Information & Communications Technology 1

Hardware

Hardware is any physical device such as a keyboard, monitor, mouse, CD drive, cable or speaker.

Hardware is divided into two main sections: Inputs and Outputs.

Input devices are any device that supplies the computer with a command or information.

Output devices are any device that displays or transfers information to the user.

Examples

Input Devices	Output Devices
Keyboard	Monitor
Mouse	Printer
Scanner	Speaker
Trackpad	3-D Printer
Microphone	Projector
Bar Code Scanner	Motor
Sensor	
Digital Camera	

Central Processing Unit (CPU)

The CPU is essentially the “brains” of the computer. The CPU in most PCs is a small silicon microchip containing electronic circuits that allow it to carry out many complex tasks quickly and efficiently.

The CPU takes the signals from input devices and interprets them and then outputs the data collected using output devices.

Peripheral devices are any input, output or any other devices that are connected to the CPU via the Input/Output ports (I/O Ports)

Storage

Most computers makes use of at least three different types of storage systems: memory, secondary storage & cloud storage.

Memory

Onboard memory in a computer stores all the information, data and commands of any programme that is currently running from the CPU.

There are three types of memory: RAM, ROM and cache

RAM

RAM stands for Random Access Memory. It is temporary, high speed memory that stores programmes and data such:

- The computer’s operating system
- The graphic interface
- Applications

ROM

ROM stands for Read Only Memory. This type of memory is permanent and can never be changed by any user. ROM is programmed in the factory during production. It stores data like the

start-up instructions for the computer, ROM stores permanent data. It is non-volatile meaning that it retains data even after the computer has been turned off.

Cache

Cache is temporary storage located on the CPU. It is used to store data that is likely to be accessed again in the very near future. By storing data in cache it allows for the user to quickly access that data, without any boot-up delays etc. Cache is a type of extra fast RAM.

Secondary Storage

Secondary storage is any additional storage used by a computer to store data. Secondary data can be either internal or external. All of these secondary storage devices are non-volatile.

Internal Secondary Storage:

- Internal hard drive

External Secondary Storage:

- Universal Serial Bus (USB) Flash Drive
- External Hard Drive
- Solid State Drive (SSD)
- Disks

Cloud Storage

Cloud storage refers to storing any form of data on a server on the internet and accessing it by logging into the server to view or download it. Many large email companies provide users with a certain amount of free cloud storage with their accounts and then if needed, additional cloud storage can be purchased (e.g. Google, Dropbox, iCloud, OneDrive).

Advantages:

- Information can be accessed from any computer in the world with an internet connection
- Easily share data between users of different computers
- Cloud storage frees up onboard computer storage allowing for increased operating speeds
- Many cloud services offer free storage or reasonably prices storage

Disadvantages:

- Although very secure, online storage can be hacked
- Loss of privacy
- Internet connection is always required to gain access to material

Software

Software is the name given to all the programmes and applications on a computer that command it to carry out different tasks. Software is not a physical entity, unlike hardware.

There are two main types of software:

- Operating System Software (OS)
- Applications

Operating System

The operating system of a computer controls all the general operations of the computer such as screen layout, volume control, storage segmentation etc.

Different manufactures use different operating systems:

- Many computers and laptops use Windows OS (e.g. Windows 7)
- Mac computers use Apple's own OS: Apple OSX (e.g. OS Catalina)
- Some computers also run off third-party OS. (e.g. Linux & ubuntu)

Operating systems are also vital for the function of smartphones, tablets, digital cameras, smartwatches and other electronic devices.

Some examples:

- iOS used in iPhones
- Android 8.0 Oreo used in Samsung Galaxy S9
- watchOS used in Apple Watches

Applications

Applications or “apps” are software downloaded and installed onto computers that carry out additional functions. Many are designed and engineered by a third party and downloaded from the internet or from a code purchased in a shop.

Examples of computer applications:

- Microsoft Word for word processing
- Microsoft Excel for spreadsheet creation
- Adobe Premiere Pro for video editing
- Audacity for audio editing

Applications are more commonly downloaded on smartphones.

- Examples:
    - Netflix
    - Spotify
    - Snapchat
    - Facebook
    - Twitter
    - Google Maps

Search Engines

Search engines are specialised types of software that allow the user to access information sorted on the world wide web using specific search algorithms and detailed coding.

Examples:

- Google Chrome
- Internet Explorer
- Safari
- Firefox
- Yahoo

URL = Uniform Resource Locator

HTTP = Hyper Text Transfer Protocol

HTTPS = Hyper Text Transfer Protocol (Secure)

HTML = Hyper Text Markup Language

Antivirus Software

Anti-viral software is software purchased by the user and installed onto their computer to protect it from any programme trying to gain information or inhibit to running of the computer. Antivirus software protects a PC against cyber-crime. Some softwares can also optimise disk space on the computer by deleting duplicate files.

