Computer Technology

About Hardware and Software

# General Concepts

## Hardware, Software and Information Technology

### Understanding the terms hardware, software, Information Technology

#### Hardware

* The term hardware refers to the physical components of your computer such as the system unit, mouse, keyboard, monitor etc.

#### Software

* The software is the collection of instructions which makes the computer work. For instance, when you type in words via the keyboard, the software is responsible for displaying the correct letters, in the correct place on the screen. Software is held either on your computer’s hard disk, CD-ROM, DVD or on a diskette (floppy disk) and is loaded (i.e. copied) from the disk into the computers RAM (Random Access Memory), as and when required.

#### Information Technology (IT)

* This is a general term which relates to the use of computers as an aid to creat­ing and maintaining data, i.e. information. IT is related to all aspects of managing and processing information, especially within a large organisation. Computers are critical to managing information, and computer departments within large organisations are often called IT departments. Alternative phrases are IS departments (Information Services) or MIS departments (Management Information Services). People working with computers within large companies will often refer to their job, as “working in IT”.

## Types of Computer

### Understanding and distinguishing between types of computer

#### What is a mainframe computer?

* Mainframe computers are the big, powerful, expensive computers used in the background by most large organisations. The power of the mainframe can be distributed amongst many people accessing the mainframe via their own PC. Or­ganisations such as large insurance companies would use the mainframe to keep track of their policyholders and send out renewal notices.

#### What is a PC?

* IBM invented the PC (Personal Computer) way back in 1981. All PCs released since then are in many ways compatible with the original design, though many extensions have been made. The term PC compatible relates to PCs manufactured by companies other than IBM which are compatible with the traditional PC specification. In the early days, most PCs ran an operating system called DOS (Disk Operating System). These days most PCs will be running a version of Microsoft Windows.

#### What is a Mac?

* The Apple Mac is a computer, but NOT a PC. It uses a different operating system, and requires special versions of application programs (such as word-processors or spreadsheets). Even the hardware add-ons have to be customised to some extent to be able to be connected to a Mac. In the early days the thing which really distinguished the Mac over the PC was the GUI (Graphical User Interface), or in plain English the way you could use the mouse to drive the computer. In the early days of the PC, you really had to be a bit of an expert to use and maintain your PC. Recently the differences between the PC and the Mac have blurred, with Microsoft buying a stake in Apple.  
    
  **More information:** http://www.apple.com

#### What is a networked computer?

* A network allows you to connect two or more computers together. This allows data stored on one PC to be retrieved by other PCs connected to the network. It also allows the sharing of resources. Thus instead of each PC requiring its own printer to be directly connected to it, you can have a single printer shared amongst many networked PCs. In the early days, to network PCs together was a complicated task, only to be attempted by qualified professionals. These days most people with a good working knowledge of Microsoft Windows can install and configure a Windows based network. However to get the best out of your network, in terms of performance and security, still requires a qualified, experienced technician.

#### What are laptop & palmtop computers?

* Laptop computers, as the name implies, are small portable computers which can run on batteries as well as mains power. They use special screens, rather than the traditional bulky VDUs (Visual Display Units), which allows for longer battery life as well as portability. A newer term, “Notebooks”, simply indicates a VERY small laptop. These are especially popular with salespersons on the move or people giving presentations. While they tend to still be more expensive than an equivalent Desktop computer, they can now match the power of a Desktop computer. Palmtops are even smaller computers which can literally fit into the palm of your hand.

#### What is a Personal Digital Assistant (PDA)?

* These devices use a special pen, rather than a keyboard and can be used for storing and retrieving information. Like most computer devices, many can connect to the Internet. They are extremely compact.

#### Types of computer - Mainframe

* **Capacity**: Very powerful computers often connected to many individual PCs over a network.  
    
  **Speed**: Much faster than PCs used for processing large amounts of data such as mail-shots, salaries, tax etc.  
    
  **Costs**: Very, very expensive, only affordable by large companies.  
    
  **Typical Users**: Only used by large companies including banks, building societies etc.

#### Types of computer - PC

* **Capacity**: Large hard disks combined with a large working memory (RAM)  
    
  **Speed**: Fast. Normally measured in GHz.   
    
  **Costs**: Getting cheaper by the day.  
    
  **Typical Users**: Home users, large and small offer users. Education, Doctors. In fact just about everyone needs to know how to operate a PC these days.

#### Types of computer - Networked PC

* **Capacity**: Large hard disks combined with a large working memory (RAM)  
    
  **Speed**: Fast. Normally measured in GHz.   
    
  **Costs**: A PC only requires an inexpensive card to be added to it to connect it to a network.  
    
  **Typical Users**: Due to ease of networking a PC these days just about anyone can network PCs together.

#### Types of computer - Laptop

* **Capacity**: Large hard disks combined with a large working memory (RAM) – Often less powerful than for a PC of equivalent price.  
    
  **Speed**: Fast. Normally measured in GHz. Often speed specifications are less than for a PC of equivalent price.  
    
  **Costs**: Components need to be much more compact, so there is a price overhead when compared to a PC of equivalent power.  
    
