

# BTEC Level 3



## Unit 1: Information Technology Systems

# Learning Aim A: Digital Devices in IT Systems

## Knowledge and Assessment Organiser



Student name: .....



**What is digital devices and the relationships among, the devices that form IT systems?**

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# Key command words

Command or term	Definition
Analyse	Learners examine in detail a scenario or problem to discover its meaning or essential features. Learners will break down the problem into its parts and show how they inter-relate. There is no requirement for any conclusion.
Assess	Learners give careful consideration to all the factors or events that apply and identify which are the most important or relevant. Make a judgement on the importance of something.
Calculate	Learners apply some form of mathematical or computational process.
Complete	Learners complete a diagram or process. Can apply to problems/solutions of varying complexity.
Demonstrate	Learners illustrate and explain how an identified computer system or process functions. May take the form of an extended writing response, a diagram or a combination of the two.
Describe	Learners provide an account of something, or highlight a number of key features of a given topic. May also be used in relation to the stages of a process.
Discuss	Learners investigate a problem or scenario showing reasoning or argument.
Draw	Learners represent understanding through the use of a diagram or flowchart.
Explain	Learners denote a series of linked points needed and/or justify or expand on an identified point required.
Evaluate	Learners review and synthesise information to provide a supported judgement about the topic or problem. Typically, a conclusion will be required.
Identify	Learners assess factual information, typically when making use of given stimuli. Requires a single-word or short-sentence answer.
Produce	Learners provide a solution that applies established constructs to a given computing problem.
State, name, give	Learners assess factual information. Requires a single-word or short-sentence answer.
Write	Learners produce a solution, or mechanism used as part of, a solution to a given computing problem.



# What is my big question?

**What is digital devices and the relationships among, the devices that form IT systems?**



What are the different digital devices and the functions of them?



What do we mean by peripherals?



What are the different types of operating systems and their roles?



What factors affect the choice of user interface?



What is emerging technologies?



What factors determine the choice of IT systems?

# A1: Digital devices, their functions and use

## What is a digital device?

A digital device is an electronic device that uses digital data (such as 1s and 0s) as opposed to analogue data (such as sound wave).

An IT system can be anything from a single digital device to a global collection of computers.



## So what are the functions each device?

Digital device	Function of device
Multifunctional Devices	<p>These devices allow you to perform multiple functions, such as inputting and outputting of data.</p> <p>An example is a touch screen, which outputs data while allowing the user to input data by pressing the screen.</p> <p>Another example is a multifunctional printer which allows you to output printed material and input scanned images.</p>
Personal Computers	<p>Personal computers are small inexpensive computers used by individual users.</p> <p>Examples are desktop computers and laptops.</p> <p>Laptops are more portable than desktop computers and they have a built in battery, screen and keyboard.</p>
Mobile Devices	<p>Smartphones and tablets are made with portability in mind to give people computer and internet access on the go.</p> <p>They often have touchscreens, speakers and microphones built in for interactivity.</p> <p>As well as making calls and sending messages, they give access to mobile applications and the internet on the go.</p>
Servers	<p>These are powerful computers that provide services to other computers connected to a network.</p> <p>An example would be a mail server that provides access to email services for all of the users connected to the network.</p> <p>Another example would be a file server that allows users to save and access their files from a centralised location from any computer on the network.</p> <p>Web servers store HTML web pages and other online content and serve this to users over the internet.</p>
Entertainment Systems	<p>These are devices for watching TV/films (such as satellite or cable digiboxes), listening to music and playing video games.</p> <p>Games consoles are entertainment systems with powerful graphics processors that are specifically designed to play video games.</p>

	Games consoles can also perform other tasks such as listening to music or watching TV/films.
Digital Cameras	<p>Digital cameras capture images and videos digitally.</p> <p>They have a built in image sensor to capture the images.</p> <p>The images are stored as digital data on storage media such as a memory card or hard drive.</p>
Communication Devices & Systems	<p>These devices allow the user to send and receive data to and from a device.</p> <p>Modern examples of communication devices are routers, WIFI dongles and mobile devices such as mobile phones and tablets.</p> <p>Communication devices can give you access to the internet and the World Wide Web</p>
Navigation Systems	<p>A navigation system uses global positioning satellites (GPS) to find the users location on a digital map.</p> <p>Navigation systems provide the user with directions to a given direction.</p> <p>In-car satnavs use GPS data with mapping software to provide directions to a given destination. These devices often use digital sound to give the directions.</p>
Data Capture & Collection Systems	<p>Data Capture &amp; Collection Systems collect and input data automatically.</p> <p>Barcode scanners read the barcode and converts this into data which can be used to look up data in databases.</p> <p>OMR or Optical Mark readers automatically read marks on pre-made printed forms such as lottery tickets and multiple choice tests.</p> <p>EPOS (Electronic Point of Sale) systems can automatically update stock levels when purchases are made.</p>

# Uses of digital devices

Can be split in the following in the following categories:

## Education & Training

- Online E-learning Courses- These courses deliver a series of lessons to a web browser or mobile device, to be conveniently accessed anytime, anyplace.
- Distance Learning Degrees- a method of studying in which lectures are broadcast without the student needing to attend a school or college.
- Virtual Learning Environments- A VLE is an online system that allows teachers to share educational materials with their pupils via the web.
- Classroom Teaching – Teachers often use digital devices to enhance learning in the classroom. Examples include interactive whiteboards, Tablets and visualisers.

## Creative

- Designing logos – Digital devices are often used to create logos and other graphics. Graphics tablets are often used for this purpose.
- Editing photos – Digital devices are often used to edit digital photographs. Mobile applications often allow the user to take digital photographs and edit them with one device.
- Producing 3D graphics – 3D graphics are used in many different industries. The movie industry use 3D graphics for CGI and The games industry use 3D graphics to make games look realistic.
- Computer Aided Design (CAD) – Digital devices combined with software used by architects, engineers, drafters, artists, and others to create precision drawings or technical illustrations

## Organisational Use

- Manufacturing and Constructing – Digital devices are used in Manufacturing and Constructing, for example 3D printers are becoming widely used to produce products.
- Video Conferencing – Used to allow businesses to communicate with their employees and their partners using a video camera over short or long distances.
- Managing accounts and payroll systems – Digital devices are often used alongside software to manage business accounts and to manage payroll systems.
- Producing and sharing business documents – Digital devices can be used for businesses to share their business documents often using cloud storage so they can be accessed from anywhere in the world.

