothes with laundry soap before wearing them again.
10. Cover your nose with a tissue/your hand when coughing or sneezing.

See how healthy and hygienic you are, by giving yourself 1 point for every ticked statement! Then take a look at what your score means.

#### Your Score

- **0-7/20:** You need to work a lot harder to stay fit and fine! Make it a point to practice good habits daily and see how much better you feel!
- **7-14/20:** Not bad, but there is scope for improvement! Try and add a few more good habits to your daily routine.
- **14-20/20:** Great job! Keep up the good work! Your body and mind thank you!

### 9.1.1.3 Swachh Bharat Abhiyan

We have already discussed the importance of following good hygiene and health practices for ourselves. But, it is not enough for us to be healthy and hygienic. We must also extend this standard to our homes, our immediate surroundings and to our country as a whole.

The 'Swachh Bharat Abhiyan' (Clean India Mission) launched by Prime Minister Shri Narendra Modi on 2nd October 2014, believes in doing exactly this. The aim of this mission is to clean the streets and roads of India and raise the overall level of cleanliness. Currently this mission covers 4,041 cities and towns across the country. Millions of our people have taken the pledge for a clean India. You should take the pledge too, and do everything possible to keep our country clean!

### 9.1.1.4 What are Habits?

A habit is a behaviour that is repeated frequently. All of us have good habits and bad habits. Keep in mind the phrase by John Dryden: “We first make our habits, and then our habits make us.” This is why it is so important that you make good habits a way of life, and consciously avoid practicing bad habits.

Some good habits that you should make part of your daily routine are:

- Always having a positive attitude
- Making exercise a part of your daily routine
- Reading motivational and inspirational stories
- Smiling! Make it a habit to smile as often as possible
- Making time for family and friends
- Going to bed early and waking up early

Some bad habits that you should quit immediately are:

- Skipping breakfast
- Snacking frequently even when you are not hungry
- Eating too much fattening and sugary food
- Smoking, drinking alcohol and doing drugs
- Spending more money than you can afford
- Worrying about unimportant issues
- Staying up late and waking up late

### Tips

- Following healthy and hygienic practices every day will make you feel good mentally and physically.
- Hygiene is two-thirds of health – so good hygiene will help you stay strong and healthy!

### 9.1.2: Safety: Tips to Design a Safe Workplace

Every employer is obligated to ensure that his workplace follows the highest possible safety protocol. When setting up a business, owners must make it a point to:

- Use ergonomically designed furniture and equipment to avoid stooping and twisting
- Provide mechanical aids to avoid lifting or carrying heavy objects
- Have protective equipment on hand for hazardous jobs
- Designate emergency exits and ensure they are easily accessible
- Set down health codes and ensure they are implemented
- Follow the practice of regular safety inspections in and around the workplace
- Ensure regular building inspections are conducted
- Get expert advice on workplace safety and follow it

### 9.1.2.1 Negotiable Employee Safety Habits

Every employer is obligated to ensure that his workplace follows the highest possible safety protocol. When setting up a business, owners must make it a point to:

- Immediately report unsafe conditions to a supervisor
- Recognize and report safety hazards that could lead to slips, trips and falls
- Report all injuries and accidents to a supervisor
- Wear the correct protective equipment when required
- Learn how to correctly use equipment provided for safety purposes
- Be aware of and avoid actions that could endanger other people
- Take rest breaks during the day and some time off from work during the week

#### Tips



- Be aware of what emergency number to call at the time of a workplace emergency
- Practice evacuation drills regularly to avoid chaotic evacuations

### 9.1.3 Self-Analysis – Attitude, Achievement Motivation

To truly achieve your full potential, you need to take a deep look inside yourself and find out what kind of person you really are. This attempt to understand your personality is known as self-analysis. Assessing yourself in this manner will help you grow, and will also help you to identify areas within yourself that need to be further developed, changed or eliminated. You can better understand yourself by taking a deep look at what motivates you, what your attitude is like, and what your strengths and weaknesses are.

#### 9.1.3.1 What is Motivation?

Very simply put, motivation is your reason for acting or behaving in a certain manner. It is important to understand that not everyone is motivated by the same desires – people are motivated by many, many different things. We can understand this better by looking at Maslow's Hierarchy of Needs.

#### 9.1.3.2 Maslow's Hierarchy of Needs

Famous American psychologist Abraham Maslow wanted to understand what motivates people. He believed that people have five types of needs, ranging from very basic needs (called physiological needs) to more important needs that are required for self-growth (called self-actualization needs). Between the physiological and self-actualization needs are three other needs – safety needs, belongingness and love needs, and esteem needs.

These needs are usually shown as a pyramid with five levels and are known as Maslow's Hierarchy of Needs.

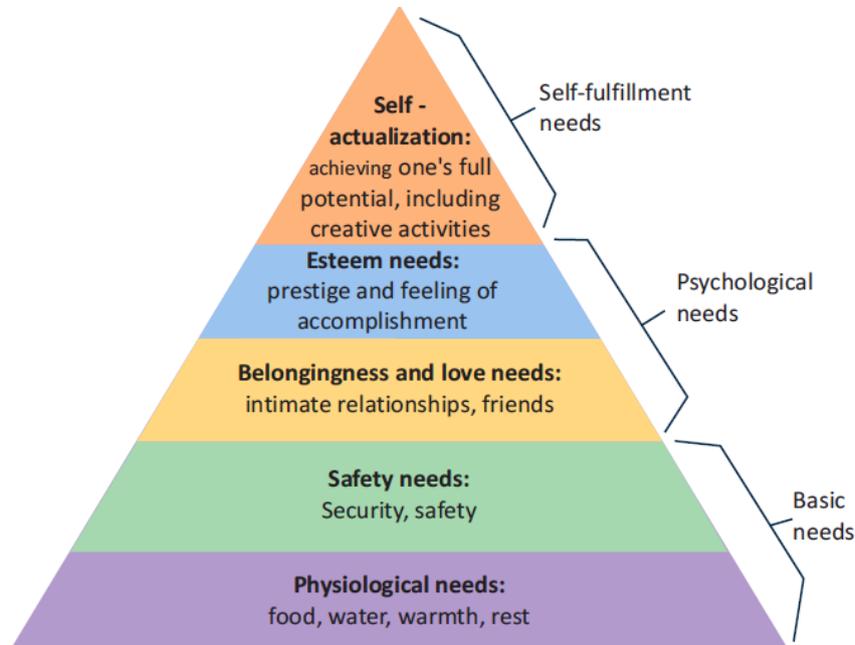


Fig. 9.1.1: Maslow's Hierarchy of Needs

The lowest level depicts the most basic needs. According to Maslow, our behaviour is driven by our basic needs, until those needs are fulfilled. Once they are fulfilled, we move to the next level and are motivated by the next level of needs. Let's understand this better with an example.

Rupa comes from a very poor family. She never has enough food, water, warmth or rest. According to Maslow, until Rupa is sure that she will get these basic needs, she will not even think about the next level of needs – her safety needs. But, once Rupa is confident that her basic needs will be met, she will move to the next level, and her behaviour will then be motivated by her need for security and safety. Once these new needs are met, Rupa will once again move to the next level, and be motivated by her need for relationships and friends. Once this need is satisfied, Rupa will then focus on the fourth level of needs – her esteem needs, after which she will move up to the fifth and last level of needs – the desire to achieve her full potential.

### 9.1.3.3 Understanding Achievement Motivation

We now know that people are motivated by basic, psychological and self-fulfillment needs. However, certain people are also motivated by the achievement of highly challenging accomplishments. This is known as Achievement Motivation, or 'need for achievement'.

The level of motivation achievement in a person differs from individual to individual. It is important that entrepreneurs have a high level of achievement motivation – a deep desire to accomplish something important and unique. It is equally important that they hire people who are also highly motivated by challenges and success.



### 9.1.3.4 How to Cultivate a Positive Attitude?

The good news is attitude is a choice. So, it is possible to improve, control and change our attitude, if we decide we want to!

The following tips help foster a positive mindset:

- Remember that you control your attitude, not the other way around
- Devote at least 15 minutes a day towards reading, watching or listening to something positive
- Avoid negative people who only complain and stop complaining yourself
- Expand your vocabulary with positive words and delete negative phrases from your mind
- Be appreciative and focus on what's good in yourself, in your life, and in others
- Stop thinking of yourself as a victim and start being proactive
- Imagine yourself succeeding and achieving your goals

### 9.1.3.5 What is Attitude?

Now that we understand why motivation is so important for self-analysis, let's look at the role our attitude plays in better understanding ourselves. Attitude can be described as your tendency (positive or negative), to think and feel about someone or something. Attitude is the foundation for success in every aspect of life. Our attitude can be our best friend or our worst enemy. In other words:

**“The only disability in life is a bad attitude.”**

When you start a business, you are sure to encounter a wide variety of emotions, from difficult times and failures to good times and successes. Your attitude is what will see you through the tough times and guide you towards success. Attitude is also infectious. It affects everyone around you, from your customers to your employees to your investors. A positive attitude helps build confidence in the workplace while a negative attitude is likely to result in the demotivation of your people.

### 9.1.3.6 What Are Your Strengths and Weaknesses?

Another way to analyse yourself is by honestly identifying your strengths and weaknesses. This will help you use your strengths to your best advantage and reduce your weaknesses. Note down all your strengths and weaknesses in the two columns below. Remember to be honest with yourself!

Strengths	Weaknesses

## Tips

- Achievement motivation can be learned.
- Don't be afraid to make mistakes.
- Train yourself to finish what you start.
- Dream big.

### 9.1.4 Honesty & Work Ethics: What is Honesty?

Honesty is the quality of being fair and truthful. It means speaking and acting in a manner that inspires trust. A person who is described as honest is seen as truthful and sincere, and as someone who isn't deceitful or devious and doesn't steal or cheat. There are two dimensions of honesty – one is honesty in communication and the other is honesty in conduct.

Honesty is an extremely important trait because it results in peace of mind and builds relationships that are based on trust. Being dishonest, on the other hand, results in anxiety and leads to relationships full of distrust and conflict.

#### 9.1.4.1 Qualities of Honest People

Honest individuals have certain distinct characteristics. Some common qualities among honest people are:

- They don't worry about what others think of them. They believe in being themselves – they don't bother about whether they are liked or disliked for their personalities.
- They stand up for their beliefs. They won't think twice about giving their honest opinion, even if they are aware that their point of view lies with the minority.
- They are thick-skinned. This means they are not affected by others judging them harshly for their honest opinions.
- They forge trusting, meaningful and healthy friendships. Honest people usually surround themselves with honest friends. They have faith that their friends will be truthful and upfront with them at all times.

They are trusted by their peers. They are seen as people who can be counted on for truthful and objective feedback and advice.

- **Honesty and employees:** When entrepreneurs build honest relationships with their employees, it leads to more transparency in the workplace, which results in higher work performance and better results.
- **Honesty and investors:** For entrepreneurs, being honest with investors means not only sharing strengths but also candidly disclosing current and potential weaknesses, problem areas and solution strategies. Keep in mind that investors have a lot of experience with startups and are aware that all new companies have problems. Claiming that everything is perfectly fine and running smoothly is a red flag for most investors.

- **Honesty with oneself:** The consequences of being dishonest with oneself can lead to dire results, especially in the case of entrepreneurs. For entrepreneurs to succeed, it is critical that they remain realistic about their situation at all times, and accurately judge every aspect of their enterprise for what it truly is.

### 9.1.4.2 Importance of Honesty in Entrepreneurs

One of the most important characteristics of entrepreneurs is honesty. When entrepreneurs are honest with their customers, employees and investors, it shows that they respect those that they work with. It is also important that entrepreneurs remain honest with themselves.

Let's look at how being honest would lead to great benefits for entrepreneurs.

- **Honesty and customers:** When entrepreneurs are honest with their customers it leads to stronger relationships, which in turn results in business growth and a stronger customer network.

### 9.1.4.3 What are Work Ethics?

Being ethical in the workplace means displaying values like honesty, integrity and respect in all your decisions and communications. It means not displaying negative qualities like lying, cheating and stealing.

Workplace ethics play a big role in the profitability of a company. It is as crucial to an enterprise as high morale and teamwork. This is why most companies lay down specific workplace ethic guidelines that must compulsorily be followed by their employees. These guidelines are typically outlined in a company's employee handbook.

### 9.1.4.4 Elements of a Strong Work Ethic

An entrepreneur must display strong work ethics, as well as hire only those individuals who believe in and display the same level of ethical behavior in the workplace. Some elements of a strong work ethic are:

- **Professionalism:** This involves everything from how you present yourself in a corporate setting to the manner in which you treat others in the workplace.
- **Respectfulness:** This means remaining poised and diplomatic regardless of how stressful or volatile a situation is.
- **Dependability:** This means always keeping your word, whether it's arriving on time for a meeting or delivering work on time.
- **Dedication:** This means refusing to quit until the designated work is done, and completing the work at the highest possible level of excellence.
- **Determination:** This means embracing obstacles as challenges rather than letting them stop you, and pushing ahead with purpose and resilience to get the desired results.

- **Accountability:** This means taking responsibility for your actions and the consequences of your actions, and not making excuses for your mistakes.
- **Humility:** This means acknowledging everyone's efforts and hard work, and sharing the credit for accomplishments.

#### 9.1.4.5 How to Foster a Good Work Ethic?

As an entrepreneur, it is important that you clearly define the kind of behaviour that you expect from each and every team member in the workplace. You should make it clear that you expect employees to display positive work ethics like:

- **Honesty:** All work assigned to a person should be done with complete honesty, without any deceit or lies.
- **Good attitude:** All team members should be optimistic, energetic, and positive.
- **Reliability:** Employees should show up where they are supposed to be, when they are supposed to be there.
- **Good work habits:** Employees should always be well groomed, never use inappropriate language, conduct themselves professionally at all times and so on.
- **Initiative:** Doing the bare minimum is not enough. Every team member needs to be proactive and show initiative.
- **Trustworthiness:** Trust is non-negotiable. If an employee cannot be trusted, it's time to let that employee go.
- **Respect:** Employees need to respect the company, the law, their work, their colleagues and themselves.
- **Integrity:** Each and every team member should be completely ethical and must display above board behaviour at all times.
- **Efficiency:** Efficient employees help a company grow while inefficient employees result in a waste of time and resources.

#### Tips

- Don't get angry when someone tells you the truth and you don't like what you hear.
- Always be willing to accept responsibility for your mistakes.

#### 9.1.5 Creativity & Innovation

##### What is Creativity?

Creativity means thinking outside the box. It means viewing things in new ways or from different perspectives, and then converting these ideas into reality. Creativity involves two parts: thinking and producing. Simply having an idea makes you imaginative, not creative. However, having an idea and acting on it makes you creative.

### Characteristics of Highly Creative People

Some characteristics of creative people are:

- They are imaginative and playful
- They see issues from different angles
- They notice small details
- They have very little tolerance for boredom
- They detest rules and routine
- They love to daydream
- They are very curious

### What is Innovation?

There are many different definitions of innovation. In simple terms, innovation means turning an idea into a solution that adds value. It can also mean adding value by implementing a new product, service or process, or significantly improving on an existing product, service or process.

### Characteristics of Highly Innovative People

Some characteristics of highly innovative people are:

- They embrace doing things differently
- They don't believe in taking shortcuts
- They are not afraid to be unconventional
- They are highly proactive and persistent
- They are organized, cautious and risk-averse

### Tips



- Take regular breaks from your creative work to recharge yourself and gain fresh perspective.
- Build prototypes frequently, test them out, get feedback, and make the required changes.

## 9.1.6 Time Management

Time management is the process organizing your time, and deciding how to allocate your time between different activities. Good time management is the difference between working smart (getting more done in less time) and working hard (working for more time to get more done).

