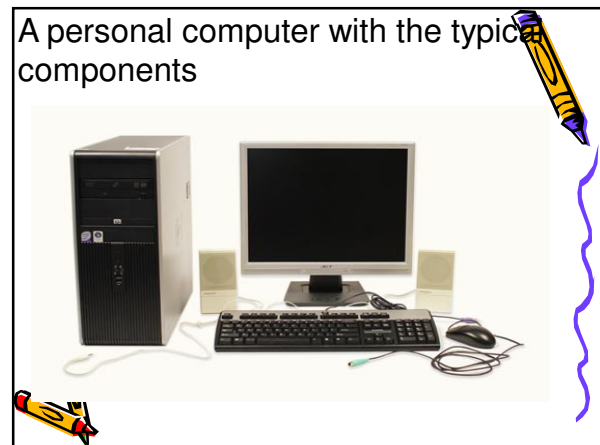
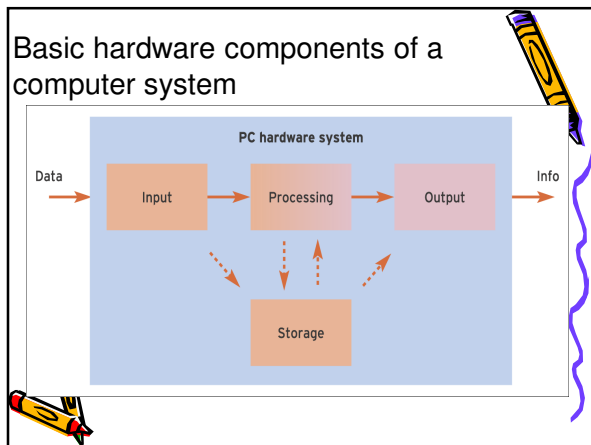


## Key concepts

- **Computer system:** Interrelated components including hardware and software that work together with the aim of converting data into information.
- **Hardware:** The physical components of a computer system: input devices, memory, central processing unit, output devices and storage devices.



## Hardware components

- **Input device:** Hardware used to enter data, information or instructions into a computer-based information system.
- **Central processing unit (CPU):** The processor found in a computer system that controls all of the computer's main functions and enables users to execute programs or process data.

## Hardware components

- **Memory:** A temporary means of storing data awaiting processing, instructions used to process data or control the computer system, and data or information that has been processed.
- **Storage devices:** A permanent means of storing data and programs until they are required.
- **Output devices:** Translate the results of processing - output - into a human readable form.

### Different forms of computer system

A diagram illustrating different forms of computer systems. It includes:
 

- PDA:** A small handheld device.
- Laptop/Notebook:** A portable computer with a screen and keyboard.
- Desktop:** A standard computer system with a monitor, keyboard, and mouse.
- Tower:** A vertical computer case.
- Server (mini):** A smaller vertical server case.
- Mainframe:** A large, multi-bay computer system.

### PDA's, Media Players & Smart Phones

A diagram showing categories of mobile devices:
 

- PDA's:** Three handheld devices.
- Media Players:** Three devices, including a classic MP3 player and two smartphones.
- Smart Phones:** Four different smartphone models.

### Tablets, Laptops & Desktops

A diagram showing various computer types:
 

- Tablets:** Two tablet devices.
- Desktops:** A desktop monitor and keyboard setup.
- Palmtops:** Two small handheld devices.
- Laptops:** A laptop computer.

### Servers

A diagram showing different types of server hardware, including tower servers and rack-mounted servers.

### Supercomputers & Mainframes

A diagram showing large-scale computing systems:
 

- Supercomputers:** A large room filled with server racks and a close-up of a server rack.
- Mainframe Computers:** A large room with multiple mainframe units and a close-up of a mainframe cabinet.

### Input devices

- **Natural keyboard:** Keys are arranged so that users can locate them more quickly and easily in a way that makes prolonged use more comfortable.
- **Mouse:** A pointing device found on most modern personal computers.
- **Pointing device:** An input device that allows the user to control the movement of a small pointer displayed on the screen that is used to select options.

## Input devices

- **Lightpen:** A pointing device used to control applications by pointing to items on the screen.



- **Trackball:** A trackball is a pointing device that is controlled by rotating a small ball with the fingertips or palm of the hand.



- **Optical scanner:** An input device used to capture graphics and text from printed documents.



## Input devices

- **Optical character recognition (OCR):** Software that attempts to recognise individual characters.
- **Optical mark recognition (OMR):** Detection and recognition of simple marks made on a document.
- **Bar code:** A means of displaying a unique identification number as a series of thick and thin lines.



## Input devices

- **Universal product code:** A standard for defining bar codes used frequently in retailing.
- **Bar code reader:** Measures the intensity of a light beam reflected from a printed bar code to identify the digits making up a unique identification number.



## Input devices

- **Touch screen:** A transparent, pressure-sensitive covering that is attached to the screen of the monitor.
- Users make selections and control programs by pressing onto the screen.