## Personal use

- Playing video games – Games are often played on specialist gaming devices as well as other mobile devices such as mobile phones and tablets.
- Watching digital TV – Digital TV can be viewed on both large screens such as a plasma screen TV and smaller screens such as a tablet.
- Internet banking – Long gone are the days of visiting the bank to complete simple banking tasks. Online banking allows users to access their accounts using digital devices such as mobile phones and tablets.
- Smart home systems – digital devices can be used to operate other devices within the home such as a kettle or the central heating system being operated through a mobile phone.

## Social

- Instant messaging – allows users to send instant messages using a mobile device. Messages can also include multimedia elements such as video, images and emoticons.
- Social Networking – Allows users to stay in contact with friends and family. Social Networking can be accessed through a variety of digital devices. Allows users to leave statuses, upload images, upload videos and join groups.
- VOIP calls – Voice Over Internet Protocol, allows voice calls to be transmitted over the internet. VoIP is often also used in online gaming for users to communicate while gaming

## Retail

- Online shopping – Allows users to use digital devices to access products sold through online shops. Users can add products to a basket and checkout using a credit or debit card.
- Recording sales – Point of Sale systems can be used to scan products using a barcode scanner to record and process sales.
- Data modelling – Data can be used by retailers to model trends e.g best sellers.
- Stock checking – Stock level data can be checked to re-order products when the order level gets lower than a set amount.

# A2: Peripheral devices and media

Peripheral devices are hardware devices that are not essential to the running of a computer system, but that connect to the system and provide additional functions. The most common are input and output devices.

## Input Devices

Device	Features	Example uses
Keyboard	Made up of keys used to input alphanumeric characters and symbols.	<ul style="list-style-type: none"> <li>• Writing a report</li> <li>• Inputting into a database</li> </ul>
Mouse	A pointing device used to select items on screen.	<ul style="list-style-type: none"> <li>• Navigating a user interface, e.g. by clicking on icons</li> </ul>
Scanner	Converts hard copy text or images into a digital format.	<ul style="list-style-type: none"> <li>• Inputting a photo for editing in graphics software</li> </ul>
Graphics tablet	Controls the computer by using a stylus on a tablet.	<ul style="list-style-type: none"> <li>• Creating digital illustrations</li> </ul>
Microphone	Converts analogue signals (sound waves) into electrical signals to be sent to the sound card which converts analogue to digital.	<ul style="list-style-type: none"> <li>• Talking on VOIP software</li> <li>• Voice recording</li> </ul>
Webcam	Inputs video and still images directly into a computer.	<ul style="list-style-type: none"> <li>• Video conferencing</li> </ul>
Sensor	Takes and inputs readings from the physical environment, such as changes in temperature.	<ul style="list-style-type: none"> <li>• Automated central heating systems</li> <li>• Security systems</li> </ul>

## Output Devices

Device	Features	Example uses
Monitor	Outputs an image to the user, e.g. of the user interface, a photo or a document.	<ul style="list-style-type: none"> <li>• Viewing the user interface</li> <li>• Watching movies</li> </ul>
Projector	Outputs an image onto a wall or screen.	
Printer	Produces hard copies of digital documents and images on paper.	<ul style="list-style-type: none"> <li>• A hard copy of a report</li> <li>• Printing digital photos</li> </ul>
Plotter	This specialist type of printer draws to a very high quality on very large paper.	<ul style="list-style-type: none"> <li>• Drawing vector graphics</li> </ul>
Speakers	Amplify analogue signals (sound waves) sent from the sound card for the user to hear.	<ul style="list-style-type: none"> <li>• Listening to music</li> <li>• Listening to someone during a VOIP call</li> </ul>
Headphones	A portable alternative to speakers.	

# Storage Devices

Are types of peripheral devices used for storing, backing up and sharing data, usually for individual use where a network is not available.

## Hard disk drives

Are magnetic storage devices, commonly used as primary internal storage device but can be external.

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>✓ Large storage</li><li>✓ Low cost</li><li>✓ Reliable</li></ul> | <ul style="list-style-type: none"><li>✗ Slower than SSD s at loading data</li><li>✗ Not as portable as other options</li></ul> |
|---|--|

## Solid State drives

Are flash memory devices commonly used as the primary storage in portable computing devices such as laptops and tablets.

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>✓ Very fast data read/write speeds</li><li>✓ Low power consumption</li><li>✓ Reliable</li></ul> | <ul style="list-style-type: none"><li>✗ Higher cost than HDDS</li><li>✗ Lower storage capacity</li></ul> |
|---|--|

## SD cards

Small flash memory cards that are commonly used for storage in digital cameras and smartphones

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>✓ Small and portable</li><li>✓ Easy to transfer data</li></ul> | <ul style="list-style-type: none"><li>✗ Small storage</li></ul> |
|--|---|

## USB memory stick

Small flash memory devices that connect through a USB port.

- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>✓ Compatible with most computer systems</li><li>✓ Extremely portable</li></ul> | <ul style="list-style-type: none"><li>✗ Easily lost</li><li>✗ Storage capacity low</li></ul> |
|--|--|

### Optical disk

Such as CDs, DVDs, Blu rays are used for software, music and movies

✓ Small and portable

✗ Fragile and easily damaged

### Magnetic tape

Is used for large data backups

✓ Large storage

✓ Low cost

✗ Specialist equipment needed for recording and reading data

## Manual and Automatic Data processing

When entering data into a computer system for processing, this can be performed manually or automatically, depending on the task.

### Manual Data Processing

Manual data processing involves an individual entering data into the computer themselves, usually by typing on a keyboard, though it could be by clicking on objects with a mouse, using a touchscreen or giving voice commands.

We might use this for all sorts of reasons, such as:

- A hotel clerk entering customer booking details using a keyboard to type data into a bookings database.
- Marking examination papers or coursework by using a keyboard to type marks into a spreadsheet.
- Inputting responses to a customer satisfaction survey by using a mouse to select options from a drop-down list or checkboxes.

### Automatic Data Processing

Automatic data processing helps resolve these problems as the role of data entry is taken away from individual users. Instead, specialist devices will interpret data, converting from its physical source into digital data stored on the computer.

