Credit value: 10

30 Digital graphics

Digital graphics are found in many places, including promotional materials, documents and websites. This unit will give you an awareness of the software currently available to create and manipulate images. It will show you techniques that you can practise to enhance your graphical skills, as well as the hardware required to capture, edit and print digital images.

When you have completed this unit you will have improved your technical skills in using both vector and bitmap software packages. You will learn the importance of choosing an appropriate file format for saved graphics, with an appreciation of the issues around resizing images and pixellation distortion. You will need to understand how to use formal checking to ensure that a final product meets the requirements and that artwork keeps within the laws of copyright.

Learning outcomes

After completing this unit, you should:

1. know the hardware and software required to work with graphic images
2. understand types of graphic images and graphical file formats
3. be able to use editing tools to edit and manipulate images
4. be able to create and modify graphic images to meet user requirements.

Assessment and grading criteria

This table shows you what you must do in order to achieve a pass, merit or distinction grade, and where you can find activities in this book to help you.

To achieve a **pass** grade the evidence must show that you are able to:	To achieve a **merit** grade the evidence must show that, in addition to the pass criteria, you are able to:	To achieve a **distinction** grade the evidence must show that, in addition to the pass and merit criteria, you are able to:
P1 describe the hardware and software used to create and edit graphic images **See Assessment activity 30.1, page 232**	**M1** compare the limitations of different hardware and software packages used in graphics work **See Assessment activity 30.1, page 232**	**D1** evaluate the impact of evolving output mediums on the design and creation of graphic images **See Assessment activity 30.1, page 232**
P2 explain how different types of graphic images relate to file formats **See Assessment activity 30.1, page 232**		
P3 demonstrate the use of editing tools to edit and manipulate images **See Assessment activity 30.2, page 237**	**M2** justify the software, tools, file format, image resolution and colour depth used for creating graphic images. **See Assessment activity 30.2, page 237**	**D2** discuss the impact that file format, compression techniques, image resolution and colour depth have on file size and image quality. **See Assessment activity 30.2, page 237**
P4 create original graphic images to meet a defined user need **See Assessment activity 30.2, page 237**		
P5 modify images as a result of user feedback **See Assessment activity 30.2, page 237**		
P6 explain the potential legal implications of using and editing graphical images **See Assessment activity 30.3, page 238**		

How you will be assessed

This unit will be assessed by internal assignments that will be designed and marked by the staff at your centre. It may be subject to sampling by your centre's Lead Internal Verifier or an Edexcel Standards Verifier as part of Edexcel's on-going quality assurance procedures. Assignments are designed to allow you to show your understanding of the unit outcomes. These relate to what you should be able to do after completing this unit.

Your assessment could be in the form of:

- presentations
- case studies
- practical tasks
- written assignments.

Dan, BTEC National IT learner

When I first started my National Diploma course, I already had a massive love for graphics. When I discovered I could carry on with graphics on the course, I was over the moon.

Our graphics course was built over three assignments that were fun, but at the same time took a while to get our heads around. We have been able to use all types of new software packages, and I have improved my skills so much by learning how to use them and being able to access them any time I needed.

In the final assignment, we had to pick an unknown company and design a brochure for them to use. I really enjoyed the assignment, picking a local band called Tom + Olly from Brighton. I got to try out new ways of making logos and editing pictures to make them look the way I wanted them to look. We were allowed so much time and freedom in this assignment that it was possible to really put my own mark on the brochure and be happy with the final outcome.

To sum up my graphics course at college, it has been fantastic and I have learnt so much over the year of studying the subject. I have improved my skills by a huge margin, and now feel confident in new areas and even more confident in the areas I knew something about before.

Over to you!

- **What planning do you think Dan needed to do before he could produce his brochure?**
- **Can you find any graphics software applications that include templates to help produce brochures?**
- **Identify and explain at least three ways that a template could help to produce a brochure?**

1 Know the hardware and software required to work with graphic images

Start up

Can we believe our eyes?

Many modern images are faked or enhanced to help them become more effective, especially when used in adverts.

- Go to www.life.com/game/realfake to look at some images on the Life website. Find out how well you can pick out the fake photographs on this website from real ones.
- Search the Web for photographs that interest you. Identify photographs that you think:
  - are enhanced to help sell a product
  - are faked to give a wrong impression
  - have been edited into a humorous image.

1.1 Hardware

Working with graphic images requires suitable **hardware** and **software** to produce the best results. The hardware used can have a dramatic impact on the ease of working with graphical images. Large amounts of data need to be moved between components such as the hard disk and RAM and video display, which can result in a frustratingly slow system if the components are not ideal.

Slow systems are not only more difficult to use, but they can also stifle the creative side of anyone using the system. If a wrong click of the mouse makes the system unusable for a minute or so while the hardware struggles to catch up, then there is less incentive for the user to try new things.

Graphics should be fun and any computer system that is used to work with graphics should be fast enough to make it a pleasure.

Suitable hardware for a graphics system should include these components at appropriate performance levels:

- graphics card – needed to produce a display at a **resolution** and **colour depth** that meet the needs of the user within the capabilities of the monitor
- internal memory (RAM) – to hold the running software and graphic images
- processor – to run the software and work out the calculations needed to manipulate digital graphics
- digital card reader – to quickly and easily accept graphic images from a digital camera
- file storage – to save the graphic images
- USB devices – to plug in pen drives to input or move graphic images to other devices or other USB devices, such as digital cameras
- input devices – to capture graphical images and transfer them to the computer system. Graphical input devices include digital cameras, scanners and graphics tablets.