Examples:

- McAfee LiveSafe
- Norton 360
- Kasperspy

Cyber Crime

Cyber-crime is any crime committed using a computer, electronic device, network or internet connection.

The most common types of cyber-crime committed are:

- Hacking
- Cyber bullying
- Pirating
- Copyright Infringement
- Phishing
- Identity Theft
- Malware

Hacking

Hacking usually describes the gaining of unauthorised access to a computer or programme and taking private or confidential information from secure databases. Many large corporations such as PlayStation and British Airways have been the targets of hacks in the past.

Phishing

Phishing is a form of hacking. Phishing involves trying to gain access to confidential data by pretending to be an official or trustworthy source. Receiving an email asking for your bank details from an address that seems like an official bank email address could be an attempted phishing scheme.

Copyright Infringement

This refers to an individual or organisation using material from another source that they do not have permission to use. They are therefore infringing on the rights of the person who holds the copyright to that material (the copyright holder). Material that is protected that copyright can often be purchased for usage for a price.

Malware

Malware is short for malicious software and refers to any software that is designed to inhibit the operation of a computer or network. Malware can mine for information in a database as well.

Database

A database is a collection of information that is filed in a system that allows for quick and easy retrieval. A database is a digital filing system. Databases can be housed in the cloud or on large external serves.

Simulation Software

Simulation software is designed to allow the user test a variety of variables of an artefact process and to see what the outcome will be. Aircraft aerodynamics and explosive damage are examples of scenarios that can be tested in a simulation software.

The use of simulation software saves money as they eliminate the need to waste materials in practical tests before production can begin. Simulation software also allows for information to be

gathered of extreme scenarios without endangering human life (e.g. high speed car collision or a building collapse)

Computer-Aided Design Software (CAD)

CAD software allows the user to create complex technical drawings and 3D models of artefacts.

CAD drawings can be converted to various formats that can either be printed or converted to files that can be read by CAM software that will allow for automated machines to then produce the designed artefact (eg: 3D Printer or Laser Cutter).

Advantages of CAD

- Highly accurate
- Mistakes can be easily fixed
- Saves paper
- Quicker than traditional drawing

Examples:

- AutoCAD
- SolidWorks
- SketchUp

Computer-Aided Manufacturing Software (CAM)

CAM software refers to software that are used to control automated machine tools for manufacturing. CAM software turns the drawings produced in CAD software into a series of commands and coordinated that control the machine that will make the artefact.

Computer Numerical Control (CNC)

This is a type of CAM software that involves a computer using numerical data to operate a machine automatically. The computer inputs into the machine data such as dimensions, cutting speed, timing and coordinates using G-codes and M-codes and then the machine manufactures the piece.

Examples of CNC Machinery:

- 3D Printer
- CNC Lathe
- CNC Router
- Laser Cutter
- Plasma Cutter

Proprietary/Open Source/Free Software

Proprietary Software

This type of software requires the user to pay a fee before they can use it. When using this type of software the user does not have access to the software's source code. An advantage of this type of software is that it is regularly updated and improved as it is a paid for service.

Open Source Software

Open source software is usually free to use and can be downloaded from the internet. Users of this software have access to the source code and can modify or edit the code and pass it on to anyone for any purpose.

Free Software

This type of software is free for the user to use, however they may not have access to the source code and there may be ads run in the software as a way of generating income for the developer. One disadvantage of free software is that it may not be regularly updated and may contain bugs.

WiFi

WiFi is a form of local area wireless technology and it allows any user to connect to the internet wirelessly. WiFi works using radio waves to transmit information. Wifi connections can often be slower than wired connections.

Cookies

Cookies are data gathered by a user's visit to a website and stored on the user's computer. Cookies store data on site preferences, shopping basket contents, language etc. Cookies are controversial as they allow for user specific advertising to appear on the computer. Cookie usage must be consented to by the user before entering most websites for the first time.

Networks

A network consists of two or more computers linked together and exchanging information. The internet is the largest network in the world.

There are two main types of network:

- Local Area Network (LAN)
- Wide Area Network (WAN)

LAN

LAN networks are used by organisations to cover small areas such as a building, campus or site.

WAN

Wan networks are used to cover large geographical areas. The internet is an example of a WAN.

Routers

A router is a piece of hardware that boosts and forwards data and signals along a network. Many homes and businesses have routers that allow for data to be transferred between computers and the internet.

Optical Fibres

Optical Fibres (also called fibre-optic) are thin pieces of plastic or glass that transmit pulses of light rather than electrical signals. Optical fibres serve a similar functions to wires, however they allow for much faster transmission speeds and allow for data to be more effectively transferred over long distances. Optical fibre signals are also less prone to interference. Many towns and villages in Ireland are slowly having fibre-optic cables installed to increase internet speed in the vicinity.