Examples of this include:

- Optical mark readers that are used to enter data from pre-printed forms. This is used commonly for lottery tickets but also used to be popular with school registers.

- Barcode readers for inputting product details automatically by scanning the barcode on the back of the device and matching it with a database.
- Smart readers in homes to monitor electricity and gas usage and automatically send this data to the energy supplier for accurate billing.
- Radio Frequency Identification (RFID) chips used for monitoring stock and even automatic collection of stock using robotics.

## Manuel vs Automatic

Manual	Automatic
<b>Human Error</b> – People are prone to making mistakes, such as typos, which causes incorrect results after the data is processed. Poorly designed forms can make this even worse.	<b>Accuracy</b> – Data accuracy is usually much greater as entry won't be subject to human error. This is not true if OCR is involved though, which can be affected by poor handwriting.
<b>Time-Consuming</b> – It takes time for individuals to enter data manually into a computer system and perform processing. Double entry is also required to ensure data integrity which takes even longer.	<b>Time &amp; Cost</b> – Data entry can be completed much more quickly as forms can be read through at fast rates and without breaks. This also saves cost on hiring data entry staff.
<b>Complex Data</b> – Data can be complex and so automated data entry methods may not exist that can handle the data. Manual entry can handle any data type.	<b>Inflexible</b> – Only very specific data ranges can be inputted usually, so it cannot handle more complex data. OCR can handle more complex data but not with good accuracy.
<b>Reduced Training</b> – Staff are very likely to be familiar with manual data entry methods. This means that staff will not require training to be able to input data.	<b>Learning Curve</b> -New automatic data entry processes usually require data entry staff to receive training. This is both expensive, & time-consuming.

## Accessibility devices

These are devices that allow users with disabilities to access IT systems. Such as:

- **Trackballs** – This acts as an alternative to a mouse. This device is made up of a ball that sits within a holder that can be rotated in order to move the cursor on the screen. This can be easier to use for people with limited mobility.
- **Braille & Large Key Keyboards** – Braille keyboards use braille characters on each key of the keyboard. Large key keyboards are keyboards with larger sized keys for typing. They often also include high contrast colouring on the keys. Both of these devices improve accessibility for users with a visual impairment.
- **Touchscreens** – While not strictly an accessibility device, touchscreens are often easier for selecting items on screen than using a mouse for users with limited mobility. As you can resize and change the colouring of onscreen elements (such as an onscreen keyboard) this can also help users with visual impairments to access a computer.
- **Braille Embossers** – This is a printer that will output using braille cells as opposed to standard ink text. This allows people with visual impairments to access the hard copies of their work after printing.
- **Screen Magnifiers** – This usually attaches to an existing monitor and magnifies the display output to make it easier to see. This is useful for users with a visual impairment.

# A3: Computer software in an IT system

Operating systems is what coordinates all the operations of your computer. It manages all the resources on the computer, such as the CPU and RAM, and controls the software and hardware. Without it, your PC would be useless.

## Types of operating systems

### Real time operating system (RTOS)

- A real time operating system is an operating system that operates in real time giving a very fast response.
- Real time operating systems are used to get instant feedback when data has been input.
- An example would be an air bag system on a car. Sensors detect whether there has been a sudden deceleration and will then send the signal to a computer which will determine whether the airbag should be deployed or not.

### Single-user single task operating system

- This type of operating system does not require many resources and is designed for one user to use the ICT system at any one time.
- An example of a this kind of operating system would be found on devices that have limited processing and memory, which could not handle running multiple applications, such as a basic mobile phone or a simple handheld game.

### Single-user multitasking operating systems

- Within this type of operating system only one user can use the system at any one time but multiple applications can be run at once.
- An example of this type of operating system would be a modern tablet, laptop or desktop computer.
- For example the user could browse the internet and listen to music at the same time using the same operating system.

### Multi-user operating systems

- As the name suggests the operating system can be used by multiple users at the same time.
- The ICT system can share resources between users.
- An example might be a file server where students in a school or college can gain access to files that a teacher has shared. Each student can gain access to the files at the same time.

# Role of operating systems

The operating system on a digital device is the link between the hardware and software. It passes messages back and forth and carries out instructions from the software to the hardware.

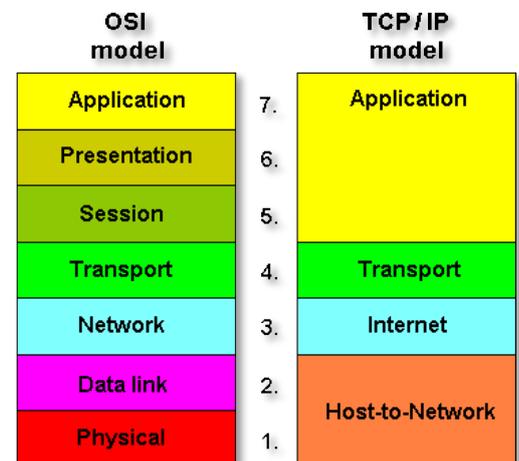
- **Networking**

Operating systems manage how digital devices are networked with other digital devices.

An operating system contains built-in software designed to simplify the networking of a computer.

Typical operating systems include an implementation of the TCP/IP protocol and related utility programs like ping and traceroute.

Operating systems contain the necessary device drivers and other software to automatically enable a device's Ethernet card. Mobile devices also normally provide the programs needed to enable Wi-Fi, Bluetooth, or other wireless connectivity.



- **Security**

**Operating system security** refers to specified steps or measures used to protect the OS from threats, viruses, worms, malware or hackers.

Operating systems control **user authentication** and password security to ensure only authenticated users can gain access.

Operating systems manage **anti-virus and firewall software** to ensure viruses, malware and worms cannot gain access to the ICT system.

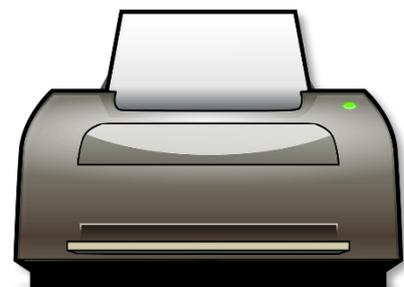
Operating systems manage **back-ups** to ensure that if data is lost then it can be recovered.