For a computer system that is used for graphics, the higher the spec the better. A high-resolution display with good colour depth is essential for most graphic designers.

Key terms

Hardware – the physical part of a computer system, including components inside the system unit, peripherals such as monitor and printer, as well as specialised devices such as a digital camera.

Software – the collection of programs installed on the computer.

Resolution – short for display resolution. This is the number of pixels (see below) or lines to the inch on the screen or other output device. It is usually written as two numbers: the number of pixels across then the number down. So a 1024 × 768 display resolution has 1024 pixels across and 786 down, giving 786,432 dots on the screen.

Colour depth – the number of bits used by the graphics system to hold the colour of each pixel on the screen. A 24-bit colour depth means the number of colours available on a computer system will be 16.7 million.

Pixel – short for picture element. It is a dot of colour on a screen or other output device..

RAM – stands for random access memory. It is the name given to the electronic memory plugged into the main motherboard inside the system unit. RAM is often 1 GB or more in a modern computer system. This component is often replaced when a PC has a memory upgrade.

Cache memory – very fast electronic memory between RAM and another device, used to make the system run faster.

Digital graphics are an art form, so you need to have some artistic ability as well as a suitable computer system before you can create outstanding images.

Graphics cards

The graphics card takes digital information from the operating system specifying what is to be shown on the screen and makes this into a signal that the display understands. The signal usually travels along a video cable to the monitor, which uses it to create the picture.

Most modern graphics cards are very capable of producing an image that meets the highest needs of any monitor without noticeably slowing the system down.

Professional graphic designers value a DVI (digital visual interface) connection between graphics card and monitor in preference to the older VGA (visual graphics array) cable connection, as it gives a better picture.

Professional graphic designers often work with 32-bit colour depth, which gives 'truecolor' – this is a system where 32 bits are used for each **pixel**: 24 bits for the colour and the other 8 bits giving transparency information of 256 values, from fully opaque to fully transparent.

Internal memory

The internal memory of a computer system is called **RAM**. It is primarily used to hold programs when they are running and any documents or graphic files that the user has opened.

There is a constant flow of data between the hard disk, the RAM and the processor (see Figure 30.1). When a software application is run, the program is first copied from the hard disk to RAM. Once in RAM, the program can travel at very high speed to the processor where the program code can be run. RAM works at the speed of electricity, much faster than a hard disk, which works at the speed the disk spins.

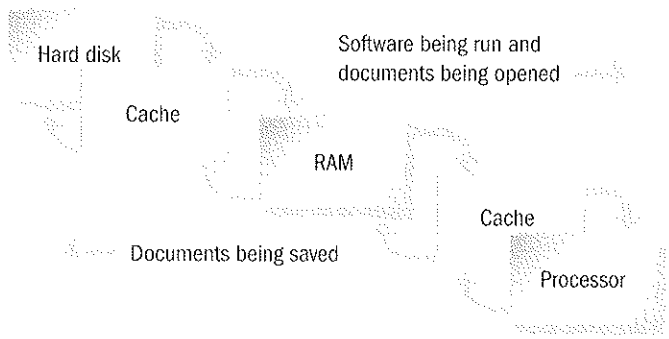


Figure 30.1: Data flows in a computer system

Similarly, when a document or data file is opened, it is first copied from the hard disk to RAM. Once it is in RAM, the file can be worked on by the user.

Most modern hard disk drives have **cache memory** built into the control electronics to help the drive work faster.

The cache is used so that:

- the **FAT** is copied from the disk to cache to make finding disk addresses faster, as fast electronic cache is used rather than slow disk to access FAT
- if data is needed from a drive, the required data is brought to cache, as well as the next data on the disk, so if the computer needs this as well, it is already in the cache, ready to go
- when data is written to disk, it is very quickly sent to cache so the drive electronics can then write the data to disk at slow disk speed without reducing performance in the rest of the system.

Usually there is some cache memory between processor and RAM. This cache may be on the motherboard or part of the processor. The processor works a lot faster than RAM, so needs a good supply of data and software to keep running without slowing the system down. Processor cache is a type of very fast RAM, keeping the processor from slowing down in a similar way to how disk cache helps the hard drive work faster.

Graphic files can be huge, so everything that the hardware can do to make rapid transfers of data helps.

Processors

The processor (or **CPU**) is the heart of a computer system, allowing the operating system and other programs to run. Every program consists of instructions for the processor that are decoded and actioned inside the processor to make them work.

When running a program, the processor has to make every instruction work, usually one after another, but some modern processors can run processes side by side. The quicker the instructions are run, the quicker a program responds to the user.

The processor is very important in maintaining performance with complex digital images, so it's important to choose a system with a powerful CPU.

The power of a CPU depends upon:

- processor speed – the faster the circuits are driven, the faster the computer runs
- processor design – the way the circuits have been designed has a massive effect on performance. Modern CPUs may have single, duo or quad cores with a lot of variation within these designs.

Key terms

FAT – stands for file allocation table. The FAT is held on the disk to connect names of files and folders to where they actually are on the disk. When a file is opened or saved, the disk address needs to be looked up in the FAT before the file can be found. FAT can be likened to a phone book holding the addresses of files on the disk.

