Types and Components of Computer Systems

1.1 Hardware and Software

- Hardware is a general term for the physical components of a computer system, hardware can either be external or internal.
- Internal hardware includes: the motherboard, random access memory (RAM), read-only memory (ROM), video cards, sound cards, video cards and internal storage devices (hard disk drive and solid state drive.
- External hardware devices include: keyboard, mouse, monitor, printer
- Software is a general term for the programs that control the computer system. They are divided into two categories: system software and application software

Application Software: programs that allow the user to do specific tasks

i. Word processing software is used to manipulate text documents. It includes copy and paste functions, spell checks, thesaurus, imported images and translation tools.
ii. Spreadsheet software is used to organise and manipulate numerical data. It includes: the use of formulas to carry out calculations and the ability to produce graphs.
iii. Database software is used to organise, manipulate and analyse data. It includes the ability to I
iv. Control and measuring software is designed to allow a computer or microprocessor to interface with sensors so it is possible to measure physical quantities and control applications.
v. Photo editing software allows a user to manipulate digital photographs stored on a computer.
vi. Video editing software allows a user to manipulate videos to produce an edited video
vii. Graphics manipulation software allows bitmap and vector images to be changed
viii. Apps normally refer to the type of software that runs on mobile phone or tablets.

System Software: allow the hardware to run properly and allow the user to communicate with the computer

i. A complier is a computer program that translates a program written in a high-level language (HLL) into machine code, so that it can be directly used by a computer to perform a required task
ii. A linker is a computer program that takes one or more object files and combines them into a single program that can be run on a computer
iii. A device driver is the name given to software that enable one or more hardware to communicate with the computer's operating system
iv. The operating system is essentially software running in the background of a computer system.
v. Utility programs are software that has been designed to carry out specific tasks on a computer, they are programs that help manage, maintain and control computer resources.

Internal hardware:

i. The motherboard is a printed circuit board that allows the processor and other computer hardware to function and communicate with each other
ii. A video card allows the computer to send graphical information to a video display device. It consist of: a processing unit, a memory unit, a cooling mechanism, and connections to a display unit
iii. A sound card is an integrated circuit board that has the ability to produce sounds.

1.2 The main components of a computer system

Central Processing Unit (Microprocessor)

- It is integrated onto the motherboard
- It is made up of:
    i. A control unit: which controls the input and output devices
    ii. A Arithmetic and Logic unit: which carries out calculations and makes logical decisions
    iii. Immediate access (RAM)

Internal Hard Disk Drive

- Stores application software, disk operating system and files

Random Access Memory

- Stores data temporarily on running applications
- Can be written to or read from
- Volatile

Read Only Memory

- Stores permanent information
- Can only be read from but cannot be altered
- Non-volatile

1.3 Operating Systems

- Programs that control the function of a computer system

Functions include:

i. Control the operation of input, output and backing storage devices
ii. Supervising the loading, running and storage of application programs
iii. Dealing with errors that occur in application programs
iv. Maintaining security of the whole computer system
v. Maintaining a computer log
vi. Allowing communication between user and the computer system

Type of Operating System	Features	Advantages	Disadvantages
Command Line Interface	Users are required to type in precisely worded commands to operate the system. Used by programmers, analysts and technicians	Direct communication with computer, no restriction of premeditated commands, possible to alter computer configuration	Need to learn a series of commands, which need to be precisely worded which are error prone, difficult to edit commands once typed
Graphical User Interface	Users interact with a computer using, windows, icons, menus and pointers	No need to learn new commands, user-friendly, pointing devices available	Uses more memory, limited to icons on screen, needs and operating system

1.4 Types of Computer Systems

PC/desktop computers

- The term PC refers to a general purpose computer that is made up of a separate monitor, keyboard, mouse and processor unit. The term PC refers to a computer system that is IBM compatible

Advantages

i. Lowers costs as all components and connections are provided
ii. Better specification, faster processor
iii. Better dissipation of heat build up
iv. Fixed location; less likelihood of damage
v. Stable internet connection due to fixed position

Disadvantages

i. Lack portability
ii. Necessary to copy files when work needs to be done elsewhere
iii. Clutters desk space

Laptop

- Refers to the type of computer where the monitor, keyboard, pointing device, and processor are all together in a single unit.

Advantages

i. Portable
ii. No trailing wires
iii. Wi-Fi enabled
iv. Able to link to any multimedia system

Disadvantages

i. Stolen easily
ii. Limited battery life
iii. Keyboards and pointing devices are awkward to use

Tablets

- Internet enabled, portable computers
- Have features such as: high definition, anti-glare screens, front and back facing cameras, solid state/ cloud storage and sync, Bluetooth, proximity sensors and an accelerometer

Advantages

- Very fast to switch on
- Portable and lightweight
- Touchscreen
- Can use several Apps as standard
- Do not generate any heat
- Have a long battery life
- Allow standby mode

Disadvantages

- Limited memory and storage

- Can be expensive if they need to access 3/4/5 G mobile phone networks
- Transferring of files have to be done through an App Store
- Laptops support more types of file formats than tablets

Smartphones

- Allow a user to send/receive mail, surf the net, GPS, calendar functions, telephone banking, VOIP, streaming of videos and music, instant access to social networks, IM

Advantages

- They are small in size and lightweight
- Can be used to make phone calls and connect to the internet on the go
- They have hundreds of Apps available
- They have a better battery life

Disadvantages

- Small screens and pages are difficult to read
- Web browsing and photography drains battery easily
- Small memory capacity
- Not all website features are compatible with smartphones
- The data transfer rate between the mobile phone networks is slower than with Wi-Fi

1.5 Impact of Emerging Technologies

Artificial intelligence biometrics

- Artificial Intelligence overcomes the problems associated with biometrics by dynamically profiling. The system learns from the different alignments and is therefore able to match fingerprints to those stored on a database. New systems use AI to learn from scanning a number of faces and can pick out soft biometric features. This means the system can still recognise faces and cross-reference these attributes with corresponding images stored on the database

Vision enhancement

- Low Vision Enhancement Systems (LVES) uses video technology through a headset connected to a computer. The system allows images to be projected inside the headset in front of the eyes. This effectively brings the objects closer for examination by the user of the system
- Night Vision Enhancement (NVE) amplifies infrared light and visible light so that an image can still be seen in the darkness.

Robotics

- Used in car factories to weld car bodies, spray body panels and fit items such as widescreens
- Drones are unmanned flying devices that are used by military for surveillance, and by civilians as means of surveying data for GPS systems, monitoring weather patterns and search or rescue missions in hazardous conditions.
- They are also used in surgical procedures to allow precision, flexibility and control. Surgeons use robotic, mechanical arms with joints which work like that of a human and are equipped with cameras.

Quantum Cryptography

- The science of making information unintelligible to a hacker i.e. encrypting

Computer Assisted Translation

- CAT is a type of language translator that uses specific software to help in the translation process. In particular CAT uses two tools: terminology databases and translation memories

3D and holograph imaging

- The technology involves the use of: a source of laser light, interference of light, light diffraction and light intensity recording
- As a holographic image is rotated, it appears to move in the same way as the original object thus depicting three dimensions
- Holograms are used in: engineering design, architecture, simulations, medical imaging, cinema, gaming, advertising, holographic televisions, holographic computer memories and optical computers

Virtual Reality

- Virtual reality is an artificial environment created by software. The use makes use of data goggles, sensor suits, data gloves or helmets to get a feeling of reality. The technology is used in training, education or in games.
- Virtual reality is also used in: military applications, education, healthcare, entertainment, fashion, heritage, business, real estate, engineering, sport and media.