- **Device drivers**

Operating systems work with **device drivers** (device software) to allow the communication between the main operating system and other devices such as **printers** and **scanners**.

Some peripheral devices such as printers and scanners come with their own drivers to use the peripheral to its maximum capability.



- **Memory Management**

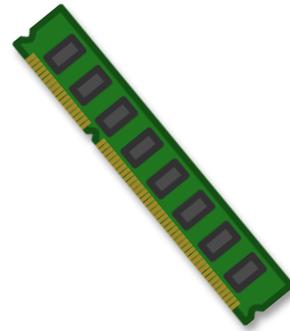
The operating system transfers programs into and out of memory.

The operating system allocates space between programs.

The operating system keeps track of memory usage.

The operating system tracks when to un-allocate memory from a particular process.

Frees space in the RAM by transferring data to the HDD



- **Multi-tasking**

The majority of operating systems will allow the running of more than one application at once. The Operating system will allocate resources such as the **CPU** and **Memory** to the applications allowing tasks to be completed.

For example a user might be listening to music while creating a spreadsheet document. The operating system will share the resources between each application.



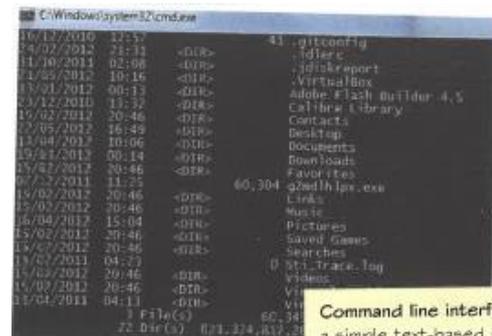
## Factors affecting the choice and use of user interfaces

The user interface is a core part of any operating system. It allows the user to interact with the computer system and is the part of the software that has a huge impact on a user in terms of usability.

- **Command Line**

Once upon a time command line interfaces, or CLI, were the most heavily used form of user interface. Computers weren't powerful enough to display the sort of graphics involved with other types of interface and so the simple text-based interface of CLI was the only option.

However, it is still used by some expert users, particularly for tasks like managing and maintaining a network. These users find a CLI much more powerful and efficient for completing these types of tasks.



Command line interfaces use a simple text-based screen to provide interaction.

MS-DOS was a popular operating system. If you have ever used Command Prompt on a Windows PC or Terminal on a Mac, then you have an idea of what a command line interface would look and work like. A plain background with a simple text prompt that would allow you to enter in commands to perform actions.

## Advantages

- Experienced computer users who know the various commands used in a CLI find it much quicker to complete tasks than navigating around a graphical user interface.
- The simplicity of this interface means it requires much less memory & processing power in order to run. This means it can run on weaker computer systems. It also takes less space on the hard disk.

## Disadvantages

- You need to know the various commands in order to operate the computer system. This makes it very difficult to use for beginner and inexperienced computer users.
- The interface is not intuitive at all. You cannot figure it out just by giving it a go and will require some training to make even the basic use of it.

- **Graphical User interface (GUI)**

The likelihood is that on your home computer your operating system is using a graphical user interface, otherwise known as a GUI for shorthand. Operating systems like Windows 10, Mac OSX & Ubuntu all make use of GUIs. As do mobile operating systems like Android and IOS.

This type of user interface is designed around graphical icons and images. We commonly know this as a WIMP interface. This stands for Windows, Icons, Menus & Pointers. This is because we use a pointer, such as a mouse cursor, to navigate and interact with the computer using windows, icons & menus.

## Advantages

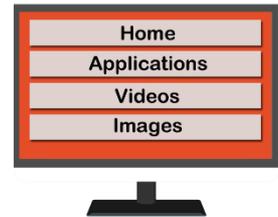
- It is easy to use, especially for beginner users. Users do not need to learn any complex commands in order to use the interface. Instead, navigation is very intuitive relying on users moving a cursor on the screen and clicking to indicate an action.
- It is easy to move data between different software applications. Dragging and dropping or copy & pasting really simplify this process and make it easy to use.

## Disadvantages

- It uses a lot of processing power and main memory to run. This can cause problems with older systems that don't have a lot to spare.
- It can be frustratingly slow to perform certain tasks for experienced users. Many tasks require a number of actions to complete, which, in a command-line interface, could be completed in just one.

- **Menu faced**

This type of user interface presents the user with a menu that contains a list of options. The user navigates through various submenus by choosing the relevant option in order to perform the function they want.



You can see this type of user interface used in many self-service kiosks. For example, ATM machines at the bank and self-service tills at the supermarket both commonly use menu-based interfaces. Many fast-food restaurants also have self-service kiosks that use menu-based interfaces to choose your meal.

### **Advantages**

- This is a very easy-to-use interface. The simplicity of the interface, with limited possible actions & clear options, makes it very user-friendly.
- The interface is very easily adapted to different users. In particular, it is easy to translate into various languages and the options can be spoken rather than just being visual.

### **Disadvantages**

- A menu based interface can be very frustrating for users if there are a lot of different levels of submenus as this can take a long time to navigate. Especially when compared to a CLI.
- Options are limited, so more complex actions cannot be performed and if the required option is not available then you will not be able to complete your task.

- **Adapted Interfaces**

An adapted, or adaptive, interface is one that will alter its presentation, layout & even options in order to better support the user or the technology it is running on.

Windows operating systems, for example, are known for being highly adaptive. Colours, images, font sizes, cursor sizes, screen resolution and many other elements can all be adapted to better support the user. Windows 10 is also able to alter itself for running on smartphone, tablet or personal computer.

### **Advantages**

- This fits the needs of the user very effectively. This can ease confusion for inexperienced users and improve accessibility for those with individual needs, such as those with visual impairments.

### **Disadvantages**

- This requires an understanding of the user needs in order to adapt it, which can be a time-consuming task. This is particularly true for a device being used by multiple users who each need the interface adapted differently.

## Factors affecting use and performance of operating systems

- **Hardware** – hardware can affect the performance of an operating system. CPU speed, RAM capacity, Number of cores and Read/Write times all affect the speed of the operating system.
- **Malware** – malware can affect the performance of an operating system. Viruses, Worms and Spyware can effect how the hardware and software can perform. They can often completely stop the system from operating.
- **Virtual Memory** – Virtual memory is used when an operating system is running many applications at one time. Using virtual memory slows the computer down because copying to a hard disk takes much longer than reading and writing RAM.