CPU – stands for central processing unit, another name for the processor. This is a chip that fits into a socket on the motherboard. Modern CPUs are often made by AMD or Intel. The AMD family of CPUs include Athlon and Opteron. Intel processors include Pentium and Celeron.

DMA – stands for direct memory addressing. DMA is the name given to circuits on the motherboard which are used to move large amounts of data from one part of the system to another.

WiFi – an increasingly popular standard for wireless networking and connection of PCs and other devices such as printers. WiFi is based on the 802.11 standard for wireless transmissions.

The core of a processor is a collection of circuits that run programs. For early CPUs, there could only be one core, as the technology of that time needed all the circuits on the chip just to make the processor work. Technology has advanced so much that now manufacturers can include two or more cores in the same chip, equivalent to having two or more CPUs in the same component.

There is a lot of choice of processor designs and it takes research to find out which performs better.

Some graphics manipulations are easy for the processor, eg loading a graphic from disk to RAM, which is delegated to the **DMA** controller(s).

Many graphics operations involve a lot of processor work, such as:

- rescaling an image, so the picture is a different size
- saving or exporting the image into another format, eg converting a bitmap file into a JPEG file (see page 227)
- applying a complex effect to a graphic, such as adjusting the tone or colour balance (see page 234).

All of these operations needs good, fast processor(s) to operate effectively.

Other hardware

Digital cameras and card readers

IT professionals who work with digital graphics often need to bring pictures from a digital camera into the computer system. There are four methods for doing this: cable, card, wireless and cradle.

Cable: Most digital cameras have a cable to connect the camera to the computer so pictures can be transferred, usually from camera to hard disk. The cable will probably be USB, but other standards, such as the faster FireWire®, are also available.

Card: Virtually every digital camera on the market uses a flash card to store the pictures taken with it. There are several types of card currently available, each with different sizes and different connections:

- SD (Secure Digital) – a secure stamp-sized digital camera memory card
- SDHC (Secure Digital High Capacity) – offers high storage capacity, currently to 256 GB
- CF (Compact Flash) – the world's most popular type of digital camera memory
- Memory Stick – from Sony, used in a wide range of Sony products
- MMC (MultiMedia Card) – a very small card which can also operate in SD devices
- XD – from Fujifilm and Olympus, with a very small footprint of only 20 × 25 × 1.7 mm

Digital camera cards

- SM (Smart Media) – from Toshiba, now becoming less popular.

Usually only one type of card will fit the camera, but many computers used for digital graphics have a card reader which can accept many types of card, often in the same slot.

The card can easily be removed from the camera and then inserted into a card reader to allow a very quick and effective data transfer of the pictures from camera to computer.

Wireless: Cameras offering **WiFi** radio connection to a network or PCs are now on the market. This allows a fast data transfer of the pictures without the need to use cables or remove the memory card. Bluetooth® is a slower wireless technology that can be used to transfer images between a mobile phone and a computer.

Cradle: Some digital cameras use a cradle to attach them to the computer system. This is a quick and easy method for transferring pictures to the computer as the camera simply pushes into the cradle that is already cabled to a computer.

Many cradles recharge the camera and can create a slide show of pictures.

Digital camera cradle

A cradle is similar to most hardware, in that it will need a driver to make it work properly, probably on an installation CD that is bundled with the cradle.

File storage

Graphic files need to be stored so they can be used again, modified, **backed up** or sent to a third party, such as a client.

Key terms

Back up – to copy computer work to another place so that it is kept safe in case of emergency such as file corruption, fire, flood or theft. Many users back up to CD-ROM, then store these somewhere secure, such as a fireproof safe or off-site in another location.

Solid state device – a device that has no moving parts. USB pen drives are solid state because they store data onto electronic circuits which hold their values even when unplugged. USB hard drives are not solid state because the hard disk spins (moves) when used.

File storage is needed to store files such as:

- hard drive
- CD-ROM and optical drives
- flash cards
- USB storage devices.

Hard drive

The hard drive is the obvious place to store graphical files as it is quick and the graphical software will look there first to open or save work because of the computer system default settings.

- Modern hard disks are very quick and spacious, with lots of room for work. Hard disk drives also have cache memory (see page 217) to improve the disk performance.

Did you know?

Even the best computer systems fail sometimes, so you should regularly back up your work.

CD-ROM and optical drives

Most computer systems have CD-ROM and/or DVD drives – these are optical disks used to install software, play DVDs and to store files.

For an optical drive to store files, it must be of the right type. Table 30.1 shows the bewildering choice of standards available for optical drives. Fortunately for most IT professionals, the choice is a simple one: usually a DVD +/- RW drive for reading and writing DVDs that also handles the CD-RW standard for writing and reading CD-ROMs.

Flash cards

Digital cameras and other devices often use a flash card to store pictures or other data.

There are several types of flash card, each with a different size, shape and connectors (see Digital cameras and card readers, page 219).

USB storage devices

There are many USB storage devices currently available to plug into the USB port of a computer system.

External USB hard drives are quite popular as a means of backing up data and to take a substantial amount of work between computers.

USB pen drives are **solid state devices** that have become increasingly popular as they are cheap, robust, quick and offer reasonable capacity for storing files, especially to move from office to home or client. A lot of organisations now find them cheap enough to send through the post or even to give to a client with their completed graphic images.