## Input devices

- **Interactive kiosk:** A typical application for touch screen systems, an interactive kiosk allows a user to purchase items or browse through a list of products by pressing buttons or other controls shown on the screen.
- **Graphics tablet:** Used in the same way as a writing pad; a stylus is used to draw images on a rigid pad located near to the computer.



## Input devices

- **Video capture card:** The video capture card records and stores video sequences (motion video).
- **Sound card:** A sound card allows a personal computer to play speech, music and other sounds. A sound card can also be used to capture sound, music and speech from a variety of sources.



## Input devices

- **Voice recognition:** The facility to control a computer program or carry out data entry through spoken commands via a microphone connected to a sound card.
- **Multimedia:** A combination of several media under the control of an interactive computer program including text, graphics, sound, video and animation.



## Selecting input devices - key issues

- Volume
- Speed
- Accuracy
- Cost
- Data complexity
- Frequency of data entry



## Output devices 1

- **Visual display unit (VDU):** A monitor connected to a computer system, traditionally used to describe character-based terminals.
- **Resolution:** The 'fineness' of the image that can be displayed, expressed as number of pixels (picture elements) - the individual dots that make up an image on the screen.



## Output devices 2

- **Video projector:** A computer system can be connected directly to a projector so that the output is directed to a projection screen.
- **Plotter:** A plotter uses a number of different coloured pens to draw lines upon the paper as it moves through the machine.



## Output devices 3

- **Computer output to microfilm (COM):** Information is processed via a computer and sent directly to a device that produces microfilm negatives.
- **Response time:** The time it takes to respond to an action. For instance, the delay between pressing a key on the keyboard and a letter appearing on the screen.



## Selecting output devices - key issues

- Appropriateness
- Permanence
- Response time
- Speed
- Cost
- Data complexity
- Frequency of data entry



## Printers

- **Laser printer:** A laser is used to charge sections of a rotating drum which is then used to print using toner powder, achieving a combination of speed with high print quality.
- **Inkjet printer:** An inkjet printer uses a print-head containing 50 or more small nozzles that squirt ink onto the paper by varying electrostatic charges produced by the printer.



## Printers

- **Dot-matrix printer:** A character is transferred to the paper by striking pins against an ink ribbon.



## Selecting printers - key issues

- Purchase cost
- Printing cost
- Print quality
- Paper handling
- Volume
- Speed



## Storage devices

- **Primary storage:** Data and instructions are loaded into memory such as random access memory. Such storage is temporary.
- **Secondary storage:** Floppy disks and hard disks are examples of secondary storage and the storage is permanent.



## Measuring storage capacity

- **Bit:** A single binary digit representing a (0) zero or a 1.
- **Byte:** Made up of eight bits and represents the amount of space required to hold a single character.
- **Kilobyte (kb):** Exactly 1024 bytes, or the equivalent of  $(2^{10})$  characters.



## Measuring storage capacity

- **Megabyte (Mb):** Exactly 1024 kb, or the equivalent of  $(2^{20})$  characters.
- **Gigabyte (Gb):** Approximately 1024 Mb, or the equivalent of  $(2^{30})$  characters.



### Secondary storage

- **Floppy disk:** Consists of a plastic disk, coated with a magnetic covering and enclosed within a rigid plastic case.
- **Hard disk:** A magnetic medium that stores data upon a number of rigid platters that are rotated at very high speeds.



### Secondary storage

- **Flash drive:** A flash drive is a portable storage device that connects to a computer via a standard USB port.
- Flash drives have no moving parts, so are reliable and robust.



### Secondary storage

- **Memory Cards:** An extension of flash drives but more portable.
- Used to store data in small and portable devices such as digital cameras and smart phones.



### Optical secondary storage

- **CD-ROM:** A computer storage device offering a relatively high capacity.
- The acronym CD-ROM stands for compact disc - read only memory, denoting the fact that CD-ROM discs are read-only devices.
- **Compact disc (CD):** The media used by CD-ROM players. The data on a compact disc is encoded as a series of dips and raised areas.



### Optical secondary storage

- **CD-R (CD-recordable):** Can both read conventional compact discs and also write data to special 'gold' discs.
- **CDRW:** In addition to providing the functionality of the CDR drive, the CDRW drive also allows the use of special compact disc media that can be written and erased many times.



### Optical secondary storage

- **Digital versatile disc (DVD):** Similar to CD-ROM but with higher storage capacities, typically between 4 Gb and 7 Gb and which is accessed at higher speeds.



### Optical secondary storage

- **Blue Ray Disc (BD-Disc):** is an optical disc storage medium designed to supersede the standard DVD format.
- Its main uses are for storing high-definition video, PlayStation 3 video games, and other data, with up to 25 GB per single-layered, and 50 GB per dual-layered disc.



### Primary storage - memory

- **Volatile memory:** Anything held in memory is lost once the power to the computer system is switched off.
- **Non-volatile memory:** Non-volatile memory retains its contents until altered or erased.
- **Random access memory (RAM):** RAM is used as volatile, working storage by a computer, holding instructions and data that are waiting to be processed.



### Primary storage - memory

- **Read-only memory (ROM):** The contents of ROM are fixed and cannot be altered. ROM is non-volatile.
- **EPROM (erasable programmable read-only memory):** This is a form of ROM memory that retains its contents until changed using a special device known as a 'burner'.