## Utility software

This is used to manage system resources. Utilities are like a tool box to help us optimise and maintain our computer system. Many utilities are pre-installed as part of the operating system, such as traceroute, while others may be selected by the user and installed, such as antivirus scanners.

- **Disk utilities**

These are designed to maintain the performance of a computers disk drive.

**File compressors** – backing up large files and sharing them online can be difficult. The utility compresses files to reduce their size and decompresses them for later access.

**Backup** – you regularly want to back up your files, but this can be slow as a manual process. Backup utilities allow you to automate the backup process.

**Disk defragmenter** – over time a computers disk drive becomes fragmented, which slows down file access. The utility reorganises the data for quicker access, but is only required on a HDD when using Windows (fat32/NTFS) file systems.

- **Network utilities**

These are designed to maintain good network traffic and keep network secure.

**Firewalls**- This application will monitor the traffic coming into and out of your computer system (via its ports) over a network to look for anything suspicious. This might be hackers or malware for example. It will block off any suspicious data to prevent harm being caused.

Firewalls don't specifically suffer from performance issues in terms of speed, though they can slow your network speed for other activities. Malware may target your firewall though to prevent it from working effectively and open security holes that can be exploited by a hacker or other malware.

**Antivirus-** Anti-virus will detect any suspicious programs and remove them before they can cause problems. They usually do this through scanning newly added files and software, as well as through regularly scheduled scans of the storage devices connected to your system.

- **Other utilities**

**Disk/Registry cleaner-** Over time our hard disk becomes cluttered with data that we do not use, such as temporary files and old unused applications.

Disk cleaner utilities will identify data that can be removed in order to save hard disk space that can be used for newer data. The registry cleaner will remove old redundant registry entries, such as from deleted software programs.

Both of these can improve performance, by reducing read/write disk times. Though this really would only show a marked difference if you have an excessive amount of redundant data/registries to remove.

## Application software

Application software allows end users to complete tasks, such as creating a report or a presentation.

There are many different types of application software that have their own uses. These include:

**Productivity software** – these are applications like word processors, desktop publishers and spreadsheets that are used in an office environment to support business tasks and improve efficiency.

**Graphics software** – are used to edit photos or create original artwork.

**Communications software** – makes communicating quicker and easier. They include instant messaging, email and VOIP software.

- **Proprietary and open source software**

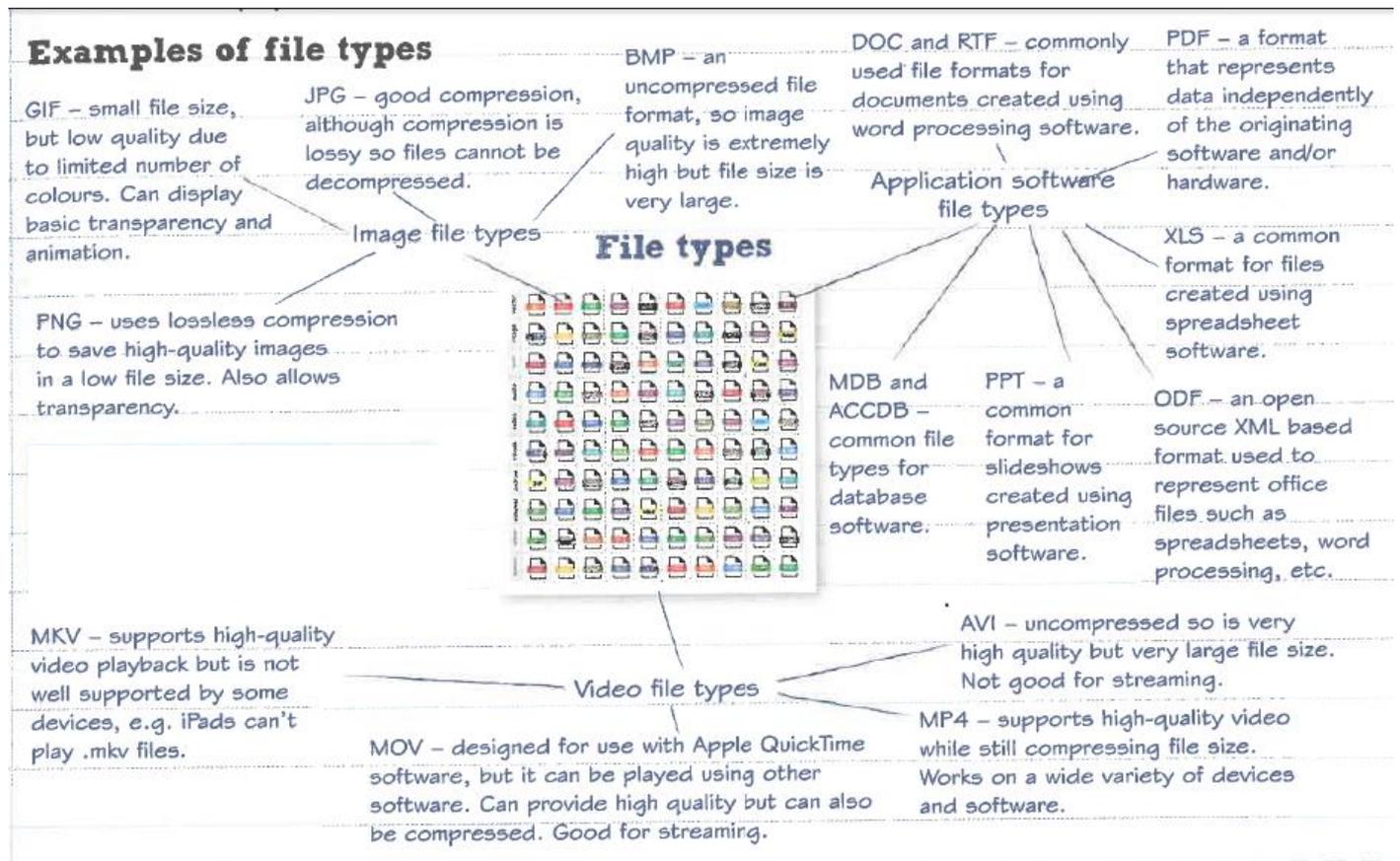
These terms refer to who owns the source code behind the software.