Effective time management leads to an efficient work output, even when you are faced with tight deadlines and high pressure situations. On the other hand, not managing your time effectively results in inefficient output and increases stress and anxiety.

### **Benefits of Time Management**

Time management can lead to huge benefits like:

- Greater productivity
- Higher efficiency
- Better professional reputation
- Reduced stress
- Higher chances for career advancement
- Greater opportunities to achieve goals

Not managing time effectively can result in undesirable consequences like:

- Missing deadlines
- Inefficient work output
- Substandard work quality
- Poor professional reputation
- Stalled career
- Increase in stress and anxiety

### **9.1.6.1 Traits of Effective Time Managers**

Some traits of effective time managers are:

- They begin projects early
- They set daily objectives
- They modify plans if required, to achieve better results
- They are flexible and open-minded
- They inform people in advance if their help will be required
- They know how to say no
- They break tasks into steps with specific deadlines
- They continually review long term goals
- They think of alternate solutions if and when required
- They ask for help when required
- They create backup plans

### 9.1.6.2 Effective Time Management Techniques

You can manage your time better by putting into practice certain time management techniques. Some helpful tips are:

- **Plan out your day as well as plan for interruptions.** Give yourself at least 30 minutes to figure out your time plan. In your plan, schedule some time for interruptions.
- **Put up a “Do Not Disturb” sign** when you absolutely have to complete a certain amount of work.
- **Close your mind to all distractions.** Train yourself to ignore ringing phones, don't reply to chat messages and disconnect from social media sites.
- **Delegate your work.** This will not only help your work get done faster, but will also show you the unique skills and abilities of those around you.
- **Stop procrastinating.** Remind yourself that procrastination typically arises due to the fear of failure or the belief that you cannot do things as perfectly as you wish to do them.
- **Prioritize.** List each task to be completed in order of its urgency or importance level. Then focus on completing each task, one by one.
- **Maintain a log of your work activities.** Analyse the log to help you understand how efficient you are, and how much time is wasted every day.
- **Create time management goals** to reduce time wastage.

### Tips

- Always complete the most important tasks first.
- Get at least 7 – 8 hours of sleep every day.
- Start your day early.
- Don't waste too much time on small, unimportant details.
- Set a time limit for every task that you will undertake.
- Give yourself some time to unwind between tasks.

### 9.1.7 Anger Management

Anger management is the process of:

1. Learning to recognize the signs that you, or someone else, is becoming angry
2. Taking the best course of action to calm down the situation in a positive way

Anger management does not mean suppressing anger.

#### Importance of Anger Management

Anger is a perfectly normal human emotion. In fact, when managed the right way, anger can be considered a healthy emotion. However, if it is not kept in check, anger can make us act inappropriately and can lead to us saying or doing things that we will likely later regret.

Extreme anger can:

- **Hurt you physically:** It leads to heart disease, diabetes, a weakened immune system, insomnia, and high blood pressure.
- **Hurt you mentally:** It can cloud your thinking and lead to stress, depression and mental health issues.
- **Hurt your career:** It can result in alienating your colleagues, bosses, clients and lead to the loss of respect.
- **Hurt your relationships:** It makes it hard for your family and friends to trust you, be honest with you and feel comfortable around you.

This is why anger management, or managing anger appropriately, is so important.

### 9.1.7.1 Anger Management Strategies

Here are some strategies that can help you control your anger:

#### Strategy 1: Relaxation

Something as simple as breathing deeply and looking at relaxing images works wonders in calming down angry feelings. Try this simple breathing exercise:

1. Take a deep breath from your diaphragm (don't breathe from your chest)
2. Visualize your breath coming up from your stomach
3. Keep repeating a calming word like 'relax' or 'take it easy' (remember to keep breathing deeply while repeating the word)
4. Picture a relaxing moment (this can be from your memory or your imagination)

Follow this relaxation technique daily, especially when you realize that you're starting to feel angry.

#### Strategy 2: Cognitive Restructuring

Cognitive restructuring means changing the manner in which you think. Anger can make you curse, swear, exaggerate and act very dramatically. When this happens, force yourself to replace your angry thoughts with more logical ones. For instance, instead of thinking 'Everything is ruined' change your mindset and tell yourself 'It's not the end of the world and getting angry won't solve this'.

#### Strategy 3: Problem Solving

Getting angry about a problem that you cannot control is a perfectly natural response. Sometimes, try as you may, there may not be a solution to the difficulty you are faced with. In such cases, stop focusing on solving the problem, and instead focus on handling and facing the problem. Remind yourself that you will do your best to deal with the situation, but that you will not blame yourself if you don't get the solution you desire.

**Strategy 4: Better Communication**

When you're angry, it is very easy to jump to inaccurate conclusions. In this case, you need to force yourself to stop reacting, and think carefully about what you want to say, before saying it. Avoid saying the first thing that enters your head. Force yourself to listen carefully to what the other person is saying. Then think about the conversation before responding.

**Strategy 5: Changing Your Environment**

If you find that your environment is the cause of your anger, try and give yourself a break from your surroundings. Make an active decision to schedule some personal time for yourself, especially on days that are very hectic and stressful. Having even a brief amount of quiet or alone time is sure to help calm you down.

**9.1.7.2 Tips for Anger Management** 

The following tips will help you keep your anger in check:

- Take some time to collect your thoughts before you speak out in anger.
- Express the reason for your anger in an assertive, but non-confrontational manner once you have calmed down.
- Do some form of physical exercise like running or walking briskly when you feel yourself getting angry.
- Make short breaks part of your daily routine, especially during days that are stressful.
- Focus on how to solve a problem that's making you angry, rather than focusing on the fact that the problem is making you angry.

**9.1.8 Stress Management**

We say we are 'stressed' when we feel overloaded and unsure of our ability to deal with the pressures placed on us. Anything that challenges or threatens our well-being can be defined as a stress. It is important to note that stress can be good and bad. While good stress keeps us going, negative stress undermines our mental and physical health. This is why it is so important to manage negative stress effectively.

**Causes of Stress**

Stress can be caused by internal and external factors.

**Internal causes of stress**

- Constant worry
- Rigid thinking
- Unrealistic expectations
- Pessimism
- Negative self-talk
- All in or all out attitude

**External causes of stress**

- Major life changes
- Difficulties with relationships
- Having too much to do
- Difficulties at work or in school
- Financial difficulties
- Worrying about one's children and/or family

**9.1.8.1 Symptoms of Stress**

Stress can manifest itself in numerous ways. Take a look at the cognitive, emotional, physical and behavioural symptoms of stress.

<b>Cognitive Symptoms</b>	<b>Emotional Symptoms</b>
<ul style="list-style-type: none"> <li>• Memory problems</li> <li>• Concentration issues</li> <li>• Lack of judgement</li> <li>• Pessimism</li> <li>• Anxiety</li> <li>• Constant worrying</li> </ul>	<ul style="list-style-type: none"> <li>• Depression</li> <li>• Agitation</li> <li>• Irritability</li> <li>• Loneliness</li> <li>• Anxiety</li> <li>• Anger</li> </ul>

<b>Physical Symptoms</b>	<b>Behavioural Symptoms</b>
<ul style="list-style-type: none"> <li>• Aches and pain</li> <li>• Diarrhoea or constipation</li> <li>• Nausea</li> <li>• Dizziness</li> <li>• Chest pain and/or rapid heartbeat</li> <li>• Frequent cold or flu like feelings</li> </ul>	<ul style="list-style-type: none"> <li>• Increase or decrease in appetite</li> <li>• Over sleeping or not sleeping enough</li> <li>• Withdrawing socially</li> <li>• Ignoring responsibilities</li> <li>• Consumption of alcohol or cigarettes</li> <li>• Nervous habits like nail biting and pacing</li> </ul>

### 9.1.8.2 Tips to Manage Stress

The following tips can help you manage your stress better:

- Note down the different ways in which you can handle the various sources of your stress.
- Remember that you cannot control everything, but you can control how you respond.
- Discuss your feelings, opinions and beliefs rather than reacting angrily, defensively or passively.
- Practice relaxation techniques like meditation, yoga or tai chi when you start feeling stressed.
- Devote a part of your day towards exercise.
- Eat healthy foods like fruits and vegetables. Avoid unhealthy foods especially those containing large amounts of sugar.
- Plan your day so that you can manage your time better, with less stress.
- Say no to people and things when required.
- Schedule time to pursue your hobbies and interests.
- Ensure you get at least 7-8 hours of sleep.
- Reduce your caffeine intake.
- Increase the time spent with family and friends.

## UNIT 9.2: Digital Literacy: A Recap

### Unit Objectives

At the end of this unit, you will be able to:

1. Identify the basic parts of a computer
2. Identify the basic parts of a keyboard
3. Recall basic computer terminology
4. Recall the functions of basic computer keys
5. Discuss the main applications of MS Office
6. Discuss the benefits of Microsoft Outlook
7. Discuss the different types of e-commerce
8. List the benefits of e-commerce for retailers and customers
9. Discuss how the Digital India campaign will help boost e-commerce in India
10. Describe how you will sell a product or service on an e-commerce platform

### 9.2.1 Computer and Internet basics

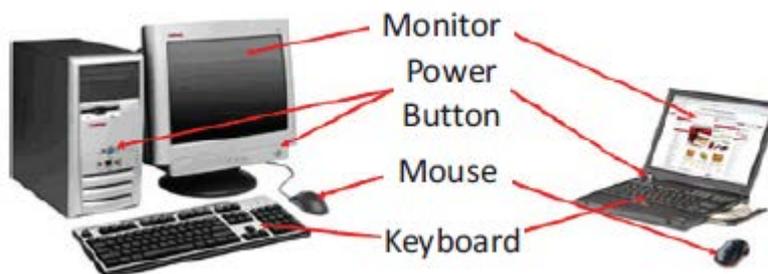


Fig.9.2.1. Parts of a Computer



Fig.9.2.2. Parts of a Keyboard

#### Basic Parts of a Computer

1. **Central Processing Unit (CPU):** The brain of the computer. It interprets and carries out program instructions.
2. **Hard Drive:** A device that stores large amounts of data.
3. **Monitor:** The device that contains the computer screen where the information is visually displayed.

4. **Desktop:** The first screen displayed after the operating system loads.
5. **Background:** The image that fills the background of the desktop.
6. **Mouse:** A hand-held device used to point to items on the monitor.
7. **Speakers:** Devices that enable you to hear sound from the computer.
8. **Printer:** A device that converts output from a computer into printed paper documents.
9. **Icon:** A small picture or image that visually represents something on your computer.
10. **Cursor:** An arrow which indicates where you are positioned on the screen.
11. **Program Menu:** A list of programs on your computer that can be accessed from the Start menu.
12. **Taskbar:** The horizontal bar at the bottom of the computer screen that lists applications that are currently in use.
13. **Recycle Bin:** A temporary storage for deleted files.

#### Basic Internet Terms

- **The Internet:** A vast, international collection of computer networks that transfers information.
- **The World Wide Web:** A system that lets you access information on the Internet.
- **Website:** A location on the World Wide Web (and Internet) that contains information about a specific topic.
- **Homepage:** Provides information about a website and directs you to other pages on that website.
- **Link/Hyperlink:** A highlighted or underlined icon, graphic, or text that takes you to another file or object.
- **Web Address/URL:** The address for a website.
- **Address Box:** A box in the browser window where you can type in a web address.

#### Basic Computer Keys

- **Arrow Keys:** Press these keys to move your cursor.
- **Space bar:** Adds a space.
- **Enter/Return:** Moves your cursor to a new line.
- **Shift:** Press this key if you want to type a capital letter or the upper symbol of a key.
- **Caps Lock:** Press this key if you want all the letters you type to be capital letters. Press it again to revert back to typing lowercase letters.
- **Backspace:** Deletes everything to the left of your cursor

#### Tips

- When visiting a .com address, there no need to type http://or even www. Just type the name of the website and then press Ctrl + Enter. (Example: Type 'apple' and press Ctrl + Enter to go to www.apple.com)
- Press the Ctrl key and press the + or - to increase and decrease the size of text.
- Press F5 or Ctrl + R to refresh or reload a web page.

## 9.2.2 MS Office and Email

### About MS Office

MS Office or Microsoft Office is a suite of computer programs developed by Microsoft. Although meant for all users, it offers different versions that cater specifically to students, home users and business users. All the programs are compatible with both, Windows and Macintosh.

### Most Popular Office Products

Some of the most popular and universally used MS Office applications are:

- **Microsoft Word:** Allows users to type text and add images to a document.
- **Microsoft Excel:** Allows users to enter data into a spreadsheet and create calculations and graphs.
- **Microsoft PowerPoint:** Allows users to add text, pictures and media and create slideshows and presentations.
- **Microsoft Outlook:** Allows users to send and receive email.
- **Microsoft OneNote:** Allows users to make drawings and notes with the feel of a pen on paper.
- **Microsoft Access:** Allows users to store data over many tables.

### Why Choose Microsoft Outlook?

A popular email management choice especially in the workplace, Microsoft Outlook also includes an address book, notebook, web browser and calendar. Some major benefits of this program are:

- **Integrated search function:** You can use keywords to search for data across all Outlook programs.
- **Enhanced security:** Your email is safe from hackers, junk mail and phishing website email.
- **Email syncing:** Sync your mail with your calendar, contact list, notes in One Note and...your phone!
- **Offline access to email:** No Internet? No problem! Write emails offline and send them when you're connected again.

### Tips

- Press Ctrl+R as a shortcut method to reply to email.
- Set your desktop notifications only for very important emails.
- Flag messages quickly by selecting messages and hitting the Insert key.
- Save frequently sent emails as a template to reuse again and again.
- Conveniently save important emails as files.

## 9.2.3 E-Commerce

### What is E-Commerce?

E-commerce is the buying or selling of goods and services, or the transmitting of money or data, electronically on the internet. E-Commerce is the short form for “electronic commerce.”

### Examples of E-Commerce

Some examples of e-commerce are:

- Online shopping
- Online auctions
- Online ticketing
- Electronic payments
- Internet banking

### Types of E-Commerce

E-commerce can be classified based on the types of participants in the transaction. The main types of e-commerce are:

- **Business to Business (B2B):** Both the transacting parties are businesses.
- **Business to Consumer (B2C):** Businesses sell electronically to end-consumers.
- **Consumer to Consumer (C2C):** Consumers come together to buy, sell or trade items to other consumers.
- **Consumer-to-Business (C2B):** Consumers make products or services available for purchase to companies looking for exactly those services or products.
- **Business-to-Administration (B2A):** Online transactions conducted between companies and public administration.
- **Consumer-to-Administration (C2A):** Online transactions conducted between individual and public administration.

### 9.2.3.1 Benefits of E-Commerce

The e-commerce business provides some benefits for retailers and customers.

#### Benefits for retailers

- Establishes an online presence
- Reduces operational costs by removing overhead costs
- Increases brand awareness through the use of good keywords
- Increases sales by removing geographical and time constraints

#### Benefits for customers

- Offers a wider range of choice than any physical store
- Enables goods and services to be purchased from remote locations
- Enables consumers to perform price comparisons

### 9.2.3.2 Digital India Campaign

Prime Minister Narendra Modi launched the Digital India campaign in 2015, with the objective of offering every citizen of India access to digital services, knowledge and information. The campaign aims to improve the country's online infrastructure and increase internet connectivity, thus boosting the e-commerce industry.

Currently, the majority of online transactions come from tier 2 and tier 3 cities. Once the Digital India campaign is in place, the government will deliver services through mobile connectivity, which will help deliver internet to remote corners of the country. This will help the e-commerce market to enter India's tier 4 towns and rural areas.

#### E-Commerce Activity

Choose a product or service that you want to sell online. Write a brief note explaining how you will use existing e-commerce platforms, or create a new e-commerce platform, to sell your product or service.