CD-R	Compact Disc-Recordable: also referred to as Compact Disc-Write Once (CD-WO). A type of disk drive that can create CD-ROMs and audio CDs, allowing users to 'master' discs for subsequent publishing.
CD-ROM	Compact Disc-Read Only Memory: a standard for compact disc to be used as a digital memory medium for personal computers. The 4.75-inch laser-encoded optical memory storage medium can hold about 650 MB of data, sound and limited stills and motion video. A CD-ROM player will typically play CD-DA discs but a CD-DA player will not play CD-ROMs. The standard used for most CD-ROM formats is known as Yellow Book, based on the standard published by Philips.
CD-ROM XA	CD-ROM Extended Architecture: a hybrid format, promoted by Sony® and Microsoft®, that combines CD-ROM and CD-i capabilities. The extension adds ADPCM audio to permit the interleaving of sound and video data to animation and with sound synchronisation. It is an essential component of Microsoft's plan for multimedia computers and also the physical format for Kodak's Photo CD format.
CD-RW	Compact Disc-Rewritable: once known as CD-Erasable, or CD-E.
DVD	Digital Versatile Disc: the replacement for the ubiquitous compact disc. Like the CD, it is available in a number of different formats. Unlike the CD, it is available with a number of capacities ranging from 4.7 GB to 17 GB.
DVD Multi	A logo program that promotes compatibility with DVD-RAM and DVD-RW. Putting the emphasis for compatibility on the reader, not the writer, it defines a testing methodology to ensure drives are able to read both DVD-RAM and DVD-RW media.
DVD+R	A write-once optical media format designed for use by devices using DVD+RW technology.
DVD+RW	A competing (with DVD-RAM and DVD-RW) rewritable DVD standard being promoted by Hewlett-Packard, Philips and Sony®. Unlike the DVD-RAM standard, DVD+RW allows the use of bare discs. All three standards are incompatible. At one time the DVD-Forum – which does not support the standard – was insisting on the name being changed to '+RW' – but this appears to have had little effect.
DVD+RW Alliance	A voluntary association of industry-leading personal computing manufacturers, optical storage and consumer electronics manufacturers.
DVD-R	DVD Recordable: the write-once DVD format. DVD-R discs are the DVD counterpart to CD-R discs.
DVD-RAM	A rewritable compact disc format that provides much greater data storage than today's CD-RW systems. The caddy-mounted discs will initially provide 2.6 GB per side on single or double-sided discs.
DVD-ROM	The read-only format supports discs with capacities of from 4.7 GB (enough for an MPEG-2 compressed full-length movie) to 17 GB and access rates of 600 KBps to 1.3 MBps. Backward-compatible with CD-ROMs.
DVD-RW	Pioneer's rewritable DVD format, incompatible with the rival DVD-RAM and DVD+RW formats but generally compatible with DVD-ROM drives and consumer DVD players.
DVD-Video	A consumer DVD format for displaying full-length digital movies. DVD-Video players attach to a television like a video cassette player. Unlike DVD-ROMs, the Digital-Video format includes a Content Scrambling System (CSS) to prevent users from copying discs. This means that today's DVD-ROM players cannot play DVD-Video discs without a software or hardware upgrade to decode the encrypted discs.

Table 30.1: Optical drive formats

Input devices

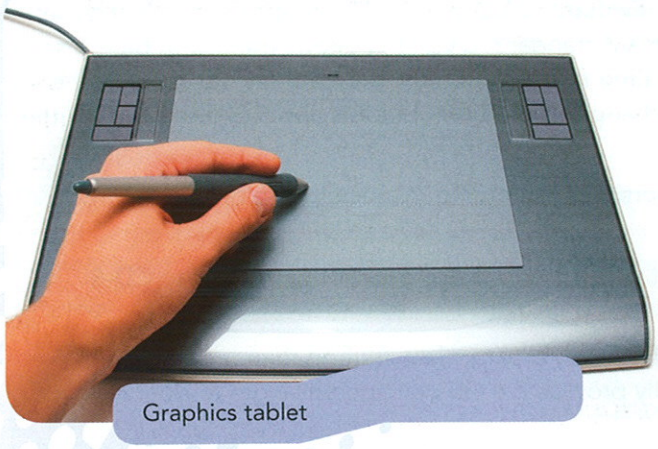
An input device is anything that can be used to feed data into a computer system or to control the system.

The mouse is an almost essential input device for computer systems, but some IT professionals who specialise in digital graphics prefer a graphics tablet.

Graphics tablet

A graphics tablet often has a special pen to operate it in a similar way to how a mouse is used. The great advantage of the graphics tablet is that it is much more precise than a mouse and positioning is absolute, because when the pen is touched to a point on the tablet it will always represent the same spot on the screen. In contrast, if a mouse is lifted and then put down on a different part of the surface, the mouse pointer will continue from where it was on the screen.

The pen of a graphics tablet usually has a pressure-sensitive tip, so if the user presses harder the line thickens. This gives the pen a very natural feel.



Graphics tablet

Graphics tablet with LCD screen

Key terms

Megapixel – a million pixels. It is a unit of image-sensing capacity in a digital camera.

CCD – stands for charge-coupled device. It is an image sensor used in digital cameras and other devices that converts the image to digital signals.

CRT – stands for cathode ray tube. CRT is an old screen technology that uses a phosphor-coated glass tube to display images. The tube makes the unit quite deep, especially for large screens, as electron rays need to be fired at the display from the back of the tube, with room to spread out to the size of the display. This technology uses a lot of electricity and older models can produce some radiation, which concerns many users.