  **Typical Users**: Business users, people on the move, educational users.

#### Types of computer - Palmtop

* **Capacity**: Much smaller storage capacity compared to a PC.  
    
  **Speed**: Much less than a PC unless you pay a lot extra.  
    
  **Costs**: In relative terms expensive when compares to a PC.  
    
  **Typical Users**: Mostly business users.

#### Types of computer - PDA (Personal Digital Assistant)

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## Main Parts of a Personal Computer

### Understanding the main parts of a personal computer and peripheral devices

#### The System Unit

* The "system unit" is the name given to the main PC box which houses the various elements which go together to make up the PC. For instance within the system unit is the computer system's motherboard, which contains all the main components, such as the CPU. The system unit also houses items such as the hard disk, the floppy disk and CD-ROM drives etc. System units come in two basic varieties, the tower version, as illustrated, or a desktop version, which is designed to sit on your desk with your monitor on top of the system unit.

#### The System (Mother) Board

* The system (mother) board is contained within your system unit and all the vital computer systems plug directly into the system board. The CPU is normally housed on your system board along with all the other electronic components. Other items such as the hard disk are attached to the system board, either directly or via cables. These boards are getting smaller and smaller as the components become more integrated. If you open up a modern system you will find that it is mainly full of air.

#### The CPU

* The CPU (Central Processing Unit) is normally an Intel Pentium (or equivalent) and it is one of the most important components within your computer. It determines how fast your computer will run and is measured by its MHz or GHz speed. Thus, a 2 GHz Pentium is much faster than say a 1 GHz Pentium CPU. It is the CPU which performs all the calculations within the computer, when running programs such as word-processors, spreadsheets and databases. See page 21 for more information.

#### Memory (RAM)

* The RAM (Random Access Memory) within your computer is where the operating system is loaded to when you switch on your computer and also where your applications are copied to when you start an application, such as a word processor or database program. When you create data, (e.g. letters and pictures), these are initially created and held in RAM and then copied to disk when you save the data. As a rule of thumb, the more RAM you have installed in your computer the better. These days you will commonly find over 128 Megabytes of RAM installed.

#### ROM-BIOS

* The ROM-BIOS (Read Only Memory - Basic Input Output System) chip is a special chip held on your computer's system (mother) board. It contains software which is required to make your computer work with your operating system, for instance it is responsible for copying your operating system into RAM when you switch on your computer.

#### Serial Port

* The serial port is a socket located at the back of your computer which enables you to connect items to the computer, such as a modem. They are commonly labelled as COM1 or COM2.

#### Parallel Port

* The parallel port is a socket located at the back of your computer which enables you to connect items to the computer, such as a printer. It is commonly labelled as LPT1 or LPT2.

#### Universal Serial Bus (USB)

* The Universal Serial Bus is a relatively new item within the PC. You will see one or more USB sockets at the back of the system unit, allowing you to plug in devices designed for the USB. These devices include printers, scanners and digital cameras.

#### What are input devices?

* Input devices allow you to input information to the computer and include things such as the keyboard and mouse.

#### What are output devices?

* Output devices allow you to output information from the computer and include the printer and the monitor.

#### What is a peripheral device?

* A peripheral device is any device which you can attach to your computer. Thus, you could attach a scanner or modem to the back of your system unit.

#### The Keyboard

* An Input device. The keyboard allows you to type information into the computer. It has evolved over the years and many people now use a Microsoft style keyboard, which has additional keys designed to make Microsoft Windows easier to use.

#### The Mouse

* An Input device. When using an operating system, such as Microsoft Windows, you use the mouse to select drop down menus, to point and click on items, to select items and to drag and drop items from one place to another.

#### CD

* Most computers are now supplied with a CD-ROM (Compact Disc - Read Only Memory) drive. CD-ROM discs look exactly like music CDs but contain computer data instead of music. The advantage of a CD-ROM is that it can hold a vast amount of data (equivalent to the storage capacity of over 450 floppy disks). The other big advantage of CD-ROMs is that they are interchangeable. This means that you can own a range of different CD-ROMs and choose which one to insert into your CD-ROM drive.

#### DVD Drives

* Short for "Digital Versatile Disk”. Similar to CD-ROM drives but allows you to use DVD disks, which contain vastly more information than a traditional CD-ROM disk. These also transfer the data from the disk to the computer far faster, allowing you to watch movies on your computer screen. A CD-ROM can store 650 MB of data, while a single-layer, single-sided DVD can store GB of data. The two-layer DVD standard allows a capacity of GB. A double-sided DVD increases the storage capacity to 17 GB (or over 25 times the data storage capacity of a CD-ROM).

#### Floppy disk

* Floppy disks are also known as diskettes. They are very slow compared to hard disks or CD-ROMs, and hold relatively small amounts of data (1.44 Mbytes). Sometimes people will backup (i.e. copy) important data from their hard disk to floppy disks. However, as diskettes are notoriously unreliable this is not the best way of backing up valuable data (but is better than nothing).