<b>Proprietary software</b> – the source code is privately owned by the software company. Users pay to buy or subscribe to the software.	
✓ Support is provided by the software ✓ May have more features than open sources software.	✗ Software company may be slow to provide updates and bug fixes. ✗ it can costly

<b>Open source software</b> – is available to read and modify	
✓ Is free to use ✓ Support and fixes are provided by the community, often via forms	✗ There may be indirect costs involved in paying for support and training ✗ Support with fast response may not be available when needed as it relies on goodwill.

# Features of common file types and formats used for images, videos and application software

Different file types are used to denote the form, or structure, of the data stored within the file. The file extension tells the user what type of data the file should contain. It also tells the operating system which icon to display and which software to use to open the file when the user double clicks the icon.



The choice of file type or storage method of data has ongoing implications for individuals and organisations, including,

Issue	Description	Why might this be an issue?
Compatibility	Some file types only work with certain software.	May need to purchase new software. Sharing files with others who do not have the required software.
Quality	Different image, video and audio file types provide varying levels of quality.	Choice will depend on intended use of the files – e.g. is high quality the priority or small file size?
File size	The file type affects file size – some types are very efficient in the way they store data whereas others use lots of storage space.	File size may have implications for storing, transmitting or displaying files.

# A4: Emerging Technologies

The growth of the IT industry has led to constant innovation with new emerging technologies appearing all the time. Businesses need to and are expected to embrace these technologies in order to keep up with competitors and to try and gain an advantage over them. Examples include:

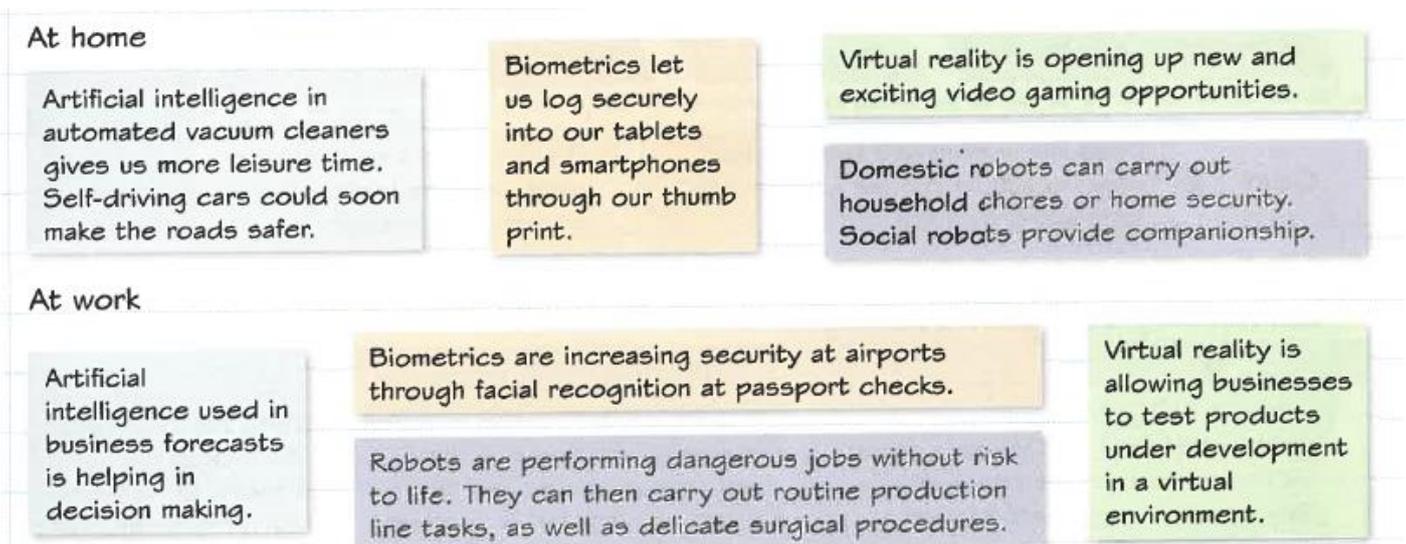
Technology	Impact on Performance
<b>Virtual Reality</b>	This requires powerful graphics processing capabilities and large main memory in order to use. Video game console manufacturers are having to release upgraded consoles to provide VR capabilities to keep up.
<b>Media Streaming</b>	Home networking & internet connections are often not fast enough for smooth media streaming. This is especially true for 4K content driven by emerging technologies in the TV industry, such as Ultra-HD TV screens.
<b>Self-Driving Cars</b>	Lidar sensors, mobile broadband communication & powerful processing are all required for self-driving cars. Tesla said the computer used for their self-driving cars is 40 times more powerful than previously used.

However, keeping up these technologies comes with some downsides. Often we do not have the required infrastructure to make use of these new technologies effectively as they require more powerful processors, increased memory, greater storage and faster networking.

## Emerging technologies at home and work

Emerging technologies are changing the way we live our personal lives and the way we do business.

Below are some examples:



## Implications of emerging technologies

The Internet of Things (IoT) allows your car to know where you are going and how to get there, and your fridge to pre-order your supplies, but all this needs data. Increasingly, advanced data-hungry technologies are placing a strain on the existing infrastructure.

