Input and Output Devices

- **(1) Keyboard**
  - Keyboard (wired / wireless, virtual) is the most common input device used today. The individual keys for letters, numbers and special characters are collectively known as character keys. This keyboard layout is derived from the keyboard of original typewriter.
  - There are different set of keys available in the keyboard such as character keys, modifier keys, system and GUI keys, enter and editing keys, function keys, navigation keys, numeric keypad and lock keys.

- **(2) Mouse**
  - Mouse (wired/wireless) is a pointing device used to control the movement of the cursor on the display screen. It can be used to select icons, menus, command buttons or activate something on a computer. Some mouse actions are move, click, double click, right click, drag and drop.
  - Different types of mouse available are: Mechanical Mouse, Optical, Laser Mouse, Air Mouse, 3D Mouse, Tactile Mouse, Ergonomic Mouse and Gaming Mouse.

Mechanical Mouse

Optical Mouse

Laser Mouse

- **(3) Scanner**
  - Scanners are used to enter the information directly into the computer's memory. This device works like a Xerox machine. The scanner converts any type of printed or written information including photographs into a digital format, which can be manipulated by the computer.

- **4)Fingerprint Scanner:**
  - Finger print Scanner is a fingerprint recognition device used for computer security, equipped with the fingerprint recognition feature that uses biometric technology. Fingerprint Reader / Scanner is a very safe and convenient device for security instead of using passwords, which is vulnerable to fraud and is hard to remember.

- **(5) Track Ball**
  - Track ball is similar to the upside- down design of the mouse. The user moves the ball directly, while the device itself remains stationary. The user spins the ball in various directions to navigate the screen movements.

- **(6) Retinal Scanner**
  - This performs a retinal scan which is a biometric technique that uses unique patterns on a person's retinal blood vessels.

- **(7) Light Pen**
  - A light pen is a pointing device shaped like a pen and is connected to a monitor. The tip of the light pen contains a light-sensitive element which detects the light from the screen enabling the computer to identify the location of the pen on the screen.

- **(8) Optical Character Reader**
  - It is a device which detects characters printed or written on a paper with OCR, a user can scan a page from a book. The Computer will recognize the characters in the page as letters and punctuation marks and stores. The Scanned document can be edited using a wordprocessor.

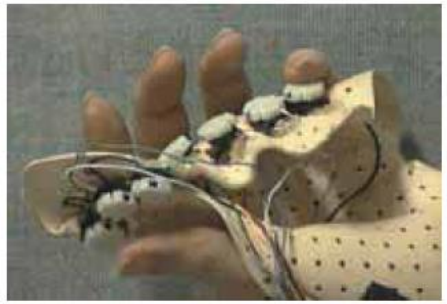
- **(9) Bar Code / QR Code Reader**
  - A Bar code is a pattern printed in lines of different thickness. The Bar code reader scans the information on the bar codes transmits to the Computer for further processing. The system gives fast and error free entry of information into the computer.
  - QR (Quick response) Code: The QR code is the two dimension bar code which can be read by a camera and processed to interpret the image

- **(10) Voice Input Systems**
  - Microphone serves as a voice Input device. It captures the voice data and send it to the Computer. Using the microphone along with speech recognition software can offer a completely new approach to input information into the Computer.

- **(11) Digital Camera**
  - It captures images / videos directly in the digital form. It uses a CCD (Charge CoupledDevice) electronic chip. When light falls on the chip through the lens, it converts light rays into digital format.

- **(12) Touch Screen**
  - A touch screen is a display device that allows the user to interact with a computer by using the finger. Touch screens are used on a wide variety of devices such as computers, laptops, monitors, smart phones, tablets, cash registers and information kiosks. Some touch screens use a grid of infrared beams to sense the presence of a finger instead of utilizing touch-sensitive input.

- **(13) Keyer**
  - A Keyer is a device for signaling by hand, by way of pressing one or more switches. Modern keyers have a large number of switches but not as many as a full size keyboard. Typically, this number is between 4 and 50. A keyer differs from a keyboard, which has "no board", but the keys are arranged in a cluster.



Input device	Application	Advantages	Disadvantages
Manual input devices			
Keyboard	(touch)		
Converts key strokes into binary digits. Carries out the commands of function keys such as 'End' and 'PgUp'	♦ Used to manually input text into the computer ♦ Used to type commands and instructions to computer systems	♦ Most common means of entering text ♦ Relatively inexpensive	♦ Continued use can cause repetitive strain injury ♦ Errors in transcription are common ♦ Speed of input depends on the user's experience
Mouse	(touch)		
Sends positional information to the computer, by clicking or scrolling of mouse buttons	♦ Acts as an interface between the user and the computer ♦ Used to issue commands directly to the computer	♦ Commands can be given directly to the computer (e.g. page down) ♦ Can activate commands by selecting icons directly	♦ Hand-to-eye coordination can be a problem ♦ Shifting between keyboard and mouse can be confusing

Input device	Application	Advantages	Disadvantages
Joystick	(touch)		
Similar to a vehicle gear shift, but with buttons for different commands	◆ Generally used in game playing	◆ Ideal for games such as car racing and combat	◆ User has to become skilled at the sensitive movement of the joystick
Touchscreen	(touch)		
Allows the user to press parts of the screen to activate different functions	◆ Are located in public places such as restaurants and shopping malls where transactions can be made and information given	◆ Easy way to input options and choices ◆ Can be used by children and the physically challenged who are unable to use other input devices	◆ A limited number of values can be displayed on one screen at a time ◆ More expensive than a standard monitor
Scanner	(light)		
Used to capture an image in hard-copy and create a digital copy of the image	◆ Conversion of hard-copy images to soft-copy can be used to import and export documents and images across different applications	◆ Relatively cheap and easy to install ◆ Depending on use, flatbed or handheld scanners can be chosen	◆ The quality of the image depends on the quality of the hard-copy, scanner and scanner software