Colorimeter – a light-sensitive instrument that can be used to calibrate a computer screen to match the colours produced by a printer.

Some top of the range graphics tablets also have LCD screens built into them so the graphic designer can use the pen directly on the image (see below left).

Digital camera

Digital cameras have become better and better and are now very impressive devices with good optical lenses, high resolution and low costs.

Choosing a digital camera involves finding the best mix of price, lens and how many **megapixels** it has.

The lens is more important than you might think, as this is the component that provides the image to the camera's **CCD** for converting into a digital image. If the CCD does not receive a good image it cannot produce a good picture.

The lens should provide an optical zoom to give control over how much is in the picture. Digital zoom can be carried out later using a computer with photo-editing software.

The number of megapixels in a digital camera is how many pixels the CCD can capture. A 12 megapixel camera will be able to take pictures in a variety of sizes, up to 12 million pixels, which is big enough for a 4000 × 3000 picture to be taken. A lot of pixels are useful if you want to be able to use small parts of the picture later, when editing or if the picture is needed for a very large print out such as a road-side poster.

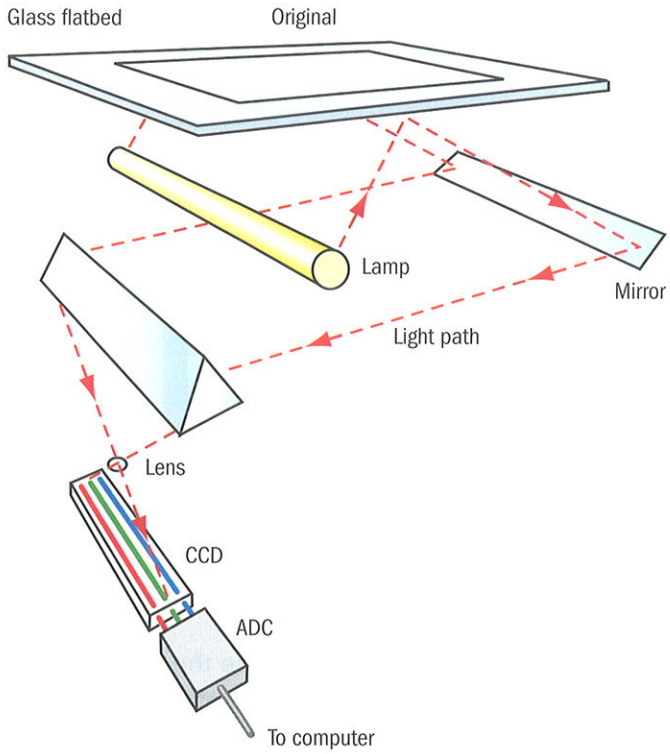


Figure 30.2: Flatbed scanner mechanism

Scanner

Scanners are still the best way to input paper images into a computer. They have a similar mechanism to a photocopier, with a scanning bar moving across the length of the scanner under glass.

The document is placed face down onto a glass window and a scanning mechanism moves back and forth underneath the glass. Light from the lamp bounces off the original and is reflected by the mirror into the lens. This focuses the image into the CCD, which digitises the results via an analogue-to-digital converter (ADC), to send the resulting information to the scanner's own hardware and then to the host PC.

1.2 Output medium

Output media for digital graphics include: printers, computer monitors, mobile phones, PDAs, plotters and vinyl cutters.

Printer

A printer is a device that produces hard copy by printing onto paper or another medium such as an overhead projector transparency or T-shirt.

There are different printer technologies available, each with their own characteristics, strengths and weaknesses. The choice of printer technology should match the user needs.

Below are the printer technologies that are of most interest to IT professionals working with digital graphics:

- **Inkjet printers**: have small nozzles that squirt tiny droplets of ink onto the paper. They are cheap to buy and run but can be slow for complex printing. Inkjets can produce near-photographic prints onto a wide variety of paper and other materials with a good choice of sizes.
- **Colour laser printers**: have cyan, magenta, yellow and black toners. They are usually more expensive than inkjets, with similar running costs and can be a lot faster, especially when printing the same page many times.
- **Dye-sublimation printers**: use dyes that vaporise and seep into the paper surface. They are usually more expensive than colour laser printers to buy and run but are quite slow. The great strength of these printers is that they produce real photo-quality prints.
- **Solid ink printers**: make use of sticks of a wax-like substance, which are melted and then applied to the page. They produce quick, quality prints. They are usually more expensive to buy but have low running costs, which can make them a cheaper option over time if they are well used.

Inkjet technology is the most well accepted of these technologies, with laser printer technology next.

Computer monitor

A computer system needs a monitor or display so the user can see what is happening. Traditionally, monitors have used **CRT** technology, which has many disadvantages, especially the space the monitor occupies and the heat produced. CRT screens have now been mostly superseded by flat screen displays.

Some professional displays feature hardware calibration to adjust and match the screen display colours to printers, image setters and other digital devices. A **colorimeter** is used to help with this.

Flat screen monitors have become much larger and cheaper in recent years and are now the natural choice for any new computer system.

Other media

There are other media that can display digital graphics.