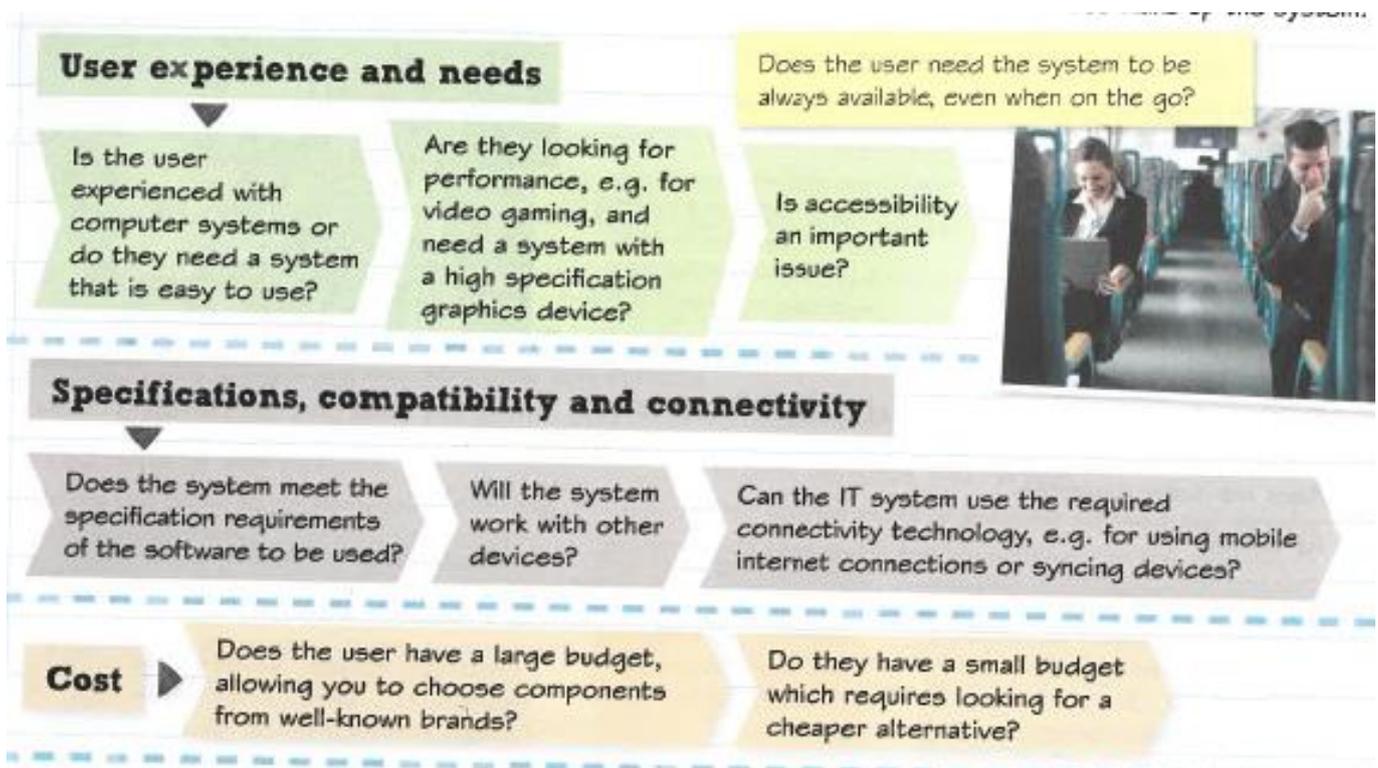
Society demands data whenever and wherever it likes, we are no longer confined to the home WIFI network or the office LAN. Location aware technologies and the availability of 3D imagery means that data access is essential to maintain and develop the emerging world of virtual reality and autonomous systems.

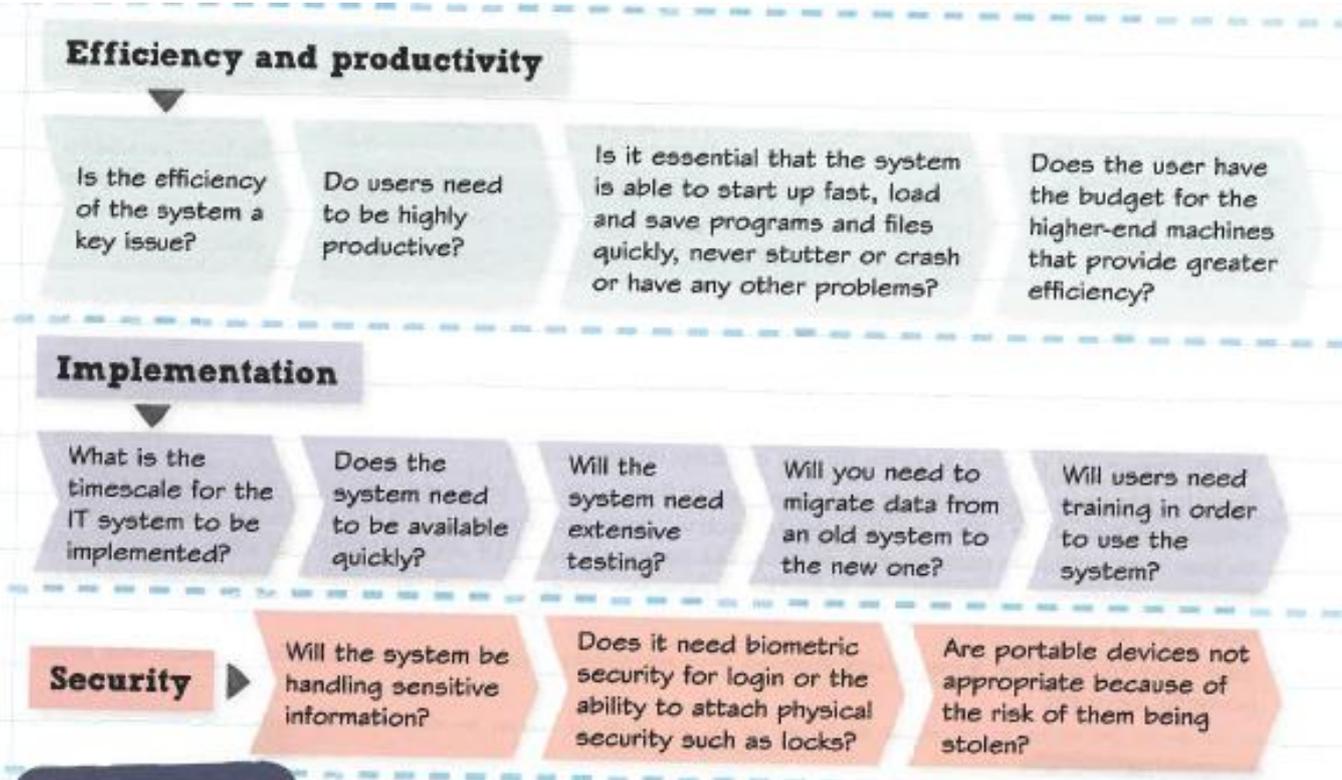
There are new ways of gathering data resulting in the emergence of “**big data**” which means we need new ways of analysing it.