#### Tips

- Before launching your e-commerce platform, test everything.
- Pay close and personal attention to your social media.

## UNIT 9.3: Money Matters

### Unit Objectives

**At the end of this unit, you will be able to:**

1. Discuss the importance of saving money
2. Discuss the benefits of saving money
3. Discuss the main types of bank accounts
4. Describe the process of opening a bank account
5. Differentiate between fixed and variable costs
6. Describe the main types of investment options
7. Describe the different types of insurance products
8. Describe the different types of taxes
9. Discuss the uses of online banking
10. Discuss the main types of electronic funds transfers

### 9.3.1 Personal Finance – Why to Save?

#### Importance of Saving

We all know that the future is unpredictable. You never know what will happen tomorrow, next week or next year. That's why saving money steadily through the years is so important. Saving money will help improve your financial situation over time. But more importantly, knowing that you have money stashed away for an emergency will give you peace of mind. Saving money also opens the door to many more options and possibilities.

#### Benefits of Saving

Inculcating the habit of saving leads to a vast number of benefits. Saving helps you:

- **Become financially independent:** When you have enough money saved up to feel secure you can start making your choices, from taking a vacation whenever you want, to switching careers or starting your own business.
- **Invest in yourself through education:** Through saving, you can earn enough to pay up for courses that will add to your professional experience and ultimately result in higher paying jobs.
- **Get out of debt:** Once you have saved enough as a reserve fund, you can use your savings to pay off debts like loans or bills that have accumulated over time.
- **Be prepared for surprise expenses:** Having money saved enables you to pay for unforeseen expenses like sudden car or house repairs, without feeling financially stressed.
- **Pay for emergencies:** Saving helps you deal with emergencies like sudden health issues or emergency trips without feeling financially burdened.

- **Afford large purchases and achieve major goals:** Saving diligently makes it possible to place down payments towards major purchases and goals, like buying a home or a car.
- **Retire:** The money you have saved over the years will keep you comfortable when you no longer have the income you would get from your job.

### Tips



- Break your spending habit. Try not spending on one expensive item per week, and put the money that you would have spent into your savings.
- Decide that you will not buy anything on certain days or weeks and stick to your word.

## 9.3.2 Types of Bank Accounts

In India, banks offer four main types of bank accounts. These are:

1. Current Accounts
2. Savings Accounts
3. Recurring Deposit Accounts
4. Fixed Deposit Accounts

### Current Accounts

Current accounts offer the most liquid deposits and thus, are best suited for businessmen and companies. As these accounts are not meant for investments and savings, there is no imposed limit on the number or amount of transactions that can be made on any given day. Current account holders are not paid any interest on the amounts held in their accounts. They are charged for certain services offered on such accounts.

### Saving Accounts

Savings accounts are meant to promote savings, and are therefore the number one choice for salaried individuals, pensioners and students. While there is no restriction on the number and amount of deposits made, there are usually restrictions on the number and amount of withdrawals. Savings account holders are paid interest on their savings.

### Recurring Deposit Accounts

Recurring Deposit accounts, also called RD accounts, are the accounts of choice for those who want to save an amount every month, but are unable to invest a large sum at one time. Such account holders deposit a small, fixed amount every month for a pre-determined period (minimum 6 months). Defaulting on a monthly payment results in the account holder being charged a penalty amount. The total amount is repaid with interest at the end of the specified period.

## Fixed Deposit Accounts

Fixed Deposit accounts, also called FD accounts, are ideal for those who wish to deposit their savings for a long term in return for a high rate of interest. The rate of interest offered depends on the amount deposited and the time period, and also differs from bank to bank. In the case of an FD, a certain amount of money is deposited by the account holder for a fixed period of time. The money can be withdrawn when the period expires. If necessary, the depositor can break the fixed deposit prematurely. However, this usually attracts a penalty amount which also differs from bank to bank.

### 9.3.2.1 Opening a Bank Account

Opening a bank account is quite a simple process. Take a look at the steps to open an account of your own:

#### Step 1: Fill in the Account Opening Form

This form requires you to provide the following information:

- Personal details (name, address, phone number, date of birth, gender, occupation, address)
- Method of receiving your account statement (hard copy/email)
- Details of your initial deposit (cash/cheque)
- Manner of operating your account (online/mobile banking/traditional via cheque, slip books)
- Ensure that you sign wherever required on the form.

#### Step 2: Affix your Photograph

Stick a recent photograph of yourself in the allotted space on the form.

#### Step 3: Provide your Know Your Customer (KYC) Details

KYC is a process that helps banks verify the identity and address of their customers. To open an account, every individual need to submit certain approved documents with respect to photo identity (ID) and address proof. Some Officially Valid Documents (OVDs) are:

- Passport
- Driving License
- Voters' Identity Card
- PAN Card
- UIDAI (Aadhar) Card

#### Step 4: Submit All your Documents

Submit the completed Account Opening Form and KYC documents. Then wait until the forms are processed and your account has been opened!

## Tips

- Select the right type of account.
- Fill in complete nomination details.
- Ask about fees.
- Understand the rules.
- Check for online banking – it's convenient!
- Keep an eye on your bank balance.

### 9.3.3 Costs: Fixed vs Variable

#### What are Fixed and Variable Costs?

Fixed costs and variable costs together make up a company's total cost. These are the two types of costs that companies have to bear when producing goods and services. A fixed cost does not change with the volume of goods or services a company produces. It always remains the same.

A variable cost, on the other hand, increases and decreases depending on the volume of goods and services produced. In other words, it varies with the amount produced.

#### Differences between Fixed and Variable Costs

Let's take a look at some of the main differences between fixed and variable costs:

Criteria	Fixed Costs	Variable Costs
<b>Meaning</b>	A cost that stays the same, regardless of the output produced.	A cost that changes when the
<b>Nature</b>	Time related.	Volume related.
<b>Incurred</b>	Incurred irrespective of units being produced.	Incurred only when units are produced
<b>Unit cost</b>	Inversely proportional to the number of units produced	Remains the same, per unit.
<b>Examples</b>	Depreciation, rent, salary, insurance and tax	Material consumed, wages, commission on sales and packing expenses

### Tips

- When trying to determine whether a cost is fixed or variable, simply ask the following question: Will the particular cost change if the company stopped its production activities? If the answer is no, then it is a fixed cost. If the answer is yes, then it is probably a variable cost.

## 9.3.4 Investment, Insurance and Taxes

### Investment

Investment means that money is spent today with the aim of reaping financial gains at a future time. The main types of investment options are as follows:

- **Bonds:** Bonds are instruments used by public and private companies to raise large sums of money – too large to be borrowed from a bank. These bonds are then issued in the public market and are bought by lenders.
- **Stocks:** Stocks or equity are shares that are issued by companies and are bought by the general public.
- **Small Savings Schemes:** Small Savings Schemes are tools meant to save money in small amounts. Some popular schemes are the Employees Provident Fund, Sukanya Samridhi Scheme and National Pension Scheme.
- **Mutual Funds:** Mutual Funds are professionally managed financial instruments that invest money in different securities on behalf of investors.
- **Fixed Deposits:** A fixed amount of money is kept aside with a financial institution for a fixed amount of time in return for interest on the money.
- **Real Estate:** Loans are taken from banks to purchase real estate, which is then leased or sold with the aim of making a profit on the appreciated property price.
- **Hedge Funds:** Hedge funds invest in both financial derivatives and/or publicly traded securities.
- **Private Equity:** Private Equity is trading in the shares of an operating company that is not publicly listed and whose shares are not available on the stock market.
- **Venture Capital:** Venture Capital involves investing substantial capital in a budding company in return for stocks in that company.

### Insurance

There are two types of insurance, Life Insurance and General Insurance.

#### Life Insurance Products

The main life insurance products are:

- **Term Insurance:** This is the simplest and cheapest form of insurance. It offers financial protection for a specified tenure, say 15 to 20 years. In the case of your death, your family is paid the sum assured. In the case of your surviving the term, the insurer pays nothing.

- **Endowment Policy:** This offers the dual benefit of insurance and investment. Part of the premium is allocated towards the sum assured, while the remaining premium gets invested in equity and debt. It pays a lump sum amount after the specified duration or on the death of the policyholder, whichever is earlier.
- **Unit-Linked Insurance Plan (ULIP):** Here part of the premium is spent on the life cover, while the remaining amount is invested in equity and debt. It helps develop a regular saving habit.
- **Money Back Life Insurance:** While the policyholder is alive, periodic payments of the partial survival benefits are made during the policy tenure. On the death of the insured, the insurance company pays the full sum assured along with survival benefits.
- **Whole Life Insurance:** It offers the dual benefit of insurance and investment. It offers insurance cover for the whole life of the person or up to 100 years whichever is earlier.

### General Insurance

General Insurance deals with all insurance covering assets like animals, agricultural crops, goods, factories, cars and so on.

### General Insurance Products

The main general insurance products are:

- **Motor Insurance:** This can be divided into Four-Wheeler Insurance and Two-Wheeler insurance.
- **Health Insurance:** The main types of health insurance are individual health insurance, family floater health insurance, comprehensive health insurance and critical illness insurance.
- **Travel Insurance:** This can be categorised into Individual Travel Policy, Family Travel Policy, Student Travel Insurance and Senior Citizen Health Insurance.
- **Home Insurance:** This protects the house and its contents from risk.
- **Marine Insurance:** This insurance covers goods, freight and cargo against loss or damage during transit by rail, road, sea and/or air.

### Taxes

There are two types of taxes:

1. Direct Taxes
2. Indirect Taxes.

### Direct Tax

Direct taxes are levied directly on an entity or a person and are non-transferrable. Some examples of Direct Taxes are:

- **Income Tax:** This tax is levied on your earning in a financial year. It is applicable to both, individuals and companies.
- **Capital Gains Tax:** This tax is payable whenever you receive a sizable amount of money. It is usually of two types – short term capital gains from investments held for less than 36 months and long term capital gains from investments held for longer than 36 months.

- **Securities Transaction Tax:** This tax is added to the price of a share. It is levied every time you buy or sell shares.
- **Perquisite Tax:** This tax is levied on perks that have been acquired by a company or used by an employee.
- **Corporate Tax:** Corporate tax is paid by companies from the revenue they earn.

### Indirect Tax

Indirect taxes are levied on goods or services. Some examples of Indirect Taxes are:

- **Sales Tax:** Sales Tax is levied on the sale of a product.
- **Service Tax:** Service Tax is added to services provided in India.
- **Value Added Tax:** Value Added Tax is levied at the discretion of the state government. The tax is levied on goods sold in the state. The tax amount is decided by the state.
- **Customs Duty & Octroi:** Customs Duty is a charge that is applied on purchases that are imported from another country. Octroi is levied on goods that cross state borders within India.
- **Excise Duty:** Excise Duty is levied on all goods manufactured or produced in India

### Tips



- Think about how quickly you need your money back and pick an investment option accordingly.
- Ensure that you are buying the right type of insurance policy for yourself.
- Remember, not paying taxes can result in penalties ranging from fines to imprisonment.

## 9.3.5 Online Banking, NEFT, RTGS etc.

### What is Online Banking?

Internet or online banking allows account holders to access their account from a laptop at any location. In this way, instructions can be issued. To access an account, account holders simply need to use their unique customer ID number and password.

Internet banking can be used to:

- Find out an account balance
- Transfer amounts from one account to another
- Arrange for the issuance of cheques
- Instruct payments to be made
- Request for a cheque book
- Request for a statement of accounts
- Make a fixed deposit

**Electronic Funds Transfers**

Electronic funds transfer is a convenient way of transferring money from the comfort of one's own home, using integrated banking tools like internet and mobile banking.

Transferring funds via an electronic gateway is extremely convenient. With the help of online banking, you can choose transferring funds:

- Into your accounts of the same bank.
- Into other people's accounts of the same bank.
- Into accounts in different banks through NEFT.
- Into other bank accounts through RTGS.
- Into various accounts through IMPS.

**NEFT**

NEFT stands for National Electronic Funds Transfer. This money transfer system allows you to electronically transfer funds from your respective bank accounts to any other account, either in the same bank or belonging to any other bank. NEFT can be used by individuals, firms and corporate organizations to transfer funds between accounts.

In order to transfer funds via NEFT, two things are required:

- A transferring bank
- A destination bank

Before you can transfer funds through NEFT, you will need to register the beneficiary who will be receiving the funds. In order to complete this registration, you will require the following information:

- Recipient's name
- Recipient's account number
- Recipient's bank's name
- Recipient's bank's IFSC code

**RTGS**

RTGS stands for Real Time Gross Settlement. This is a real time funds transfer system which enables you to transfer funds from one bank to another, in real time or on a gross basis. The transferred amount is immediately deducted from the account of one bank, and instantly credited to the other bank's account. The RTGS payment gateway is maintained by the Reserve Bank of India. The transactions between banks are made electronically.

RTGS can be used by individuals, companies and firms to transfer large sums of money. Before remitting funds through RTGS, you will need to add the beneficiary and his bank account details via your online banking account.

In order to complete this registration, you will require the following information:

- Name of the beneficiary
- Beneficiary's account number
- Beneficiary's bank address
- Bank's IFSC code

### **IMPS**

IMPS stands for Immediate Payment Service. This is a real-time, inter-bank, electronic funds transfer system used to transfer money instantly within banks across India. IMPS enables users to make instant electronic transfer payments using mobile phones through both, Mobile Banking and SMS. It can also be used through ATMs and online banking. IMPS is available 24 hours a day and 7 days a week. The system features a secure transfer gateway and immediately confirms orders that have been fulfilled.

To transfer money through IMPS, you need to:

- Register for IMPS with your bank
- Receive a Mobile Money Identifier (MMID) from the bank
- Receive a MPIN from the bank

Once you have both these, you can login or make a request through SMS to transfer a particular amount to a beneficiary.

In order for the beneficiary to receive the transferred money, he must:

- Link his mobile number with his respective account
- Receive the MMID from the bank

In order to initiate a money transfer through IMPS, you will need to enter the following information:

- The beneficiary's mobile number
- The beneficiary's MMID
- The transfer amount
- Your MPIN

As soon as money has been deducted from your account and credited into the beneficiary's account, you will be sent a confirmation SMS with a transaction reference number, for future reference.

### 9.3.5.1 Differences between NEFT, RTGS & IMPS

Criteria	NEFT	RTGS	IMPS
Settlement	Done in batches	Real-time	Real-time
Full form	National Electronic Fund Transfer	Real Time Gross Settlement	Immediate Payment Service
Timings on Monday – Friday	8:00 am – 6:30 pm	9:00 am – 4:30 pm	24x7
Timings on Saturday	8:00 am – 1:00 pm	9:00 am – 1:30 pm	24x7
Minimum amount of money transfer limit	₹1	₹2 lacs	₹1
Maximum amount of money transfer limit	₹10 lacs	₹10 lacs per day	₹2 lacs
Maximum charges as per RBI	Up to 10,000 – ₹2.5 above 10,000 – 1 lac - ₹5 above 1 – 2 lacs ₹15 above 2 – 5 lacs ₹25 above 5 – 10 lacs ₹25	above 2 – 5 lacs ₹25 above 5 – 10 lacs ₹50	Up to 10,000 – ₹5 above 10,000 – 1 lac – ₹5 above 1 – 2 lacs – ₹15

Fig.9.3.2: Differences Between NEFT, RTGS & IMPS

#### Tips

- Never click on any links in any e-mail message to access your online banking website.
- You will never be asked for your credit or debit card details while using online banking.
- Change your online banking password regularly.