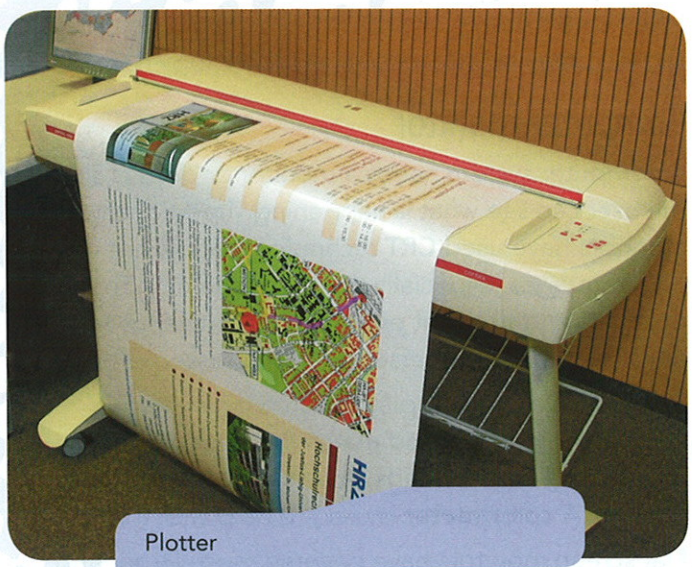
Mobile phones can use images that are captured using the phone camera or are downloaded from another source. Many **PDAs** also have a built-in camera and can display pictures on the device screen.

Plotters are used for large prints onto paper, material or other materials.

Vinyl cutters are used to cut signs from vinyl in the shape of the graphic image; the sign can then be peeled from its backing fabric and stuck onto a surface, such as the side of a van.

Vinyl cutter

Palm Tungsten PDA



Plotter

1.3 Software

Software is the term used to describe the programs that run on a computer. Application software is used to help people produce work. There are many types of application (often called 'apps') that can be used to create, manipulate and view digital graphics.

Vector-based graphics software

Vector graphics are different from **bitmap graphics**. The main features of vector graphics are:

- small file size when saved to disk
- no loss of print quality when enlarged or reduced in size
- vector pictures are made from objects such as circles and rectangles
- each object has an outline and/or fill
- objects may be grouped together.

Vector graphics are very good for diagrams.

Key terms

PDA – stands for personal digital assistant. This small hand-held device offers a calendar, contact list and other useful programs.

Vector graphics – define objects as coordinate points and use mathematics inside the software to calculate how to display the image onto the screen or printer.

Bitmap graphics – also called raster graphics, they are made from lots of pixels, each with a colour.

Examples of vector drawing packages include CorelDRAW® (see Figure 30.3), Autodesk AutoCAD (see Figure 30.4) and Microsoft® Visio® (see Figure 30.5).

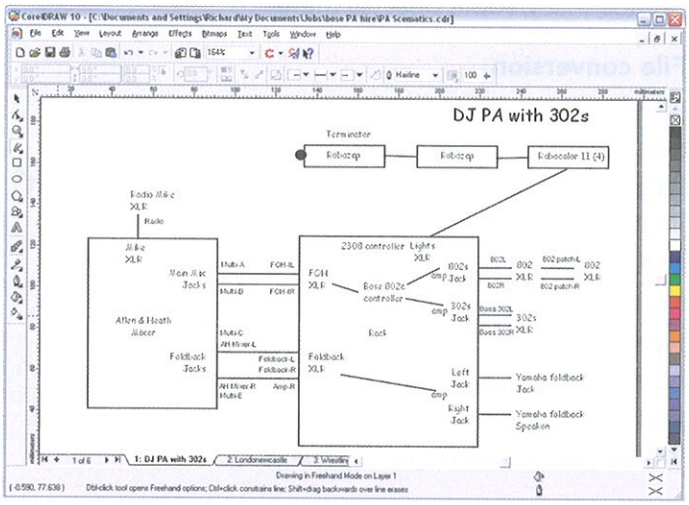


Figure 30.3: CorelDRAW®

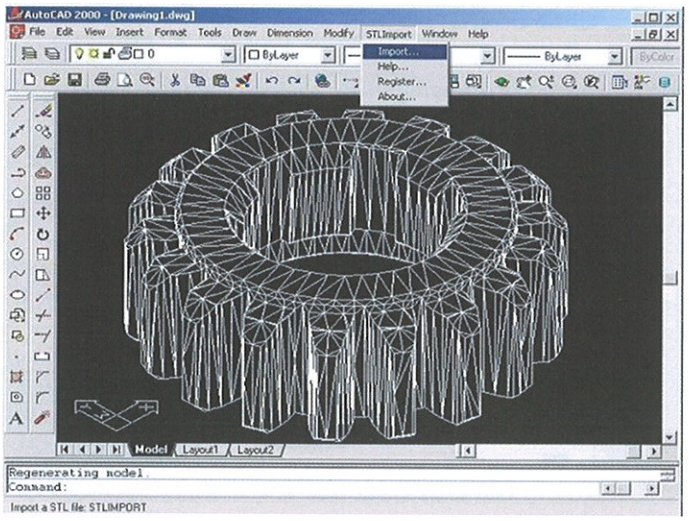


Figure 30.4: Autodesk AutoCAD

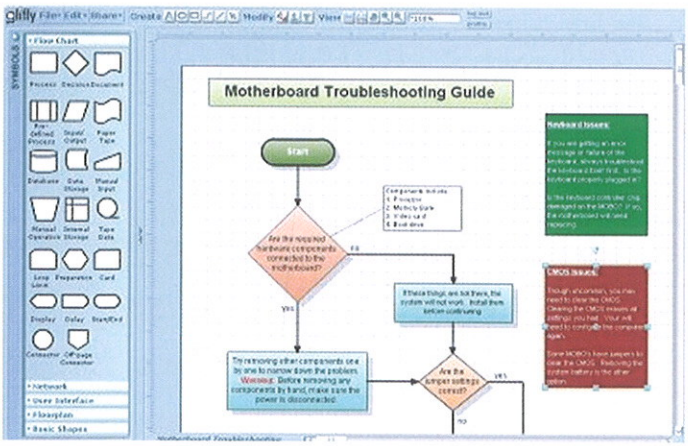


Figure 30.5: Microsoft® Visio®

Bitmap software

Bitmap graphics are different from vector graphics. They have a large file size when saved to disk and print quality can become 'blocky' when enlarged or reduced in size. Bitmap graphics can be created when a picture is scanned into a computer system using a scanner or from a digital camera.