### Primary storage - memory

- **Cache memory:** Used to improve performance by anticipating the data and instructions needed by the processor.
- The required data is retrieved and held in the cache, ready to be transferred directly to the processor when required.



### Storage-type summary of selection criteria

Storage medium	Speed	Cost	Capacity	Permanent
Magnetic tape	Very slow	Very low	Very high	No
Floppy disk	Slow	Low	Very low	No
Hard disk drive	Fast	Low	Very high	No
CD-ROM	Slow	Low	Very high	Yes
Memory	Very fast	High	Low	No/yes



Comparison between storage media and devices

### Processors

- **Processor:** Uses instructions from software to control the different components of a PC.
- **Clock speed:** Measured in MHz (megahertz or millions of pulses per second).
- The clock speed is governed by a quartz-crystal circuit.

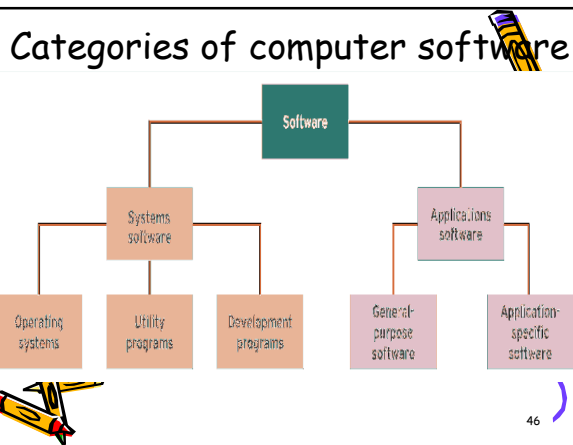
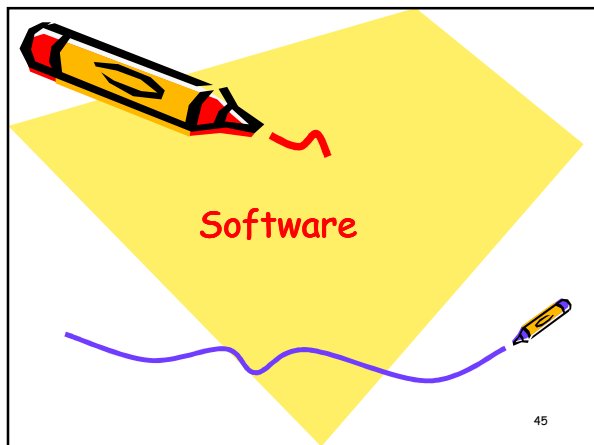


### Processors

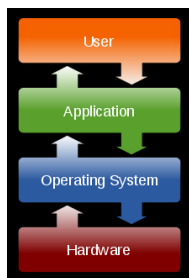
- **Bus width:** Describes how many pieces of data can be transmitted or received at one time by the bus connecting the processor to other components of the PC.
- **VGA (video graphics array):** A common standard for graphics cards. All graphics cards support the VGA standard which specifies a maximum image size of 640 by 320 pixels, displayed in 16 colours.

### Virtual computing

- Virtual computing involves simulating a complete computer system in software. The **virtual machine (VM)** behaves exactly the same as a physical computer system and can be used in the same way.



### An Illustration Of HCI



### Categories of software

- **Software:** A series of detailed instructions that control the operation of a computer system.
- Software exists as programs that are developed by computer programmers.



## Categories of software

- **Systems software:** This form of software manages and controls the operation of the computer system as it performs tasks on behalf of the user.
- System software is computer software designed to operate the computer hardware and to provide and maintain a platform for running application software.



## Examples Of Systems Software

- The computer BIOS and device Firmware, which provide basic functionality to operate and control the hardware connected to or built into the computer.
- Utility Software, which helps to analyze, configure, optimize and maintain the computer.



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## The Operating System

- (prominent examples being Microsoft Windows, Mac OS X and Linux), which allows the parts of a computer to work together by performing tasks like transferring data between memory and disks or rendering output onto a display device.
- It also provides a platform to run high-level system software and application software.



## Other Systems software

- **Command line interpreter (CLI):** Passes instructions from a user to a computer program as instructions from a user in the form of brief statements entered via the keyboard.
- **Graphical user interface (GUI):** Provides a means for a user to control a computer program using a mouse to issue instructions using menus and icons.



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## Other Systems software

- **WIMP:** WIMP (windows, icons, mouse and pull-down menus) is often used to describe a GUI environment.
- **Network operating system (NOS):** This describes the software needed to operate and manage a network system



## Applications software

- **Applications software:** A set of programs that enable users to perform specific information-processing activities that may be general-purpose or application-specific.



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### Applications software

- **General Purpose applications:** This is also known as **productivity software** and describes a category of computer software that aims to support users in performing a variety of common tasks. (e.g. word processor, spreadsheet, database).



### Applications software

- **Application-specific software:** This is intended to serve a specific purpose, for example software used in the marketing and accounting functions



### Questions