#### Zip Disc

* A Zip disk is like a bigger version of the floppy disk, the main difference being that a single Zip disk can hold up to 250 Mbytes of data. They also offer increased speed compared to the old floppy disk.

#### Hard (Fixed) Disk

* Hard disks are the main, large data storage area within your computer. Hard disks are used to store your operating system, your application programs (i.e. your word processor, games etc) and your data. They are much faster than CD-ROMs and floppy disks and can also hold much more data. The picture shows the inside of a hard disk (which you would not normally see). Hard disks are installed within the system unit of your computer.

#### The Monitor

* An output device. The monitor is the TV type screen on which you view your programs. They are supplied in different sizes, common sizes range from 15" to 21" screens. You should be aware that poor quality or badly maintained monitors could harm your eyesight.

#### Additional items or cards

* Many 'extra' components can easily be fitted to your computer, which has the advantage of making the computer 'upgradeable' as newer and better hardware comes along.

#### Sound cards and speakers

* Many computers are now supplied with sound cards and speakers which means that when you run 'multi-media' programs, you can listen to sounds which are played back via your computer. If you have a microphone and suitable software, you can also record sounds. You can even purchase special software which will allow you to talk to your computer and get the computer to type the words you have spoken on your screen. In time, this type of software may replace the keyboard.

#### Modems

* A modem is a device which is used to attach your computer to the telephone system. The modem converts data into sound which is sent over the telephone line, the receiving modem turns the sounds back into data. If you wish to connect to the Internet, you will need a modem (or equivalent device). Modems used to be large boxes that you had to plug into the computer, but now modems boxes have become very small and in many cases the modem is actually inside the computer. If you are using ISDN or broadband then you will use another device similar to a modem.

#### Printers

* Most data is printed once you have created it and there are a vast number of different printers available to accomplish this. Most common are ink jet and laser printers both of which can now produce coloured output (at a cost).

#### Scanners

* Scanners allow you to scan printed materials into your computer, which can then be stored within the computer. These pictures can then be altered, resized and printed as required.

#### Recordable CDs

* CD-ROMs are read-only devices, but increasingly people are purchasing a special type of CD drive unit which allows you to record data, music or video to your own CDs. These devices require the purchase of special CDs to which you can write, called CD-R (Compact Disc – Recordable).

#### Tape backup

* A tape backup unit allows for regular backing up of your data. These tapes can store a vast amount of data at a low cost. DAT (Digital Audio Tape) devices are commonly used for backups. The DAT tapes which are used can backup enormous amounts of data (i.e. over 4 GBytes per tape). The devices are also fast and reliable.

#### What is PCMCIA?

* Portables by their very nature are very compact and require smaller than standard parts such as hard disks and CD-ROM drives. Many portables are supplied with special adaptor sockets which enable what are called PCMCIA compatible hardware to be connected to them. PCMCIA components tend to be more expensive than standard computer parts which are designed for more bulky desktop computers.  
    
  **More information:** http://www.pcmcia.org

## Computer Performance

### Understanding some of the factors which impact on a computer’s performance

#### Factors affecting performance

* **CPU Clock speed:** The computer clock speed governs how fast the CPU will run. The higher the clock speed the faster the computer will work for you. The clock speed is given in megahertz (MHz). The original IBM PC ran at 4.77 MHz whereas modern PCs will run at over 2000 MHz, which gives you an idea of how far things have progressed. The higher the MHz speed the faster the computer.  
    
  **RAM size:** As a rule the more memory you have the faster the PC will appear to operate. Windows also uses the hard disk a lot, so logically the faster the hard disk can operate then again the faster the PC will appear to run.  
    
  **Hard disk speed and storage:** Hard disks are also measured by their speed, defined by the disk access time, which is measured in milliseconds. The smaller this access time the faster the hard disk will store or retrieve data. The data storage capacity of hard disks continues to increase as new products are released. The disk storage capacity is measured in Gigabytes (GBytes). 1 GByte is equivalent to 1024 Mbytes.  
    
  **Free Hard Disk Space:** To get the most out of your Windows based PC, you not only need a fast hard disk but also a large hard disk with plenty of "spare space". This is due to the fact Windows is constantly moving data between the hard disk and RAM (Random Access Memory). Microsoft Windows will create many so-called “temporary files” which it uses for managing your programs. In fact, if you have very little free hard disk space you may find that Microsoft Windows will not be able to run your programs at all.  
    
  **De-fragmenting Files:** If you are running Windows you may find that if you click on the **Start** menu, select **Programs**, and then select the **Accessories** / **System tools** group, there is a de-fragmentation program. Running this periodically may noticeably speed up the operation of your PC. When you use a PC, over a period of time the files get broken up into separate pieces which are spread all over the hard disk. De-fragmentation means taking all the broken up pieces and joining them back together again.  
    
  **Multitasking considerations:** Windows is a multitasking system, which means that it can run more than one program at a time. However the more programs which are running at the same time, the slower each one will run. To some extent this slowing effect depends on what each program is doing. Editing a large, full colour picture for instance can take up a lot of CPU time.