Bitmap graphics are very good for screenshots and web page illustrations. Examples of bitmap drawing packages include Corel Paint Shop Pro® (see Figure 30.6) and Microsoft® Paint® (see Figure 30.7).

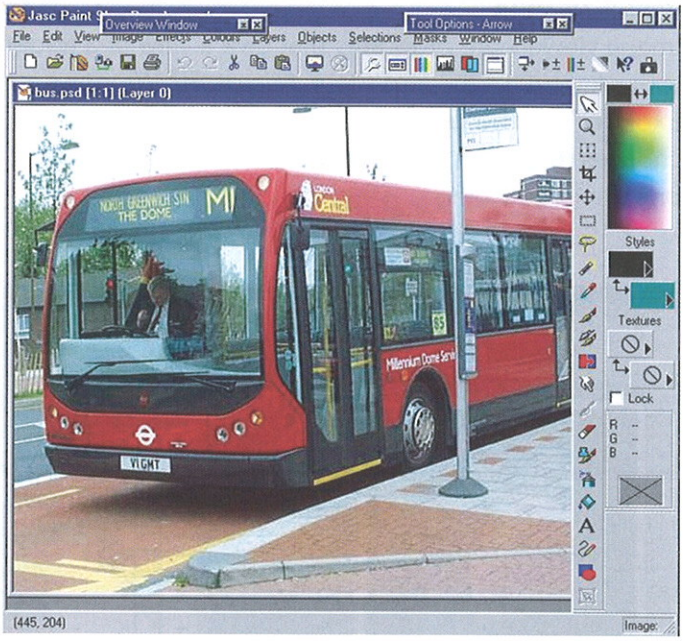


Figure 30.6: Corel Paint Shop Pro®

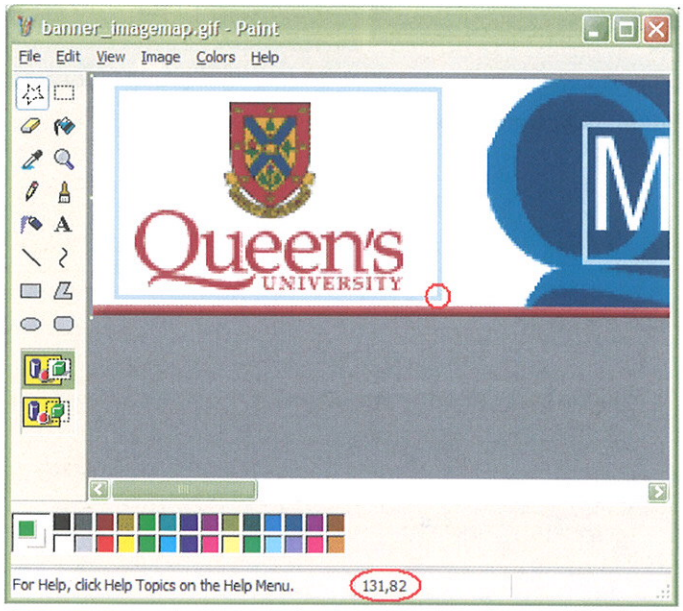


Figure 30.7: Microsoft® Paint

Photo manipulation software

Photo manipulation software applications are specialist bitmap programs with tools that are specialised for manipulating photographs.

Examples of photo manipulation software applications include Corel Photo-Paint® (see Figure 30.8) and Adobe® Photoshop® (see Figure 30.9).

Other graphics-related software

There are many utility programs available to help graphics professionals work more effectively.

Image viewers

Image viewers are programs that give a view of a folder with previews of the files there. Microsoft® Windows Explorer® can be used as an image viewer if the user chooses to set the view to medium icons, large icons or extra large icons.

Photo galleries

A photo gallery is a program that displays a collection of images for people to look at and enjoy. A photo gallery is often a collection of web pages showing photos that people post up there.

File conversion

File conversions can often be done by using the File Save As menu in a graphics app then choosing the type of file that the image is to be saved to. Microsoft® Paint is bundled in with Windows® and can do this to save an image as a BMP, JPG, GIF, TIF or PNG file.

Other file conversion apps have a wider range of file types available and may be able to batch convert a number of files automatically into another graphics file type. More information on converting files can be found on the next page.