## UNIT 9.4: Preparing for Employment & Self-Employment

### Unit Objectives

**At the end of this unit, you will be able to:**

1. Discuss the steps to prepare for an interview
2. Discuss the steps to create an effective Resume
3. Discuss the most frequently asked interview questions
4. Discuss how to answer the most frequently asked interview questions
5. Discuss basic workplace terminology

### 9.4.1 Interview Preparation: How to Prepare for an Interview?

The success of your getting the job that you want depends largely on how well your interview for that job goes. Therefore, before you go in for your interview, it is important that you prepare for it with a fair amount of research and planning. Take a look at the steps to follow in order to be well prepared for an interview:

#### 1. Research the organization that you are having the interview with.

- Studying the company beforehand will help you be more prepared at the time of the interview. Your knowledge of the organization will help you answer questions at the time of the interview, and will leave you looking and feeling more confident. This is sure to make you stand out from other, not as well informed, candidates.
- Look for background information on the company. Try and find an overview of the company and its industry profile.
- Visit the company website to get a good idea of what the company does. A company website offers a wealth of important information. Read and understand the company's mission statement. Pay attention to the company's products/services and client list. Read through any press releases to get an idea of the company's projected growth and stability.
- Note down any questions that you have after your research has been completed.

#### 2. Think about whether your skills and qualifications match the job requirements.

- Carefully read through and analyse the job description.
- Make a note of the knowledge, skills and abilities required to fulfil the job requirements.
- Take a look at the organization hierarchy. Figure out where the position you are applying for fits into this hierarchy.

**3. Go through the most typical interview questions asked, and prepare your responses.**

- Remember, in most interviews a mix of resume-based, behavioural and case study questions are asked.
- Think about the kind of answers you would like to provide to typical questions asked in these three areas.
- Practice these answers until you can express them confidently and clearly.

**4. Plan your attire for the interview.**

- It is always safest to opt for formal business attire, unless expressly informed to dress in business casual (in which case you should use your best judgement).
- Ensure that your clothes are clean and well-ironed. Pick neutral colours – nothing too bright or flashy.
- The shoes you wear should match your clothes, and should be clean and suitable for an interview.
- Remember, your aim is to leave everyone you meet with the impression that you are a professional and highly efficient person.

**5. Ensure that you have packed everything that you may require during the interview.**

- Carry a few copies of your resume. Use a good quality paper for your resume print outs.
- Always take along a notepad and a pen.
- Take along any information you may need to refer to, in order to fill out an application form.
- Carry a few samples of your work, if relevant.

**6. Remember the importance of non-verbal communication.**

- Practice projecting confidence. Remind yourself to smile and make eye contact. Practice giving a firm handshake.
- Keep in mind the importance of posture. Practice sitting up straight. Train yourself to stop nervous gestures like fidgeting and foot-tapping.
- Practice keeping your reactions in check. Remember, your facial expressions provide a good insight into your true feelings. Practice projecting a positive image.

**7. Make a list of questions to end the interview with.**

- Most interviews will end with the interviewer(s) asking if you have any questions. This is your chance to show that you have done your research and are interested in learning more about the company.
- If the interviewer does not ask you this question, you can inform him/her that you have some queries that you would like to discuss. This is the time for you to refer to the notes you made while studying the company.
- Some good questions to ask at this point are:
  - What do you consider the most important criteria for success in this job?
  - How will my performance be evaluated?
  - What are the opportunities for advancement?
  - What are the next steps in the hiring process?
- Remember, never ask for information that is easily available on the company website.

## Tips

- Ask insightful and probing questions.
- When communicating, use effective forms of body language like smiling, making eye contact, and actively listening and nodding. Don't slouch, play with nearby items, fidget, chew gum, or mumble.

## 9.4.2 Preparing an Effective Resume

A resume is a formal document that lists a candidate's work experience, education and skills. A good resume gives a potential employer enough information to believe the applicant is worth interviewing. That's why it is so important to create a résumé that is effective. Take a look at the steps to create an effective resume:

### Step 1: Write the Address Section

The Address section occupies the top of your resume. It includes information like your name, address, phone number and e-mail address. Insert a bold line under the section to separate it from rest of your resume.

#### Example:

Jasmine Watts  
Breach Candy, Mumbai – India  
Contact No: +91 2223678270  
Email: jasmine.watts@gmail.com

---

### Step 2: Add the Profile Summary Section

This part of your resume should list your overall experiences, achievements, awards, certifications and strengths. You can make your summary as short as 2-3 bullet points or as long as 8-10 bullet points.

#### Example:

##### Profile Summary

- A Content Writer graduated from University of Strathclyde having 6 years of experience in writing website copy.
- Core expertise lies in content creation for e-learning courses, specifically for the K-12 segment.

### Step 3: Include Your Educational Qualifications

When listing your academic records, first list your highest degree. Then add the second highest qualification under the highest one and so on. To provide a clear and accurate picture of your educational background, it is critical that include information on your position, rank, percentage or CPI for every degree or certification that you have listed.

If you have done any certifications and trainings, you can add a Trainings & Certifications section under your Educational Qualifications section.

**Example:**

**Educational Qualifications**

- Masters in International Management (2007) from Columbia University with 8.8 CPI.
- Bachelor of Management Studies (2004) from Mumbai University with 87% marks.
- 10+2 with Math, Stats (2001) from Maharashtra Board with 91% marks.
- High School (1999) from Maharashtra Board with 93% marks.

**Step 4: List Your Technical Skills**

When listing your technical skills, start with the skills that you are most confident about. Then add the skills that you do not have as good a command over. It is perfectly acceptable to include just one skill, if you feel that particular skill adds tremendous value to your résumé. If you do not have any technical skills, you can omit this step.

**Example:**

**Technical Skills**

- Flash
- Photoshop

**Step 5: Insert Your Academic Project Experience**

List down all the important projects that you have worked on. Include the following information in this section:

- |                 |                |                 |
|-----------------|----------------|-----------------|
| • Project title | • Organization | • Platform used |
| • Contribution  | • Description  |                 |

**Example:**

**Academic Projects**

**Project Title:** Different Communication Skills

**Organization:** True Blue Solutions

**Platform used:** Articulate

**Contribution:** Content writing and graphic visualization

**Description:** Development of storyboards for corporate induction & training programs

**Step 6: List Your Strengths**

This is where you list all your major strengths. This section should be in the form of a bulleted list.

**Example:****Strengths**

- Excellent oral, written and presentation skills
- Action-oriented and result-focused
- Great time management skills

**Step 7: List Your Extracurricular Activities**

It is very important to show that you have diverse interests and that your life consists of more than academics. Including your extracurricular activities can give you an added edge over other candidates who have similar academic scores and project experiences. This section should be in the form of a bulleted list.

**Example:****Extracurricular Activities**

- Member of the Debate Club
- Played tennis at a national level
- Won first prize in the All India Camel Contest, 2010

**Step 8: Write Your Personal Details**

The last section of your résumé must include the following personal information:

- Date of birth
- Gender & marital status
- Nationality
- Languages known

**Example:****Personal Details**

- Date of birth: 25<sup>th</sup> May, 1981
- Gender & marital status: Female, Single
- Nationality: Indian
- Languages known: English, Hindi, Tamil, French

**Tips**

- Keep your resume file name short, simple and informational.
- Make sure the resume is neat and free from typing errors.
- Always create your resume on plain white paper.

### 9.4.3 Interview FAQs

Take a look at some of the most frequently asked interview questions, and some helpful tips on how to answer them.

#### **Q1. Can you tell me a little about yourself?**

Tips to answer:

- Don't provide your full employment or personal history.
- Offer 2-3 specific experiences that you feel are most valuable and relevant.
- Conclude with how those experiences have made you perfect for this specific role.

#### **Q2. How did you hear about the position?**

Tips to answer:

- Tell the interviewer how you heard about the job – whether it was through a friend (name the friend), event or article (name them) or a job portal (say which one).
- Explain what excites you about the position and what in particular caught your eye about this role.

#### **Q3. What do you know about the company?**

Tips to answer:

- Don't recite the company's About Us page.
- Show that you understand and care about the company's goals.
- Explain why you believe in the company's mission and values.

#### **Q4. Why do you want this job?**

Tips to answer:

- Show that you are passionate about the job.
- Identify why the role is a great fit for you.
- Explain why you love the company.

#### **Q5. Why should we hire you?**

Tips to answer:

- Prove through your words that you can not only do the work, but can definitely deliver excellent results.
- Explain why you would be a great fit with the team and work culture.
- Explain why you should be chosen over any other candidate.

#### **Q6. What are your greatest professional strengths?**

Tips to answer:

- Be honest – share some of your real strengths, rather than give answers that you think sound good.
- Offer examples of specific strengths that are relevant to the position you are applying for.
- Provide examples of how you've demonstrated these strengths.

**Q7. What do you consider to be your weaknesses?****Tips to answer:**

- The purpose of this question is to gauge your self-awareness and honesty.
- Give an example of a trait that you struggle with, but that you're working on to improve.

**Q8. What are your salary requirements?****Tips to answer:**

- Do your research beforehand and find out the typical salary range for the job you are applying for.
- Figure out where you lie on the pay scale based on your experience, education, and skills.
- Be flexible. Tell the interviewer that you know your skills are valuable, but that you want the job and are willing to negotiate.

**Q9. What do you like to do outside of work?****Tips to answer:**

- The purpose of this question is to see if you will fit in with the company culture.
- Be honest – open up and share activities and hobbies that interest and excite you.

**Q10. If you were an animal, which one would you want to be?****Tips to answer:**

- The purpose of this question is to see if you are able to think on your feet.
- There's no wrong answer – but to make a great impression try to bring out your strengths or personality traits through your answer.

**Q11: What do you think we could do better or differently?****Tips to answer:**

- The purpose of this question is to see if you have done your research on the company, and to test whether you can think critically and come up with new ideas.
- Suggest new ideas. Show how your interests and expertise would help you execute these ideas.

**Q12: Do you have any questions for us?****Tips to answer:**

- Do not ask questions to which the answers can be easily found on the company website or through a quick online search.
- Ask intelligent questions that show your ability to think critically.

**Tips** 

- Be honest and confident while answering.
- Use examples of your past experiences wherever possible to make your answers more impactful.

### 9.4.4 Work Readiness – Terms & Terminologies

Every employee should be well versed in the following terms:

- **Annual leave:** Paid vacation leave given by employers to employees.
- **Background Check:** A method used by employers to verify the accuracy of the information provided by potential candidates.
- **Benefits:** A part of an employee's compensation package.
- **Breaks:** Short periods of rest taken by employees during working hours.
- **Compensation Package:** The combination of salary and benefits that an employer provides to his/her employees.
- **Compensatory Time (Comp Time):** Time off in lieu of pay.
- **Contract Employee:** An employee who works for one organization that sells said employee's service to another company, either on a project or time basis.
- **Contract of Employment:** When an employee is offered work in exchange for wages or salary, and accepts the offer made by the employer, a contract of employment exists.
- **Corporate Culture:** The beliefs and values shared by all the members of a company, and imparted from one generation of employees to another.
- **Counter Offer/Counter Proposal:** A negotiation technique used by potential candidates to increase the amount of salary offered by a company.
- **Cover Letter:** A letter that accompanies a candidate's resume. It emphasizes the important points in the candidate's resume and provides real examples that prove the candidate's ability to perform the expected job role.
- **Curriculum Vitae (CV)/Resume:** A summary of a candidate's achievements, educational work experience, skills and strengths.
- **Declining Letter:** A letter sent by an employee to an employer, turning down the job offer employer to the employee.
- **Deductions:** Amounts subtracted from an employee's pay and listed on the employee's pay slip.
- **Discrimination:** The act of treating one person not as favourably as another person.
- **Employee:** A person who works for another person in exchange for payment.
- **Employee Training:** A workshop or in-house training that an employee is asked to attend by his or her superior, for the benefit of the employer.
- **Employment Gaps:** Periods of unemployed time between jobs.
- **Fixed-Term Contract:** A contract of employment which gets terminated on an agreed-upon date.
- **Follow-Up:** The act of contacting a potential employer after a candidate has submitted his or her resume.
- **Freelancer/Consultant/Independent Contractor:** A person who works for him or herself for temporary jobs and projects with different employers.
- **Holiday:** Paid time-off from work.
- **Hourly Rate:** The amount of salary or wages paid for 60 minutes of work.

- **Internship:** A job opportunity offered by an employer to a potential employee, called an at the employer's company for a fixed, limited time period.
- **Interview:** A conversation between a potential employee and a representative of an order to determine if the potential employee should be hired.
- **Job Application:** A form which asks for a candidate's information like the candidate's name, details and work experience. The purpose of a candidate submitting a job application, is to show that candidate's interest in working for a particular company.
- **Job Offer:** An offer of employment made by an employer to a potential employee.
- **Job Search Agent:** A program that enables candidates to search for employment opportunities by selecting criteria listed in the program, for job vacancies. background, made by the and pitches intern, to work employer, in address, contact
- **Lay Off:** A lay off occurs when an employee is temporarily let go from his or her job, due to the employer not having any work for that employee.
- **Leave:** Formal permission given to an employee, by his or her employer, to take a leave of absence from work.
- **Letter of Acceptance:** A letter given by an employer to an employee, confirming the offer of employment made by the employer, as well as the conditions of the offer.
- **Letter of Agreement:** A letter that outlines the terms of employment.
- **Letter of Recommendation:** A letter written for the purpose of validating the work skills of a person.
- **Maternity Leave:** Leave taken from work by women who are pregnant, or who have just given birth.
- **Mentor:** A person who is employed at a higher level than you, who offers you advice and guides you in your career.
- **Minimum wage:** The minimum wage amount paid on an hourly basis.
- **Notice:** An announcement made by an employee or an employer, stating that the employment contract will end on a particular date.
- **Offer of Employment:** An offer made by an employer to a prospective employee that contains important information pertaining to the job being offered, like the starting date, salary, working conditions etc.
- **Open-Ended Contract:** A contract of employment that continues till the employer or terminates it.
- **Overqualified:** A person who is not suited for a particular job because he or she has too many years of work experience, or a level of education that is much higher than required for the job, or is currently or was previously too highly paid.
- **Part-Time Worker:** An employee who works for fewer hours than the standard number of hours normally worked.
- **Paternity Leave:** Leave granted to a man who has recently become a father.
- **Recruiters/Head-hunters/Executive Search Firms:** Professionals who are paid by employers to search for people to fill particular positions.
- **Resigning/Resignations:** When an employee formally informs his or her employer that he or she is quitting his or her job.

- **Self-Employed:** A person who has his or her own business and does not work in the capacity of an employee.
- **Time Sheet:** A form that is submitted to an employer, by an employee, that contains the number of hours worked every day by the employee.

## UNIT 8.5: Understanding Entrepreneurship

### Unit Objectives

**At the end of this unit, you will be able to:**

1. Discuss the concept of entrepreneurship
2. Discuss the importance of entrepreneurship
3. Describe the characteristics of an entrepreneur
4. Describe the different types of enterprises
5. List the qualities of an effective leader
6. Discuss the benefits of effective leadership
7. List the traits of an effective team
8. Discuss the importance of listening effectively
9. Discuss how to listen effectively
10. Discuss the importance of speaking effectively
11. Discuss how to speak effectively
12. Discuss how to solve problems
13. List important problem solving traits
14. Discuss ways to assess problem solving skills
15. Discuss the importance of negotiation
16. Discuss how to negotiate
17. Discuss how to identify new business opportunities
18. Discuss how to identify business opportunities within your business
19. Understand the meaning of entrepreneur
20. Describe the different types of entrepreneurs
21. List the characteristics of entrepreneurs
22. Recall entrepreneur success stories
23. Discuss the entrepreneurial process
24. Describe the entrepreneurship ecosystem
25. Discuss the government's role in the entrepreneurship ecosystem
26. Discuss the current entrepreneurship ecosystem in India
27. Understand the purpose of the Make in India campaign
28. Discuss the relationship between entrepreneurship and risk appetite
29. Discuss the relationship between entrepreneurship and resilience
30. Describe the characteristics of a resilient entrepreneur
31. Discuss how to deal with failure

## 9.5.1 Concept Introduction

Anyone who is determined to start a business, no matter what the risk, is an entrepreneur. Entrepreneurs run their own start-up, take responsibility for the financial risks and use creativity, innovation and vast reserves of self-motivation to achieve success. They dream big and are determined to do whatever it takes to turn their idea into a viable offering. The aim of an entrepreneur is to create an enterprise. The process of creating this enterprise is known as entrepreneurship.