Graphics tablet	(machine-readable)		
Used to input lines and shapes through pressure and movement of a stylus on the tablet	♦ Captures input like hand-created drawings and signatures ♦ Resulting images can be displayed on a monitor	♦ Allows artists to sketch detailed digital drawings more easily than by using a mouse ♦ Can be used to capture signatures as a biometric	♦ Requires some practice ♦ More expensive than a mouse
Voice-recognition system	(sound)		
Data that is input in audio form. The input is analysed for commands which are then processed	♦ Allows users to dictate text or give commands directly to the computer	♦ The user can speak normally for dictation	♦ Must be trained to recognise voice patterns ♦ Software cannot interpret all English meanings

Direct data entry devices			
Barcode reader	(light *or* laser)		
Barcodes are groups of bars of different widths and are found on almost every product you buy. The codes are read into the computer using a wand or a fixed scanner	◆ Different groups of bars represent different numbers. These numbers represent the product's country of origin, manufacture and item code	◆ Data can be input much faster than it takes to be keyed in ◆ Not easily damaged ◆ Can be printed using a normal printer and ink and so cheap to produce	◆ The order of the data stored cannot be changed easily
Electronic Point of Sale (EPOS)	(laser)		
Data collected from the barcodes is used to produce information and update the database	◆ Used to record transactions and track inventory	◆ Prices of products can be easily updated ◆ Items can be easily scanned	◆ Depends on a reliable Internet connectivity
Optical Character Recognition (OCR)	(light)		
Text and graphics are scanned as soft copy	◆ Can be used to input large blocks of typed text	◆ Can speed up the typing process	◆ Accuracy of the text can be poor

Input device	Application	Advantages	Disadvantages
Magnetic ink character recognition (MICR)	(magnetic)		
Data is printed as special characters using magnetic ink. This data is translated into text or values	◆ Used by banks to process cheques, by printing additional bank details (branch, account number)	◆ Is quick and highly efficient ◆ Both humans and machines can interpret the data ◆ Not easy to forge	◆ Has limited applications ◆ As the use of cheques becomes obsolete, its use is in decline
Optical Mark Recognition (OMR)	(light)		
Relies on the presence or absence of precisely positioned marks on a form being read by a special scanner. This data is then processed by the system	◆ Popular with lotteries and multiple-choice question sheets issued by examination boards	◆ Data input is very fast and accurate	◆ There is a limit to the number of responses ◆ Incorrect or inconsistent marking on the sheet may result in the data being rejected
Smart card	(magnetic)		
A magnetic strip containing encoded data about the owner of the card is placed on a plastic card	◆ Used to store data on debit, credit, loyalty, phone and other cards	◆ Can be used to store financial transactions ◆ Transactions are fast ◆ Saves the user from carrying cash	◆ Can be damaged ◆ May soon be replaced by embedded microchips
Musical Instrument Digital Interface (MIDI)	(sound)		
Can be used by musicians to create, manipulate and store sounds in a computer	◆ Used to store music from instruments or voice for editing	◆ Once stored, the data can be arranged in many ways	◆ Special software must be used to translate the music into a musical score

OUTPUT DEVICES

- **(1) Monitor**
  - Monitor is the most commonly used output device to display the information. It looks like a TV. Pictures on a monitor are formed with picture elements called PIXELS. Monitors may either be Monochrome which display text or images in Black and White or can be color, which display results in multiple colors.
  - There are many types of monitors available such as CRT (Cathode Ray Tube), LCD (Liquid Crystal Display) and LED (Light Emitting Diodes). The monitor works with the VGA (Video Graphics Array) card. The video graphics card helps the keyboard to communicate with the screen. It acts as an interface between the computer and display monitor. Usually the recent motherboards incorporate built-in video card.

- **(2) Plotter**
  - Plotter is an output device that is used to produce graphical output on papers. It uses single color or multi color pens to draw pictures.

- **(3) Printers**
  - Printers are used to print the information on papers. Printers are divided into two main categories:
    - Impact Printers
    - Non Impact printers
- **Impact Printers**
  - These printers print with striking of hammers or pins on ribbon. These printers can print on multi-part (using carbon papers) by using mechanical pressure. For example, Dot Matrix printers and Line matrix printers are impact printers.

- **Non-Impact Printers**
  - These printers do not use striking mechanism for printing. They use electrostatic or laser technology. Quality and speed of these printers are better than Impact printers. For example, Laser printers and Inkjet printers are non-impact printers.
- **Laser Printers**
  - Laser printers mostly work with similar technology used by photocopiers. It makes a laser beam scan back and forth across a drum inside the printer, building up a pattern. It can produce very good quality of graphic images.
- **Inkjet Printers**
  - Inkjet Printers use colour cartridges which combined Magenta, Yellow and Cyan inks to create color tones. A black cartridge is also used for monochrome output. Inkjet printers work by spraying ionized ink at a sheet of paper.

- **(4) Speakers**
  - Speakers produce voice output (audio) . Using speaker along with speech synthesize software, the computer can provide voice output. This has become very common in places like airlines, schools, banks, railway stations, etc..

- **(5) Multimedia Projectors**
  - Multimedia projectors are used to produce computer output on a big screen. These are used to display presentations in meeting halls or in classrooms.