New ways of identifying ourselves through biometric data also brings the need for greater and more powerful security.

## A5: Choosing IT systems

There are many factors to consider when choosing the best systems for the end user, ranging from what the system needs to be capable of doing, to how the user interacts with it and what devices make up the system.





⇒ User Experience

The “user experience” is about the feeling a person gets when making use of a device. When purchasing an IT system, we all want to use it for different reasons and are looking for a different experience from the device.

The experience a user is looking for depends on their own skill set and needs. Some of the user experience factors include:

- Ease of Use – How simple and intuitive the device is to navigate and perform tasks on. An inexperienced IT user may choose a device that is simple for them to use, or they’re more experienced with.
- Performance – How powerful the device is, such as processing, memory, graphics & storage. Someone purchasing a system for high-end gaming may prioritise a device that has excellent performance.
- Availability – How often the device can be used, such as whether the device can be always on. A company purchasing an IT system for hosting their website will want it on 24/7.
- Accessibility – How available the device is to be used by someone with a disability. Someone with a visual impairment may choose a device that uses adaptive technology to support them.

Each of these factors has different levels of importance to different users. The inexperienced IT user who wants a device for browsing the web while commuting will prioritise ease-of-use and availability over performance. If they have a disability then accessibility will become of greater importance.

## ⇒ User Needs

This is about what actual tasks the user wants to perform using the IT system. We all use IT systems for different reasons, and often we have multiple devices and we use each for a separate reason.

That's because many devices are designed to meet specific user needs and are much better at meeting that particular need. A graphic designer purchasing an IT system for working on will look for a device compatible with the graphics software they use and the peripheral devices they prefer. They'll also want one that can produce high-resolution output.

## ⇒ Specification

This is the list of components required of a computer system in order to allow users to run the software they need and perform their tasks.

This can vary greatly depending on what the user is using the IT system for. Someone purchasing a computer for video gaming will need a system that meets the minimum hardware requirements of the games they wish to play. This commonly includes the storage space, processor speed, main memory capacity & graphics processing capabilities.

## ⇒ Compatibility

This is about whether the IT system can communicate with the other devices you are using it with. Peripheral devices, for example, will need to be able to connect to and work with the IT system.

A user purchasing a tablet will not be able to connect any device that uses a standard USB port, as these devices almost exclusively use mini-USB & USB-C style connectors. Some modern PCs only have an HDMI port for connecting a monitor, which an older monitor would not be compatible with.

## ⇒ Connectivity

This is about how a device can connect to a network, such as a LAN or the Internet. Users may require connectivity on the go, or need a wired network connection.

For example, many devices can only connect wirelessly, and those that can connect wirelessly, that might be just WiFi. However, some wireless devices can also use Bluetooth and/or mobile broadband.

A user purchasing a device for accessing their emails & the web while on the go will want to ensure it is compatible with mobile broadband, such as a smartphone or a tablet.

However business' often use wired connections throughout their building for a LAN. This means a device will need an ethernet port, which most mobile devices and even many laptops will not have.

## ⇒ Cost

The cost of an IT system varies wildly. A Raspberry Pi computer will cost you around £30, while a powerful gaming computer can cost well over £1000.

There is also the cost of running a device to consider. Not just in terms of electricity, but consumables, such as printer ink. We don't have unlimited funds as individuals or as a business and so have to be careful with how we spend our money.

For example, when purchasing new printers for a business you have many options, such as whether you use an inkjet or laser printer, the speed of printing and whether it prints in colour or not. There are also multi-functional printers that can scan, photocopy & fax.

The features available will affect the cost of purchasing and running it, and a business must balance the capabilities of the device against the cost.

### ⇒ Efficiency

This is about how effectively tasks can be completed by the digital device with as little wastage of resources as possible.

The resources we most often consider are time and staff. Can the system perform the task quicker? Does it need fewer people to operate it? However, it can also be energy efficiency, such as a technology that requires less power to run.

Most supermarkets have self-service tills nowadays. This wasn't true several years ago though. This changed because it allowed a single employee to look after several self-service tills. This reduces the number of staff the supermarkets need and so makes the business much more efficient.

### ⇒ Implementation

This is about the time involved with putting a new system into effect. This isn't just the time for delivering the hardware, connecting it up and running it, because we also need to install our software and likely transfer data from the old system to the new one.

Some of the implementation factors to consider with a new IT system include:

- Timescales – The time it takes for the new system to be delivered. The lead time for the delivery of an item could mean it will take too long to arrive to meet our needs.
- Testing – Ensuring the new system works correctly and our software is compatible & stable. Some devices will require greater testing than others and this has to be factored into your decision.
- Migration – The process of transferring data, software & files from the old system to the new one. This can be much more complicated depending on your device, but some can automate the process.

An example where implementation has an impact is when you purchase a new smartphone. If a certain phone is out of stock for some time you might not consider it as an option.

Additionally, if you have historically had an iPhone, switching to an Android device will make migrating your data and software much harder, which might drive you to stick with an iPhone.

### ⇒ Productivity

This is about how quickly tasks can be completed when making use of an IT system. Slow boot times, save/load times & whether the device tends to freeze or crash can have a big impact on efficiency.

Obviously, within a business, this can have a big impact on the productivity of staff, but it must be balanced carefully against other factors, such as cost.

An example is how many shops have started to use contactless payment methods at the till. One of the key benefits to this is that payment can be completed quicker which helps make the business more productive.

### ⇒ Security

This is about how safe a device is from security threats, such as hackers & viruses. Some devices are much more susceptible to these threats than others.

For example, Windows PCs are more likely to come under attack from viruses, than a Linux computer or a Mac. This means additional costs will need to be considered such as anti-virus software as well as better recovery procedures.

We also treat some devices differently and can be much more vigilant about security with certain devices than we are about others. For example, users often aren't as careful about security with mobile devices as they are with laptops.

# Articles for Wider Reading and Flipped Learning

## Know it all Ninja

Read through the topics on:

- ⇒ Functions and use of digital devices
- ⇒ Peripherals devices and media
- ⇒ Computer software in an IT system
- ⇒ Emerging Technologies
- ⇒ Choosing IT systems

Remember to complete the on-line quiz to gain house points and test your knowledge.

<https://www.knowitallninja.com/>