### 9.5.1.1 Importance of Entrepreneurship

Entrepreneurship is very important for the following reasons:

1. It results in the creation of new organizations
2. It brings creativity into the marketplace
3. It leads to improved standards of living
4. It helps develop the economy of a country

### 9.5.1.2 Characteristics of Entrepreneurs

All successful entrepreneurs have certain characteristics in common.

They are all:

- Extremely passionate about their work
- Confident in themselves
- Disciplined and dedicated
- Motivated and driven
- Highly creative
- Visionaries
- Open-minded
- Decisive

Entrepreneurs also have a tendency to:

- Have a high-risk tolerance
- Thoroughly plan everything
- Manage their money wisely
- Make their customers their priority
- Understand their offering and their market in detail
- Ask for advice from experts when required
- Know when to cut their losses

### 9.5.1.3 Examples of Famous Entrepreneurs

Some famous entrepreneurs are:

- Bill Gates (Founder of Microsoft)
- Steve Jobs (Co-founder of Apple)
- Mark Zuckerberg (Founder of Facebook)
- Pierre Omidyar (Founder of eBay)

### 9.5.1.4 Types of Enterprises

As an entrepreneur in India, you can own and run any of the following types of enterprises:

#### Sole Proprietorship

In a sole proprietorship, a single individual owns, manages and controls the enterprise. This type of business is the easiest to form with respect to legal formalities. The business and the owner have no separate legal existence. All profit belongs to the proprietor, as do all the losses the liability of the entrepreneur is unlimited.

#### Partnership

A partnership firm is formed by two or more people. The owners of the enterprise are called partners. A partnership deed must be signed by all the partners. The firm and its partners have no separate legal existence. The profits are shared by the partners. With respect to losses, the liability of the partners is unlimited. A firm has a limited life span and must be dissolved when any one of the partners dies, retires, claims bankruptcy or goes insane.

#### Limited Liability Partnership (LLP)

In a Limited Liability Partnership or LLP, the partners of the firm enjoy perpetual existence as well as the advantage of limited liability. Each partner's liability is limited to their agreed contribution to the LLP. The partnership and its partners have a separate legal existence.

#### Tips

- Learn from others' failures.
- Be certain that this is what you want.
- Search for a problem to solve, rather than look for a problem to attach to your idea.

### 9.5.2 Leadership & Teamwork: Leadership and Leaders

Leadership means setting an example for others to follow. Setting a good example means not asking someone to do something that you wouldn't willingly want to do yourself. Leadership is about figuring out what to do in order to win as a team, and as a company.

Leaders believe in doing the right things. They also believe in helping others to do the right things. An effective leader is someone who:

- Creates an inspiring vision of the future.
- Motivates and inspires his team to pursue that vision.

### 9.5.2.1 Leadership Qualities That All Entrepreneurs Need

Building a successful enterprise is only possible if the entrepreneur in charge possesses excellent leadership qualities. Some critical leadership skills that every entrepreneur must have are:

1. **Pragmatism:** This means having the ability to highlight all obstacles and challenges, in order to resolve issues and reduce risks.
2. **Humility:** This means admitting to mistakes often and early, and being quick to take responsibility for your actions. Mistakes should be viewed as challenges to overcome, not opportunities to point blame.
3. **Flexibility:** It is critical for a good leader to be very flexible and quickly adapt to change. It is equally critical to know when to adapt and when not to.
4. **Authenticity:** This means showing both, your strengths and your weaknesses. It means being human and showing others that you are human.
5. **Reinvention:** This means refreshing or changing your leadership style when necessary. To do this, it's important to learn where your leadership gaps lie and find out what resources are required to close them.
6. **Awareness:** This means taking the time to recognize how others view you. It means understanding how your presence affects those around you.

### 9.5.2.2 Benefits of Effective Leadership

Effective leadership results in numerous benefits. Great leadership leads to the leader successfully:

- Gaining the loyalty and commitment of the team members
- Motivating the team to work towards achieving the company's goals and objectives
- Building morale and instilling confidence in the team members
- Fostering mutual understanding and team-spirit among team members
- Convincing team members about the need to change when a situation requires adaptability

### 9.5.2.3 Teamwork and Teams

Teamwork occurs when the people in a workplace combine their individual skills to pursue a common goal. Effective teams are made up of individuals who work together to achieve this common goal. A great team is one who holds themselves accountable for the end result.

### 9.5.2.4 Importance of Teamwork in Entrepreneurial Success

For an entrepreneurial leader, building an effective team is critical to the success of a venture. An entrepreneur must ensure that the team he builds possesses certain crucial qualities, traits and characteristics. An effective team is one which has:

1. **Unity of purpose:** All the team members should clearly understand and be equally committed to the purpose, vision and goals of the team.
2. **Great communication skills:** Team members should have the ability to express their concerns, ask questions and use diagrams, and charts to convey complex information.
3. **The ability to collaborate:** Every member should feel entitled to provide regular feedback on new ideas.
4. **Initiative:** The team should consist of proactive individuals. The members should have the enthusiasm to come up with new ideas, improve existing ideas, and conduct their own research.
5. **Visionary members:** The team should have the ability to anticipate problems and act on these potential problems before they turn into real problems.
6. **Great adaptability skills:** The team must believe that change is a positive force. Change should be seen as the chance to improve and try new things.
7. **Excellent organizational skills:** The team should have the ability to develop standard work processes, balance responsibilities, properly plan projects, and set in place methods to measure progress and ROI.

### Tips

- Don't get too attached to your original idea. Allow it to evolve and change.
- Be aware of your weaknesses and build a team that will complement your shortfalls.
- Hiring the right people is not enough. You need to promote or incentivize your most talented people to keep them motivated.
- Earn your team's respect.

### 9.5.3 Communication Skills

Listening is the ability to correctly receive and understand messages during the process of communication. Listening is critical for effective communication. Without effective listening skills, messages can easily be misunderstood. This results in a communication breakdown and can lead to the sender and the receiver of the message becoming frustrated or irritated.

It's very important to note that listening is not the same as hearing. Hearing just refers to sounds that you hear. Listening is a whole lot more than that. To listen, one requires focus. It means not only paying attention to the story, but also focusing on how the story is relayed, the way language and voice is used, and even how the speaker uses their body language. The ability to listen depends on how effectively one can perceive and understand both, verbal and non-verbal cues.

### 9.5.3.1 How to Listen Effectively?

To listen effectively you should:

- Stop talking
- Stop interrupting
- Focus completely on what is being said
- Nod and use encouraging words and gestures
- Be open-minded
- Think about the speaker's perspective
- Be very, very patient
- Pay attention to the tone that is being used
- Pay attention to the speaker's gestures, facial expressions and eye movements
- Not try and rush the person
- Not let the speaker's mannerisms or habits irritate or distract you

### 9.5.3.2 The Importance of Speaking Effectively

How successfully a message gets conveyed depends entirely on how effectively you are able to get it through. An effective speaker is one who enunciates properly, pronounces words correctly, chooses the right words and speaks at a pace that is easily understandable. Besides this, the words spoken out loud need to match the gestures, tone and body language used.

What you say, and the tone in which you say it, results in numerous perceptions being formed. A person who speaks hesitantly may be perceived as having low self-esteem or lacking in knowledge of the discussed topic. Those with a quiet voice may very well be labelled as shy. And those who speak in commanding tones with high levels of clarity, are usually considered to be extremely confident. This makes speaking a very critical communication skill.

### 9.5.3.3 How to Speak Effectively?

To speak effectively you should:

- Incorporate body language in your speech like eye contact, smiling, nodding, gesturing etc.
- Build a draft of your speech before actually making your speech.
- Ensure that all your emotions and feelings are under control.
- Pronounce your words distinctly with the correct pitch and intensity. Your speech should be crystal clear at all times. Use a pleasant and natural tone when speaking. Your audience should not feel like you are putting on an accent or being unnatural in any way.
- Use precise and specific words to drive your message home. Ambiguity should be avoided at all costs.
- Ensure that your speech has a logical flow.

- Be brief. Don't add any unnecessary information.
- Make a conscious effort to avoid irritating mannerisms like fidgeting, twitching etc.
- Choose your words carefully and use simple words that the majority of the audience will have no difficulty understanding.
- Use visual aids like slides or a whiteboard.
- Speak slowly so that your audience can easily understand what you're saying. However, be careful not to speak too slowly because this can come across as stiff, unprepared or even condescending.
- Remember to pause at the right moments.

### Tips

- If you're finding it difficult to focus on what someone is saying, try repeating their words in your head.
- Always maintain eye contact with the person that you are communicating with, when speaking as well as listening. This conveys and also encourages interest in the conversation.

## 9.5.4 Problem Solving & Negotiation Skills

As per The Concise Oxford Dictionary (1995), a problem is, "A doubtful or difficult matter requiring a solution"

All problems contain two elements:

1. Goals
2. Obstacles

The aim of problem solving is to recognize the obstacles and remove them in order to achieve the goals.

### 9.5.4.1 How to Solve Problems?

Solving a problem requires a level of rational thinking. Here are some logical steps to follow when faced with an issue:

- **Step 1:** Identify the problem
- **Step 2:** Study the problem in detail
- **Step 3:** List all possible solutions
- **Step 4:** Select the best solution
- **Step 5:** Implement the chosen solution
- **Step 6:** Check that the problem has really been solved

### 9.5.4.2 Important Traits for Problem Solving

Highly developed problem-solving skills are critical for both, business owners and their employees. The following personality traits play a big role in how effectively problems are solved:

- Being open minded
- Asking the right questions
- Being proactive
- Not panicking
- Having a positive attitude
- Focusing on the right problem

### 9.5.4.3 How to Assess for Problem Solving Skills?

As an entrepreneur, it would be a good idea to assess the level of problem solving skills of potential candidates before hiring them. Some ways to assess this skill are through:

1. **Application forms:** Ask for proof of the candidate's problem solving skills in the application form.
2. **Psychometric tests:** Give potential candidates logical reasoning and critical thinking tests and see how they fare.
3. **Interviews:** Create hypothetical problematic situations or raise ethical questions and see how the candidates respond.
4. **Technical questions:** Give candidates examples of real life problems and evaluate their thought process.

### 9.5.4.4 What is Negotiation?

Negotiation is a method used to settle differences. The aim of negotiation is to resolve differences through a compromise or agreement while avoiding disputes. Without negotiation, conflicts are likely to lead to resentment between people. Good negotiation skills help satisfy both parties and go a long way towards developing strong relationships.

#### Why Negotiate?

Starting a business requires many, many negotiations. Some negotiations are small while others are critical enough to make or break a start-up. Negotiation also plays a big role inside the workplace. As an entrepreneur, you need to know not only how to negotiate yourself, but also how to train employees in the art of negotiation.

### How to Negotiate?

Take a look at some steps to help you negotiate:

- **Step 1:** Pre-Negotiation Preparation: Agree on where to meet to discuss the problem, decide who all will be present and set a time limit for the discussion.
- **Step 2:** Discuss the problem: This involves asking questions, listening to the other side, putting your views forward and clarifying doubts.
- **Step 3:** Clarify the Objective: Ensure that both parties want to solve the same problem and reach the same goal.
- **Step 4:** Aim for a Win-Win Outcome: Try your best to be open minded when negotiating. Compromise and offer substitute solutions to arrive at an outcome where both win.
- **Step 5:** Clearly Define the Agreement: When an agreement has been reached, the details of the agreement should be crystal clear to both sides, with no scope for misunderstandings.
- **Step 6:** Implement the Agreed Upon Solution: Agree on a course of action to set the solution in motion.

### Tips



- Know exactly what you want before you work towards getting it
- Give more importance to listening and thinking, than speaking
- Focus on building a relationship rather than winning
- Remember that your people skills will affect the outcome
- Know when to walk away – sometimes reaching an agreement may not be possible

### 9.5.5 Business Opportunities Identification

*“The entrepreneur always searches for change, responds to it and exploits it as an opportunity.”*

*Peter Drucker*

The ability to find good business opportunities is an important characteristic of an entrepreneur.

#### What is an Opportunity?

The word opportunity suggests a good chance or a favourable situation to do something offered by circumstances.

A business opportunity is typically a good/favourable change that can be used to run a business in a given environment, at a given point of time.

### Common Questions Faced by Entrepreneurs

A critical question that all entrepreneurs face is how to go about finding the business opportunity that is right for them.

Some common questions that entrepreneurs constantly think about are:

- Should the new enterprise introduce a new product or service based on an unmet need?
- Should the new enterprise select an existing product or service from one market and offer it in another where it may not be available?
- Should the enterprise be based on a tried and tested formula that has worked elsewhere?

It is therefore extremely important that entrepreneurs must learn how to identify new and existing business opportunities and evaluate their chances of success.

### When is an Idea an Opportunity?

An idea is an opportunity when:

- It creates or adds value to a customer
- It solves a significant problem, removes a pain point or meets a demand
- Has a robust market and profit margin
- Is a good fit with the founder and management team at the right time and place

### Factors to Consider When Looking for Opportunities

Consider the following when looking for business opportunities:

- Economic trends
- Changes in funding
- Changing relationships between vendors, partners and suppliers
- Market trends
- Changes in political support
- Shift in target audience

### Ways to Identify New Business Opportunities

- **Identify Market Inefficiencies:** When looking at a market, consider what inefficiencies are present in the market. Think about ways to correct these inefficiencies.
- **Remove Key Hassles:** Rather than create a new product or service, you can innovatively improve a product, service or process.
- **Create Something New:** Think about how you can create a new experience for customers, based on existing business models.
- **Pick a Growing Sector/Industry:** Research and find out which sectors or industries are growing and think about what opportunities you can tap in the same.
- **Think About Product Differentiation:** If you already have a product in mind, think about ways to set it apart from the existing ones.

## Ways to Identify Business Opportunities within Your Business

### 1. SWOT Analysis

An excellent way to identify opportunities inside your business is by creating a SWOT analysis. The acronym SWOT stands for strengths, weaknesses, opportunities, and threats. SWOT analysis framework:

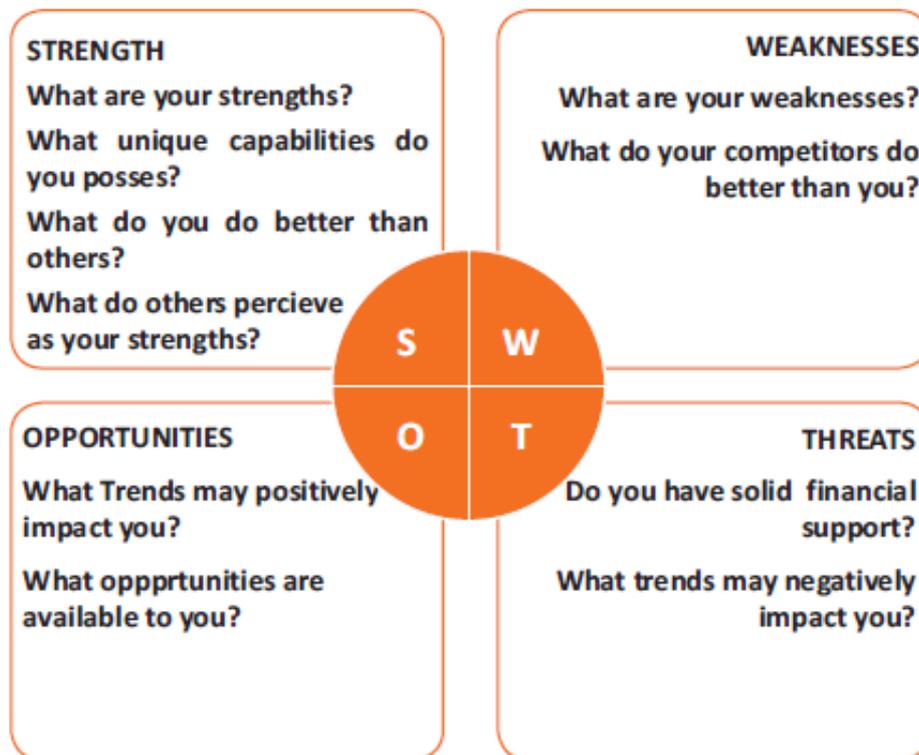


Fig.9.5.1. SWOT Analysis

#### Consider the following when looking for business opportunities:

By looking at yourself and your competitors using the SWOT framework, you can uncover opportunities that you can exploit, as well as manage and eliminate threats that could derail your success.

### 2. Establishing Your USP

Establish your USP in such a way that positions you differently from your competitors. Identify the uniqueness about your product that will motivate customers to buy from you and then promote that reason.

#### Opportunity Analysis

Once you have identified an opportunity, you need to analyse it. To analyse an opportunity, you must:

- Focus on the idea
- Focus on the market of the idea
- Talk to industry leaders in the same space as the idea
- Talk to players in the same space as the idea

## Tips

- Remember, opportunities are situational.
- Look for a proven track record.
- Avoid the latest craze.
- Love your idea.

## 9.5.6 Entrepreneurship Support Eco-System

An entrepreneur is a person who:

- Does not work for an employee
- Runs a small enterprise
- Assumes all the risks and rewards of the enterprise, idea, good or service

### Types of Entrepreneurs

There are four main types of entrepreneurs:

1. **The Traditional Entrepreneur:** This type of entrepreneur usually has some kind of skill – they can be a carpenter, mechanic, cook etc. They have businesses that have been around for numerous years like restaurants, shops and carpenters. Typically, they gain plenty of experience in a particular industry before they begin their own business in a similar field.
2. **The Growth Potential Entrepreneur:** The desire of this type of entrepreneur is to start an enterprise that will grow, win many customers and make lots of money. Their ultimate aim is to eventually sell their enterprise for a nice profit. Such entrepreneurs usually have a science or technical background.
3. **The Project-Oriented Entrepreneur:** This type of entrepreneur generally has a background in the Arts or psychology. Their enterprises tend to be focus on something that they are very passionate about.
4. **The Lifestyle Entrepreneur:** This type of entrepreneur has usually worked as a teacher or a secretary. They are more interested in selling something that people will enjoy, rather than making lots of money.

### Characteristics of an Entrepreneur

Successful entrepreneurs have the following characteristics:

- They are highly motivated
- They are creative and persuasive
- They are mentally prepared to handle each and every task
- They have excellent business skills – they know how to evaluate their cash flow, sales and revenue

- They are willing to take great risks
- They are very proactive – this means they are willing to do the work themselves, rather than wait for someone else to do it
- They have a vision – they are able to see the big picture
- They are flexible and open-minded
- They are good at making decisions

### 9.5.6.1 Entrepreneur Success Stories

#### Dhiru Bhai Ambani

Dhirubhai Ambani began his entrepreneurial career by selling “bhajias” to pilgrims in Mount Girnar on weekends. At 16, he moved to Yemen where he worked as a gas-station attendant, and as a clerk in an oil company. He returned to India with Rs. 50,000 and started a textile trading company. Reliance went on to become the first Indian company to raise money in global markets and the first Indian company to feature in Forbes 500 list.

#### Dr. Karsanbhai Patel

Karsanbhai Patel made detergent powder in the backyard of his house. He sold his product door-to door and offered a money back guarantee with every pack that was sold. He charged Rs.3 per kg when the cheapest detergent at that time was Rs.13 per kg. Dr. Patel eventually started Nirma which became a whole new segment in the Indian domestic detergent market.

### 9.5.6.2 The Entrepreneurial Process

Let’s take a look at the stages of the entrepreneurial process.

- **Stage 1:** Idea Generation. The entrepreneurial process begins with an idea that has been thought of by the entrepreneur. The idea is a problem that has the potential to be solved.
- **Stage 2:** Germination or Recognition. In this stage a possible solution to the identified problem is thought of.
- **Stage 3:** Preparation or Rationalization. The problem is studied further and research is done to find out how others have tried to solve the same problem.
- **Stage 4:** Incubation or Fantasizing. This stage involves creative thinking for the purpose of coming up with more ideas. Less thought is given to the problem areas.
- **Stage 5:** Feasibility Study: The next step is the creation of a feasibility study to determine if the idea will make a profit and if it should be seen through.
- **Stage 6:** Illumination or Realization. This is when all uncertain areas suddenly become clear. The entrepreneur feels confident that his idea has merit.
- **Stage 7:** Verification or Validation. In this final stage, the idea is verified to see if it works and if it is useful.

Take a look at the diagram below to get a better idea of this process.

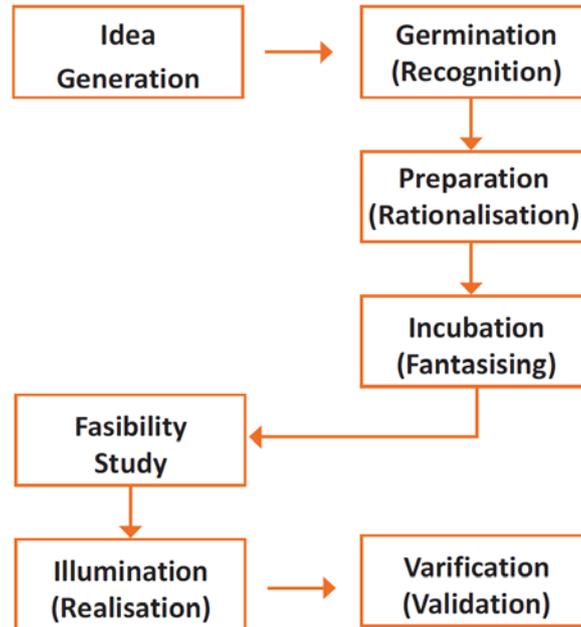


Fig.7.5.2: Stages of the entrepreneurial process

### 9.5.6.3 What is an Entrepreneur?

The entrepreneurship support ecosystem signifies the collective and complete nature of entrepreneurship. New companies emerge and flourish not only because of the courageous, visionary entrepreneurs who launch them, but they thrive as they are set in an environment or 'ecosystem' made of private and public participants. These players nurture and sustain the new ventures, facilitating the entrepreneurs' efforts. An entrepreneurship ecosystem comprises of the following six domains:

1. **Favourable Culture:** This includes elements such as tolerance of risk and errors, valuable networking and positive social standing of the entrepreneur.
2. **Facilitating Policies & Leadership:** This includes regulatory framework incentives and existence of public research institutes.
3. **Financing Options:** Angel financing, venture capitalists and micro loans would be good examples of this.
4. **Human Capital:** This refers to trained and untrained labour, entrepreneurs and entrepreneurship training programmes, etc.
5. **Conducive Markets for Products & Services:** This refers to an existence or scope of existence of a market for the product/service.
6. **Institutional & Infrastructural Support:** This includes legal and financing advisers, telecommunications, digital and transportation infrastructure, and entrepreneurship networking programmes.

These domains indicate whether there is a strong entrepreneurship support ecosystem and what actions should the government put in place to further encourage this ecosystem.

The six domains and their various elements have been graphically depicted.

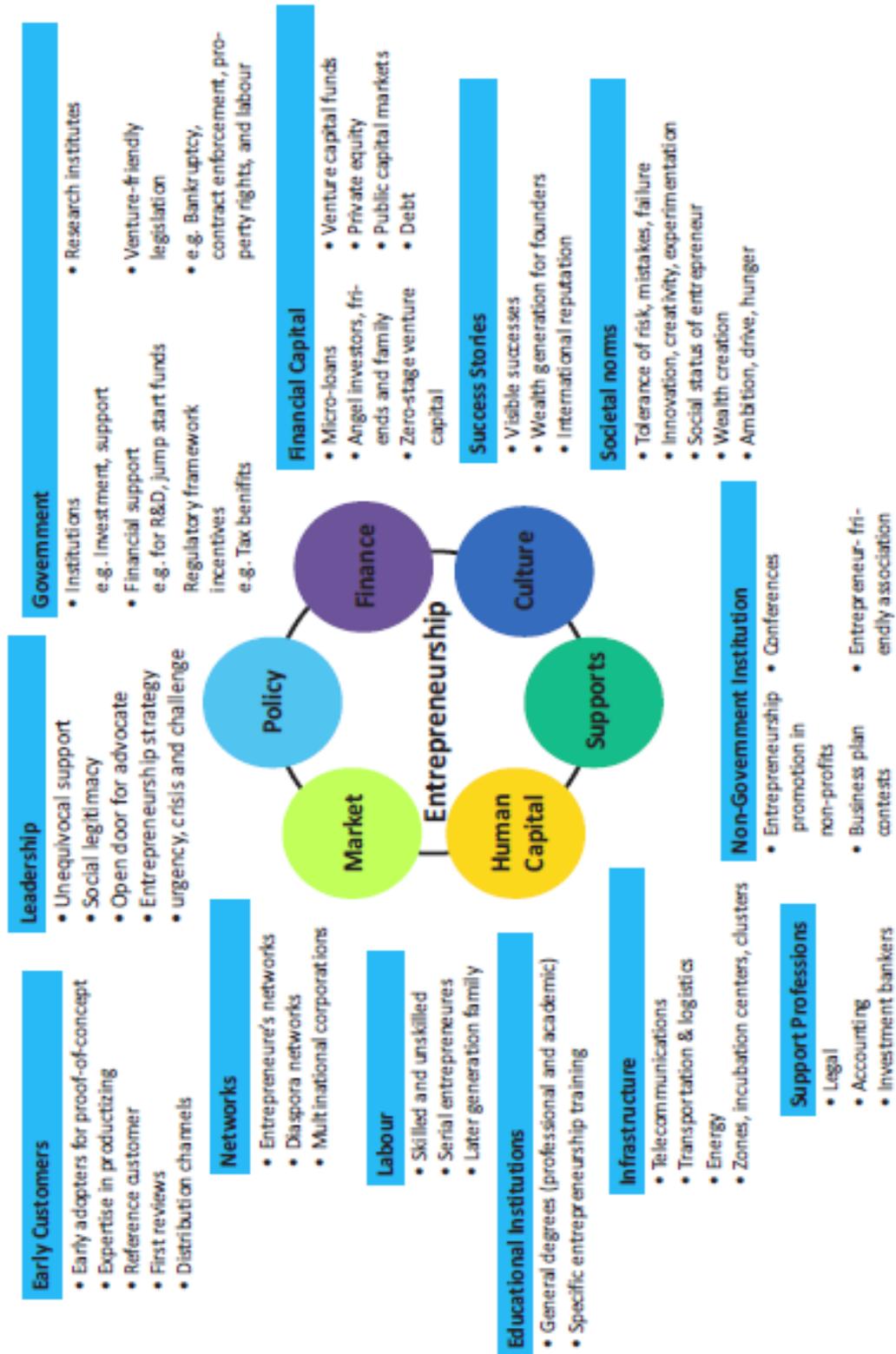


Fig.9.5.3. Entrepreneurship at a Glance

Every entrepreneurship support ecosystem is unique and all the elements of the ecosystem are interdependent. Although every region's entrepreneurship ecosystem can be broadly described by the above features, each ecosystem is the result of the hundred elements interacting in highly complex and particular ways.

Entrepreneurship ecosystems eventually become (largely) self-sustaining. When the six domains are resilient enough, they are mutually beneficial. At this point, government involvement can and should be significantly minimized. Public leaders do not need to invest a lot to sustain the ecosystem. It is imperative that the entrepreneurship ecosystem incentives are formulated to be self-liquidating, hence focusing on sustain ability of the environment.

#### 9.5.6.4 Government's Role in the Entrepreneurship Ecosystem

Encouraging new ventures is a major focus for policymakers. Governments across the world are recognizing that new businesses flourish in distinctive types of supportive environments. Policymakers should study the scenario and take into account the following points whilst they formulate policies and regulations that enable successful entrepreneurship support ecosystems.

- Policymakers should avoid regulations that discourage new entrants and work towards building efficient methods for business startups. Policies and regulations which help existing, leading firms over entrepreneurial ventures, limit competition and obstruct growth/formation of new companies.
- Therefore, in place of developing policies that are intended to improve market failures, policymakers should interact with entrepreneurs and understand the challenges faced by them. The feedback is used to develop policies which encourage exploring ideas, developing new products and increase the rates of deal flow.
- Entrepreneurial supporters ideally need to create a database that enables identifying who the members in the ecosystem are and how they are connected. The ecosystem database are useful tools in developing engagement strategies.
- Disruptions are inevitable in economic as well as social life. However, it's important to note that economic disruption gives rise to entrepreneurial opportunities. Architects of the entrepreneurship ecosystems (entrepreneurs, mentors, policymakers and consumers,) should anticipate these dips, thus capitalizing on the opportunities they create.

#### 9.5.6.5 Snapshot of the Entrepreneurship Ecosystem in India

Entrepreneurship has earned a newfound respect in India. Many Indians, with exposure to the world of business, who traditionally would have opted for a job, are setting up their own ventures. Many elements of the entrepreneurship ecosystem are beginning to come together. For example, increase in venture capitalists, government schemes and incubators, academia industry linkages, and emerging clusters and support to rural economy.

All these initiatives are effective but there is a need to scale up and enrich the ecosystem further in the following ways:

1. We need to review our attitude towards failures and accept them as learning experiences.
2. We must encourage the educated to become entrepreneurs and provide students in schools and colleges with entrepreneurship skills.
3. Universities, research labs and the government need to play the role of enablers in the entrepreneurship support ecosystem.
4. Policymakers need to focus on reducing the obstacles such as corruption, red tape and bureaucracy.
5. We need to improve our legal systems and court international venture capital firms and bring them to India.
6. We must devise policies and methods to reach the secondary and tertiary towns in India, where people do not have access to the same resources available in the cities.

Today, there is a huge opportunity in this country to introduce innovative solutions that are capable of scaling up, and collaborating within the ecosystem as well as enriching it.

### 9.5.6.6 Make in India Campaign

Every entrepreneur has certain needs. Some of their important needs are:

- To easily get loans
- To easily find investors
- To get tax exemptions
- To easily access resources and good infrastructure
- To enjoy a procedure that is free of hassles and is quick
- To be able to easily partner with other firms

The Make in India campaign, launched by Prime Minister Modi aims to satisfy all these needs of young, aspiring entrepreneurs. Its objective is to:

- Make investment easy
- Support new ideas
- Enhance skill development
- Safeguard the ideas of entrepreneurs
- Create state-of-the-art facilities for manufacturing goods

### Tips

- Research the existing market, network with other entrepreneurs, venture capitalists, angel investors, and thoroughly review the policies in place to enable your entrepreneurship.
- Failure is a stepping stone and not the end of the road. Review yours and your peers' errors and correct them in your future venture.
- Be proactive in your ecosystem. Identify the key features of your ecosystem and enrich them to ensure self-sustainability of your entrepreneurship support ecosystem.

## 9.5.7 Risk Appetite & Resilience

### Entrepreneurship and Risk

Entrepreneurs are inherently risk takers. They are path-makers not path-takers. Unlike a normal, cautious person, an entrepreneur would not think twice about quitting his job (his sole income) and taking a risk on himself and his idea.

An entrepreneur is aware that while pursuing his dreams, assumptions can be proven wrong and unforeseen events may arise. He knows that after dealing with numerous problems, success is still not guaranteed. Entrepreneurship is synonymous with the ability to take risks. This ability, called risk-appetite, is an entrepreneurial trait that is partly genetic and partly acquired.

### What is Risk Appetite?

Risk appetite is defined as the extent to which a company is equipped to take risk, in order to achieve its objectives. Essentially, it refers to the balance, struck by the company, between possible profits and the hazards caused by changes in the environment (economic ecosystem, policies, etc.). Taking on more risk may lead to higher rewards but have a high probability of losses as well. However, being too conservative may go against the company as it can miss out on good opportunities to grow and reach their objectives.

The levels of risk appetite can be broadly categorized as “low”, “medium” and “high.” The company’s entrepreneur(s) need to assess all possible alternatives and choose the option most likely to succeed. Companies have varying levels of risk appetites for different objectives. The levels depend on:

- The type of industry
- Market pressures
- Company objectives

For example, a start-up with a revolutionary concept will have a very high risk appetite. The start-up can afford short term failures before it achieves longer term success. This type of appetite will not remain constant and will be adjusted to account for the present circumstances of the company.

### Risk Appetite Statement

Companies have to define and articulate their risk appetite in sync with decisions made about their objectives and opportunities. The point of having a risk appetite statement is to have a framework that clearly states the acceptance and management of risk in business. It sets risk taking limits within the company. The risk appetite statement should convey the following:

- The nature of risks the business faces.
- Which risks the company is comfortable taking on and which risks are unacceptable.
- How much risk to accept in all the risk categories.
- The desired trade-off between risk and reward.
- Measures of risk and methods of examining and regulating risk exposures.

## Entrepreneurship and Resilience

Entrepreneurs are characterized by a set of qualities known as resilience. These qualities play an especially large role in the early stages of developing an enterprise. Risk resilience is an extremely valuable characteristic as it is believed to protect entrepreneurs against the threat of challenges and changes in the business environment.

### What is Entrepreneurial Resilience?

Resilience is used to describe individuals who have the ability to overcome setbacks related to their life and career aspirations. A resilient person is someone who is capable of easily and quickly recovering from setbacks. For the entrepreneur, resilience is a critical trait. Entrepreneurial resilience can be enhanced in the following ways:

- By developing a professional network of coaches and mentors
- By accepting that change is a part of life
- By viewing obstacles as something that can be overcome

### Characteristics of a Resilient Entrepreneur

The characteristics required to make an entrepreneur resilient enough to go the whole way in their business enterprise are:

- A strong internal sense of control
- Ability to diversify and expand
- Strong social connections
- Survivor attitude
- Skill to learn from setbacks
- Cash-flow conscious habits
- Ability to look at the bigger picture
- Attention to detail

## Tips

- Cultivate a great network of clients, suppliers, peers, friends and family. This will not only help you promote your business, but will also help you learn, identify new opportunities and stay tuned to changes in the market.
- Don't dwell on setbacks. Focus on what you need to do next to get moving again.
- While you should try, and curtail expenses, ensure that it is not at the cost of your growth.

## 9.5.8 Success & Failures

### Understanding Successes and Failures in Entrepreneurship

Shyam is a famous entrepreneur, known for his success story. But what most people don't know, is that Shyam failed numerous times before his enterprise became a success. Read his interview to get an idea of what entrepreneurship is really about, straight from an entrepreneur who has both, failed and succeeded.

**Interviewer:** Shyam, I have heard that entrepreneurs are great risk-takers who are never afraid of failing. Is this true?

**Shyam:** Ha ha, no of course it's not true! Most people believe that entrepreneurs need to be fearlessly enthusiastic. But the truth is, fear is a very normal and valid human reaction, especially when you are planning to start your own business! In fact, my biggest fear was the fear of failing. The reality is, entrepreneurs fail as much as they succeed. The trick is to not allow the fear of failing to stop you from going ahead with your plans. Remember, failures are lessons for future success!

**Interviewer:** What, according to you, is the reason that entrepreneurs fail?

**Shyam:** Well, there is no one single reason why entrepreneurs fail. An entrepreneur can fail due to numerous reasons. You could fail because you have allowed your fear of failure to defeat you. You could fail because you are unwilling to delegate (distribute) work. As the saying goes, "You can do anything, but not everything!" You could fail because you gave up too easily – maybe you were not persistent enough. You could fail because you were focusing your energy on small, insignificant tasks and ignoring the tasks that were most important. Other reasons for failing are partnering with the wrong people, not being able to sell your product to the right customers at the right time at the right price... and many more reasons!

**Interviewer:** As an entrepreneur, how do you feel failure should be looked at?

**Shyam:** I believe we should all look at failure as an asset, rather than as something negative. The way I see it, if you have an idea, you should try to make it work, even if there is a chance that you will fail. That's because not trying is failure right there, anyway! And failure is not the worst thing that can happen. I think having regrets because of not trying, and wondering 'what if' is far worse than trying and actually failing.

**Interviewer:** How did you feel when you failed for the first time?

**Shyam:** I was completely heartbroken! It was a very painful experience. But the good news is, you do recover from the failure. And with every subsequent failure, the recovery process gets a lot easier. That's because you start to see each failure more as a lesson that will eventually help you succeed, rather than as an obstacle that you cannot overcome. You will start to realize that failure has many benefits.

**Interviewer:** Can you tell us about some of the benefits of failing?

**Shyam:** One of the benefits that I have experienced personally from failing is that the failure made me see things in a new light. It gave me answers that I didn't have before. Failure can make you a lot stronger. It also helps keep your ego in control.

**Interviewer:** What advice would you give entrepreneurs who are about to start their own enterprises?

**Shyam:** I would tell them to do their research and ensure that their product is something that is actually wanted by customers. I'd tell them to pick their partners and employees very wisely and cautiously. I'd tell them that it's very important to be aggressive – push and market your product as aggressively as possible. I would warn them that starting an enterprise is very expensive and that they should be prepared for a situation where they run out of money. I would tell them to create long term goals and put a plan in action to achieve that goal. I would tell them to build a product that is truly unique. Be very careful and ensure that you are not copying another start-up. Lastly, I'd tell them that it's very important that they find the right investors.

**Interviewer:** That's some really helpful advice, Shyam! I'm sure this will help all entrepreneurs to be more prepared before they begin their journey! Thank you for all your insight!

### Tips

- Remember that nothing is impossible.
- Identify your mission and your purpose before you start.
- Plan your next steps – don't make decisions hastily.

## UNIT 9.6: Preparing to be an Entrepreneur

### Unit Objectives

**At the end of this unit, you will be able to:**

1. Discuss how market research is carried out
2. Describe the 4 Ps of marketing
3. Discuss the importance of idea generation
4. Recall basic business terminology
5. Discuss the need for CRM
6. Discuss the benefits of CRM
7. Discuss the need for networking
8. Discuss the benefits of networking
9. Discuss the importance of setting goals
10. Differentiate between short-term, medium-term and long-term goals
11. Discuss how to write a business plan
12. Explain the financial planning process
13. Discuss ways to manage your risk
14. Describe the procedure and formalities for applying for bank finance
15. Discuss how to manage your own enterprise
16. List important questions that every entrepreneur should ask before starting an enterprise

### 9.6.1 Market Study/The 4 Ps of Marketing/Importance of an IDEA

#### Understanding Market Research

Market research is the process of gathering, analysing and interpreting market information on a product or service that is being sold in that market. It also includes information on:

- Past, present and prospective customers
- Customer characteristics and spending habits
- The location and needs of the target market
- The overall industry
- Relevant competitors

Market research involves two types of data:

- **Primary information.** This is research collected by yourself or by someone hired by you.
- **Secondary information.** This is research that already exists and is out there for you to find and use.

**Primary research**

Primary research can be of two types:

- **Exploratory:** This is open-ended and usually involves detailed, unstructured interviews.
- **Specific:** This is precise and involves structured, formal interviews. Conducting specific

**Secondary research**

Secondary research uses outside information. Some common secondary sources are:

- **Public sources:** These are usually free and have a lot of good information. Examples are government departments, business departments of public libraries etc.
- **Commercial sources:** These offer valuable information but usually require a fee to be paid. Examples are research and trade associations, banks and other financial institutions etc.
- **Educational institutions:** These offer a wealth of information. Examples are colleges, universities, technical institutes etc.

**9.6.1.1 The 4 Ps of Marketing**

The 4 Ps of marketing are Product, Price, Promotion and Place.

Let's look at each of these 4 Ps in detail.

**Product**

A product can be tangible, like a good or intangible, like a service.

Whatever your product is, it is critical that you have a clear understanding of what you are offering, and what its unique characteristics are, before you begin with the marketing process.

Some questions to ask yourself are:

- What need does the customer have for the product/service?
- What needs does it satisfy?
- Are there any more features that can be added?
- Does it have any expensive and unnecessary features?
- How will customers use it?
- What should it be called?
- How is it different from similar products?
- How much will it cost to produce?
- Can it be sold at a profit?

**Price**

Once all the elements of Product have been established, the Price factor needs to be considered. The Price of a Product will depend on several factors such as profit margins, supply, demand and the marketing strategy.

Some typical questions to ask yourself include:

- What is the value of the product/service to customers?
- Do local products/services have established price points?
- Is the customer price sensitive?
- Should discounts be offered?
- How is your price compared to that of your competitors?

### **Promotion**

Once you are certain about your Product and your Price, the next step is to look at ways to promote it. Some key elements of promotion are advertising, public relations, social media marketing, email marketing, search engine marketing, video marketing and more.

Some questions to ask yourself are:

- Where should you promote your product or service?
- What is the best medium to use to reach your target audience?
- When would be the best time to promote your product?
- How are your competitors promoting their products?

### **Place**

According to most marketers, the basis of marketing is about offering the right product, at the right price, at the right place, at the right time. For this reason, selecting the best possible location is critical for converting prospective clients into actual clients.

Some questions to ask yourself are:

- Will your product or service be looked for in a physical store, online or both?
- What should you do to access the most appropriate distribution channels?
- Will you require a sales force?
- Where are your competitors offering their products or services?
- Should you follow in your competitors' footsteps?
- Should you do something different from your competitors?

### **Importance of an IDEA**

Ideas are the foundation of progress. An idea can be small or ground-breaking, easy to accomplish or extremely complicated to implement. Whatever the case, the fact that it is an idea gives it merit. Without ideas, nothing is possible. Most people are afraid to speak out their ideas, out for fear of being ridiculed. However, if you are an entrepreneur and want to remain competitive and innovative, you need to bring your ideas out into the light.

Some ways to do this are by:

- Establishing a culture of brainstorming where you invite all interested parties to contribute
- Discussing ideas out loud so that people can add their ideas, views, opinions to them

- Being open minded and not limiting your ideas, even if the idea who have seems ridiculous
- Not discarding ideas that you don't work on immediately, but instead making a note of them and shelving them so they can be revisited at a later date.

### Tips

- Keep in mind that good ideas do not always have to be unique.
- Remember that timing plays a huge role in determining the success of your idea.
- Situations and circumstances will always change, so be flexible and adapt your idea accordingly.

## 9.6.2 Business Entity Concepts: Basic Business Terminology

If your aim is to start and run a business, it is crucial that you have a good understanding of basic business terms. Every entrepreneur should be well versed in the following terms:

- **Accounting:** A systematic method of recording and reporting financial transactions.
- **Accounts payable:** Money owed by a company to its creditors.
- **Accounts Receivable:** The amount a company is owed by its clients.
- **Assets:** The value of everything a company owns and uses to conduct its business.
- **Balance Sheet:** A snapshot of a company's assets, liabilities and owner's equity at a given moment.
- **Bottom Line:** The total amount a business has earned or lost at the end of a month.
- **Business:** An organization that operates with the aim of making a profit.
- **Business to Business (B2B):** A business that sells goods or services to another business.
- **Business to Consumer (B2C):** A business that sells goods or services directly to the end user.
- **Capital:** The money a business has in its accounts, assets and investments. The two main types of capital are debt and equity.
- **Cash Flow:** The overall movement of funds through a business each month, including income and expenses.
- **Cash Flow Statement:** A statement showing the money that entered and exited a business during a specific period of time.
- **Contract:** A formal agreement to do work for pay.
- **Depreciation:** The degrading value of an asset over time.
- **Expense:** The costs that a business incurs through its operations.
- **Finance:** The management and allocation of money and other assets.
- **Financial Report:** A comprehensive account of a business' transactions and expenses.
- **Fixed Cost:** A one-time expense.

- **Income Statement (Profit and Loss Statement):** Shows the profitability of a business during a period of time.
- **Liabilities:** The value of what a business owes to someone else.
- **Marketing:** The process of promoting, selling and distributing a product or service.
- **Net Income/Profit:** Revenues minus expenses.
- **Net Worth:** The total value of a business.
- **Payback Period:** The amount of time it takes to recover the initial investment of a business.
- **Profit Margin:** The ratio of profit, divided by revenue, displayed as a percentage.
- **Return on Investment (ROI):** The amount of money a business gets as return from an investment.
- **Revenue:** The total amount of income before expenses are subtracted.
- **Sales Prospect:** A potential customer.
- **Supplier:** A provider of supplies to a business.
- **Target Market:** A specific group of customers at which a company's products and services are aimed.
- **Valuation:** An estimate of the overall worth of the business.
- **Variable Cost:** Expenses that change in proportion to the activity of a business.
- **Working Capital:** Calculated as current assets minus current liabilities.

### 9.6.3 CRM & Networking

#### What is CRM?

CRM stands for Customer Relationship Management. Originally the expression Customer Relationship Management meant managing one's relationship with customers. However, today it refers to IT systems and software designed to help companies manage their relationships.

#### The Need for CRM

The better a company can manage its relationships with its customers, the higher the chances of the company's success. For any entrepreneur, the ability to successfully retain existing customers and expand the enterprise is paramount. This is why IT systems that focus on addressing the problems of dealing with customers on a daily basis are becoming more and more in demand.

Customer needs change over time, and technology can make it easier to understand what customers really want. This insight helps companies to be more responsive to the needs of their customers. It enables them to modify their business operations when required, so that their customers are always served in the best manner possible. Simply put, CRM helps companies recognize the value of their clients and enables them to capitalize on improved customer relations.

### Benefits of CRM

CRM has a number of important benefits:

- It helps improve relations with existing customers which can lead to:
  - Increased sales
  - Identification of customer needs
  - Cross-selling of products
- It results in better marketing of one's products or services
- It results in better marketing of one's products or services
- It enhances customer satisfaction and retention
- It improves profitability by identifying and focusing on the most profitable customers

### 9.6.3.1 What is Networking?

In business, networking means leveraging your business and personal connections in order to bring in a regular supply of new business. This marketing method is effective as well as low cost. It is a great way to develop sales opportunities and contacts. Networking can be based on referrals and introductions, or can take place via phone, email, and social and business networking websites.

#### The Need for Networking

Networking is an essential personal skill for business people, but it is even more important for entrepreneurs. The process of networking has its roots in relationship building. Networking results in greater communication and a stronger presence in the entrepreneurial ecosystem. This helps build strong relationships with other entrepreneurs.

Business networking events held across the globe play a huge role in connecting like-minded entrepreneurs who share the same fundamental beliefs in communication, exchanging ideas and converting ideas into realities. Such networking events also play a crucial role in connecting entrepreneurs with potential investors. Entrepreneurs may have vastly different experiences and backgrounds but they all have a common goal in mind – they all seek connection, inspiration, advice, opportunities and mentors. Networking offers them a platform to do just that.

#### Benefits of Networking

Networking offers numerous benefits for entrepreneurs. Some of the major benefits are:

- Getting high quality leads
- Increased business opportunities
- Good source of relevant connections
- Advice from like-minded entrepreneurs
- Gaining visibility and raising your profile
- Meeting positive and enthusiastic people

- Increased self-confidence
- Satisfaction from helping others
- Building strong and lasting friendships

### Tips



- Use social media interactions to identify needs and gather feedback.
- When networking, ask open-ended questions rather than yes/no type questions.

## 9.6.4 Business Plan: Why Set Goals?

Setting goals is important because it gives you long-term vision and short-term motivation. Goals can be short term, medium term and long term.

### Short-Term Goals

- These are specific goals for the immediate future.

**Example:** Repairing a machine that has failed.

### Medium-Term Goals

- These goals are built on your short-term goals.
- They do not need to be as specific as your short-term goals.

**Example:** Arranging for a service contract to ensure that your machines don't fail again.

### Long-Term Goals

These goals require time and planning.

They usually take a year or more to achieve.

**Example:** Planning your expenses so you can buy new machinery

### Why Create a Business Plan?

A business plan is a tool for understanding how your business is put together. It can be used to monitor progress, foster accountability and control the fate of the business. It usually offers a 3-5-year projection and outlines the plan that the company intends to follow to grow its revenues. A business plan is also a very important tool for getting the interest of key employees or future investors.

A business plan typically comprises of eight elements.

### 9.6.4.1 Elements of a Business Plan

#### Executive Summary

The executive summary follows the title page. The summary should clearly state your desires as the business owner in a short and business like way. It is an overview of your business and your plans. Ideally this should not be more than 1-2 pages.

Your Executive Summary should include:

- **The Mission Statement:** Explain what your business is all about.

**Example: Nike's Mission Statement**

Nike's mission statement is "To bring inspiration and innovation to every athlete in the world."

- **Company Information:** Provide information like when your business was formed, the names and roles of the founders, the number of employees, your business location(s) etc.
- **Growth Highlights:** Mention examples of company growth. Use graphs and charts where possible.
- **Your Products/Services:** Describe the products or services provided.
- **Financial Information:** Provide details on current bank and investors.
- **Summarize future plans:** Describe where you see your business in the future.

#### Business Description

The second section of your business plan needs to provide a detailed review of the different elements of your business. This will help potential investors to correctly understand your business goal and the uniqueness of your offering.

Your Business Description should include:

- A description of the nature of your business
- The market needs that you are aiming to satisfy
- The ways in which your products and services meet these needs
- The specific consumers and organizations that you intend to serve
- Your specific competitive advantages

#### Market Analysis

The market analysis section usually follows the business description. The aim of this section is to showcase your industry and market knowledge. This is also the section where you should lay down your research findings and conclusions.

Your Market Analysis should include:

- Your industry description and outlook
- Information on your target market
- The needs and demographics of your target audience
- The size of your target market

- The amount of market share you want to capture
- Your pricing structure
- Your competitive analysis
- Any regulatory requirements

### **Organization & Management**

This section should come immediately after the Market Analysis. Your Organization & Management section should include:

- Your company's organizational structure
- Details of your company's ownership
- Details of your management team
- Qualifications of your board of directors
- Detailed descriptions of each division/department and its function
- The salary and benefits package that you offer your people

### **Service or Product Line**

The next section is the service or product line section. This is where you describe your service or product, and stress on their benefits to potential and current customers. Explain in detail why your product of choice will fulfil the needs of your target audience.

Your Service or Product Line section should include:

- A description of your product/service
- A description of your product or service's life cycle
- A list of any copyright or patent filings
- A description of any R&D activities that you are involved in or planning

### **Marketing & Sales**

Once the Service or Product Line section of your plan has been completed, you should start on the description of the marketing and sales management strategy for your business.

Your Marketing section should include the following strategies:

- **Market penetration strategy:** This strategy focuses on selling your existing products or services in existing markets, in order to increase your market share.
- **Growth strategy:** This strategy focuses on increasing the amount of market share, even if it reduces earnings in the short-term.
- **Channels of distribution strategy:** These can be wholesalers, retailers, distributors and even the internet.
- **Communication strategy:** These can be written strategies (e-mail, text, chat), oral strategies (phone calls, video chats, face-to-face conversations), non-verbal strategies (body language, facial expressions, tone of voice) and visual strategies (signs, webpages, illustrations).

Your Sales section should include the following information:

- **A salesforce strategy:** This strategy focuses on increasing the revenue of the enterprise.
- **A breakdown of your sales activities:** This means detailing out how you intend to sell your products or services – will you sell it offline or online, how many units do you intend to sell, what price do you plan to sell each unit at, etc.

### Funding Request

This section is specifically for those who require funding for their venture. The Funding Request section should include the following information:

- How much funding you currently require.
- How much funding you will require over the next five years. This will depend on your long-term goals.
- The type of funding you want and how you plan to use it. Do you want funding that can be used only for a specific purpose, or funding that can be used for any kind of requirement?
- Strategic plans for the future. This will involve detailing out your long-term plans – what these plans are and how much money you will require to put these plans in motions.
- Historical and prospective financial information. This can be done by creating and maintaining all your financial records, right from the moment your enterprise started, to the present day. Documents required for this are your balance sheet which contains details of your company's assets and liabilities, your income statement which lists your company's revenues, expenses and net income for the year, your tax returns (usually for the last three years) and your cash flow budget which lists the cash that came in, the cash that went out and states whether you had a cash deficit (negative balance) or surplus (positive balance) at the end of each month.

### Financial Planning

Before you begin building your enterprise, you need to plan your finances. Take a look at the steps for financial planning:

- **Step 1:** Create a financial plan. This should include your goals, strategies and timelines for accomplishing these goals.
- **Step 2:** Organize all your important financial documents. Maintain a file to hold your investment details, bank statements, tax papers, credit card bills, insurance papers and any other financial records.
- **Step 3:** Calculate your net worth. This means figure out what you own (assets like your house, bank accounts, investments etc.), and then subtract what you owe (liabilities like loans, pending credit card amounts etc.) the amount you are left with is your net worth.
- **Step 4:** Make a spending plan. This means write down in detail where your money will come from, and where it will go.
- **Step 5:** Build an emergency fund. A good emergency fund contains enough money to cover at least 6 months' worth of expenses.
- **Step 6:** Set up your insurance. Insurance provides long term financial security and protects you against risk.

### Risk Management

As an entrepreneur, it is critical that you evaluate the risks involved with the type of enterprise that you want to start, before you begin setting up your company. Once you have identified potential risks, you can take steps to reduce them. Some ways to manage risks are:

- Research similar business and find out about their risks and how they were minimized.
- Evaluate current market trends and find out if similar products or services that launched a while ago are still being well received by the public.
- Think about whether you really have the required expertise to launch your product or service.
- Examine your finances and see if you have enough income to start your enterprise.
- Be aware of the current state of the economy, consider how the economy may change over time, and think about how your enterprise will be affected by any of those changes.
- Create a detailed business plan.

### Tips

- Ensure all the important elements are covered in your plan.
- Scrutinize the numbers thoroughly.
- Be concise and realistic.
- Be conservative in your approach and your projections.
- Use visuals like charts, graphs and images wherever possible.

## 9.6.5 Procedure and Formalities for Bank Finance

### The Need for Bank Finance

For entrepreneurs, one of the most difficult challenges faced involves securing funds for start-ups. With numerous funding options available, entrepreneurs need to take a close look at which funding methodology works best for them. In India, banks are one of the largest funders of start-ups, offering funding to thousands of start-ups every year.

### 9.6.5.1 What Information Should Entrepreneurs Offer Banks for Funding?

When approaching a bank, entrepreneurs must have a clear idea of the different criteria that banks use to screen, rate and process loan applications. Entrepreneurs must also be aware of the importance of providing banks with accurate and correct information. It is now easier than ever for financial institutions to track any default behaviour of loan applicants. Entrepreneurs looking for funding from banks must provide banks with information relating to their general credentials, financial situation and guarantees or collaterals that can be offered.

### General Credentials

This is where you, as an entrepreneur, provide the bank with background information on yourself. Such information includes:

- **Letter(s) of Introduction:** This letter should be written by a respected business person who knows you well enough to introduce you. The aim of this letter is set across your achievements and vouch for your character and integrity.
- **Your Profile:** This is basically your resume. You need to give the bank a good idea of your educational achievements, professional training, qualifications, employment record and achievements.
- **Business Brochure:** A business brochure typically provides information on company products, clients, how long the business has been running for etc.
- **Bank and Other References:** If you have an account with another bank, providing those bank references is a good idea.
- **Proof of Company Ownership or Registration:** In some cases, you may need to provide the bank with proof of company ownership and registration. A list of assets and liabilities may also be required.

### Financial Situation

Banks will expect current financial information on your enterprise. The standard financial reports you should be prepared with are:

- Balance Sheet
- Cash-Flow Statement
- Business Plan
- Profit-and-Loss Account
- Projected Sales and Revenues
- Feasibility Study

### Guarantees or Collaterals

Usually banks will refuse to grant you a loan without security. You can offer assets which the bank can seize and sell off if you do not repay the loan. Fixed assets like machinery, equipment, vehicles etc. are also considered to be security for loans.

## 9.6.5.2 The Lending Criteria of Banks

Your request for funding will have a higher chance of success if you can satisfy the following lending criteria:

- Good cash flow
- Adequate shareholders' funds
- Adequate security
- Experience in business
- Good reputation

### The Procedure

To apply for funding the following procedure will need to be followed.

- Submit your application form and all other required documents to the bank.
- The bank will carefully assess your credit worthiness and assign ratings by analysing your business information with respect to parameters like management, financial, operational and industry information as well as past loan performance.
- The bank will make a decision as to whether or not you should be given funding.

### Tips



- Get advice on funding options from experienced bankers.
- Be cautious and avoid borrowing more than you need, for longer than you need, at an interest rate that is higher than you are comfortable with.

## 9.6.6 Enterprise Management - An Overview

To manage your enterprise effectively you need to look at many different aspects, right from managing the day-to-day activities to figuring out how to handle a large-scale event. Let's take a look at some simple steps to manage your company effectively.

### Step 1: Use your leadership skills and ask for advice when required.

Let's take the example of Ramu, an entrepreneur who has recently started his own enterprise. Ramu has good leadership skills – he is honest, communicates well, knows how to delegate work etc. These leadership skills definitely help Ramu in the management of his enterprise. However, sometimes Ramu comes across situations that he is unsure how to handle. What should Ramu do in this case? One solution is for him to find a more experienced manager who is willing to mentor him. Another solution is for Ramu to use his networking skills so that he can connect with managers from other organizations, who can give him advice on how to handle such situations.

### Step 2: Divide your work amongst others – realize that you cannot handle everything yourself.

Even the most skilled manager in the world will not be able to manage every single task that an enterprise will demand of him. A smart manager needs to realize that the key to managing his enterprise lies in his dividing all his work between those around him. This is known as delegation. However, delegating is not enough. A manager must delegate effectively if he wants to see results. This is important because delegating, when done incorrectly, can result in you creating even more work for yourself. To delegate effectively, you can start by making two lists. One list should contain the things that you know you need to handle yourself. The second list should contain the things that you are confident can be given to others to manage and handle.

Besides incorrect delegation, another issue that may arise is over-delegation. This means giving away too many of your tasks to others. The problem with this is, the more tasks you delegate, the more time you will spend tracking and monitoring the work progress of those you have handed the tasks to. This will leave you with very little time to finish your own work.

### **Step 3: Hire the right people for the job.**

Hiring the right people goes a long way towards effectively managing your enterprise. To hire the best people suited for the job, you need to be very careful with your interview process. You should ask potential candidates the right questions and evaluate their answers carefully. Carrying out background checks is always a good practice. Running a credit check is also a good idea, especially if the people you are planning to hire will be handling your money. Create a detailed job description for each role that you want filled and ensure that all candidates have a clear and correct understanding of the job description. You should also have an employee manual in place, where you put down every expectation that you have from your employees. All these actions will help ensure that the right people are approached for running your enterprise.

### **Step 4: Motivate your employees and train them well.**

Your enterprise can only be managed effectively if your employees are motivated to work hard for your enterprise. Part of being motivated involves your employees believing in the vision and mission of your enterprise and genuinely wanting to make efforts towards pursuing the same. You can motivate your employees with recognition, bonuses and rewards for achievements. You can also motivate them by telling them about how their efforts have led to the company's success. This will help them feel pride and give them a sense of responsibility that will increase their motivation. Besides motivating your people, your employees should be constantly trained in new practices and technologies. Remember, training is not a one-time effort. It is a consistent effort that needs to be carried out regularly.

### **Step 5: Train your people to handle your customers well.**

Your employees need to be well-versed in the art of customer management. This means they should be able to understand what their customers want, and also know how to satisfy their needs. For them to truly understand this, they need to see how you deal effectively with customers.

This is called leading by example. Show them how you sincerely listen to your clients and the efforts that you put into understand their requirements. Let them listen to the type of questions that you ask your clients so they understand which questions are appropriate.

### **Step 6: Market your enterprise effectively.**

Also, hire a marketing agency if you feel you need help in this area. Now that you know what is required to run your enterprise effectively, put these steps into play, and see how much easier managing your enterprise becomes!

**Tips**

- Get advice on funding options from experienced bankers.
- Be cautious and avoid borrowing more than you need, for longer than you need, at an interest rate that is higher than you are comfortable with.

**9.6.7 Considering Entrepreneurship**

Questions to ask yourself before considering entrepreneurship.

1. Why am I starting a business?
2. What problem am I solving?
3. Have others attempted to solve this problem before? Did they succeed or fail?
4. Do I have a mentor<sup>1</sup> or industry expert that I can call on?
5. Who is my ideal customer<sup>2</sup>?
6. Who are my competitors<sup>3</sup>?
7. What makes my business idea different from other business ideas?
8. What are the key features of my product or service?
9. Have I done a SWOT<sup>4</sup> analysis?
10. What is the size of the market that will buy my product or service?
11. What would it take to build a minimum viable product<sup>5</sup> to test the market?
12. How much money do I need to get started?
13. Will I need to get a loan?
14. How soon will my products or services be available?
15. When will I break even<sup>6</sup> or make a profit?
16. How will those who invest in my idea make a profit?
17. How should I set up the legal structure<sup>7</sup> of my business?
18. What taxes<sup>8</sup> will I need to pay?
19. What kind of insurance<sup>9</sup> will I need?
20. Have I reached out to potential customers for feedback

**Tips**

- It is very important to validate your business ideas before you invest significant time, money and resources into it.
- The more questions you ask yourself, the more prepared you will be to handle to highs and lows of starting an enterprise.

**Footnotes:**

1. A mentor is a trusted and experienced person who is willing to coach and guide you.
2. A customer is someone who buys goods and/or services.
3. A competitor is a person or company that sells products and/or services similar to your products and/or services.
4. SWOT stands for Strengths, Weaknesses, Opportunities and Threats. To conduct a SWOT analysis of your company, you need to list down all the strengths and weaknesses of your company, the opportunities that are present for your company and the threats faced by your company.
5. A minimum viable product is a product that has the fewest possible features, that can be sold to customers, for the purpose of getting feedback from customers on the product.
6. A company is said to break even when the profits of the company are equal to the costs.
7. The legal structure could be a sole proprietorship, partnership or limited liability partnership.
8. There are two types of taxes – direct taxes payable by a person or a company, or indirect taxes charged on goods and/or services.
9. There are two types of insurance – life insurance and general insurance. Life insurance covers human life while general insurance covers assets like animals, goods, cars etc.



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