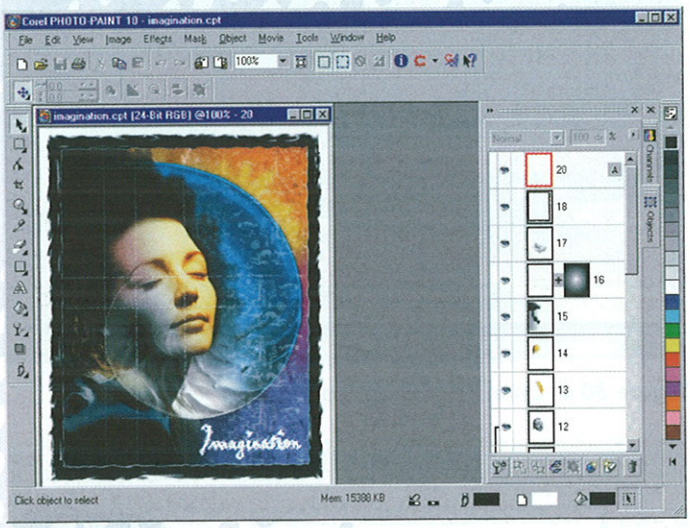


Figure 30.8: Corel Photo-Paint®

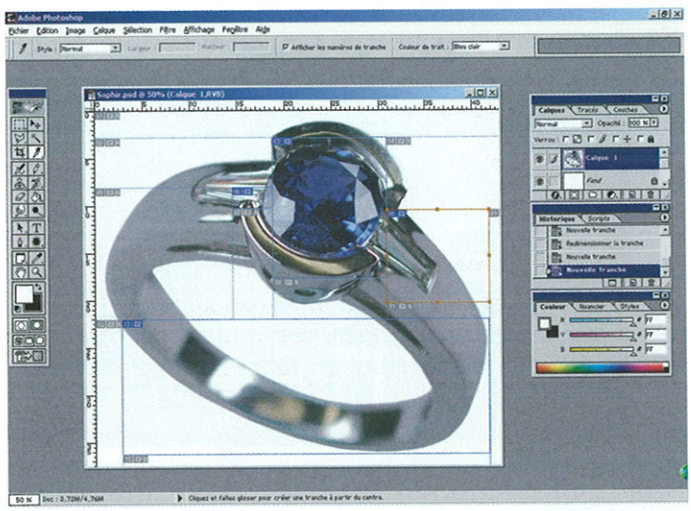


Figure 30.9: Adobe® Photoshop®

2 Understand types of graphic images and graphical file formats

As discussed earlier, there are two main types of graphic images and many graphical file formats. The bitmap (also called raster) type stores an image as lots of pixels, each with a colour. The vector type stores the image as a collection of objects, each with coordinate points to define size and position, as well as mathematical formulae defining line curvatures, thickness, fills and other properties. Each of these two types can be saved in many different formats to the disk.

2.1 File handling

Converting files

Files can usually be converted from one format to another. Many IT professionals simply use the File menu of their favourite graphical application to export or save as a new file type. There are also utility programs available that convert between formats and may offer batch options in order to automatically convert a collection of files from one format to another.

File sizes

The size of a bitmap graphic file saved to disk depends upon the format of the file and the options taken when saving it. Vector files are usually a lot smaller and do not have save options for controlling file size.

The same graphic would have different sizes in different formats (see Table 30.2).

BMP	GIF	JPG	PNG	TIF
2305 KB	209 KB	440 KB	348 KB	2305 KB

Table 30.2: Graphic sizes in different formats

Controlling the file size is achieved by setting the compression or quality level when saving the graphic. The same graphic file might have the sizes shown in Table 30.3 using JPEG quality settings.

100%	90%	60%	40%	10%
440 KB	216 KB	116 KB	92 KB	41 KB

Table 30.3: Graphic sizes with different JPEG quality settings

File formats

The file format is the way the graphic is internally structured. Each file format uses a different structure – a program using that format must be able to understand the structure so it knows how to show the graphic on the screen, print, edit and so on. Table 30.4 below shows some of the more common file formats.

File extension	Graphics type	Proper name	Description
.ai	vector	Adobe® Illustrator® Artwork	Vector format for Adobe® Illustrator® (originally a subset of PostScript®, if an appropriate header was present).
.bmp	raster	Windows® Bitmap	Commonly used by Microsoft® Windows® program and the Windows® operating system itself. **Lossless compression** can be specified but some programs use only uncompressed files.
.cdr	vector	CorelDRAW® Document	Default proprietary format for CorelDRAW ®2D documents. Features include multiple import/export filters, 3D special effects and object/image layering.
.cgm	vector	Computer Graphics Metafile	Defined by ISO Standard 8632. Often used for complex engineering drawings, eg in the aviation industry.
.cpi	raster	Cartesian Perceptual Compression	Hyper-compressed format for black-and-white raster images. Typically compresses images 5–20 times smaller than corresponding TIFF or PDF version, leading to dramatic reductions in download times and server network traffic.

File extension	Graphics type	Proper name	Description
.cpt	raster	Corel Photo-Paint® Image	Default proprietary format for Corel Photo-Paint® documents. Has many extra features such as image layering. Supported by very few image editing programs other than Corel Photo-Paint®. Photo-Paint® images are usually smaller than Photoshop® documents.
.dxf	vector	ASCII Drawing Interchange	Standard ASCII text files used to store vector data for CAD programs.
.eps	raster/vector	Encapsulated PostScript®	A PostScript® file that describes a small vector graphic, as opposed to a whole page or set of pages.
.emf	vector	Windows® Enhanced Metafile	An enhanced version of Windows® Metafile. Supported in Windows® NT and later.
.exr	raster	Extended Dynamic Range Image File Format	OpenEXR is the Open Source high dynamic-range (HDR) file format developed by Industrial Light & Magic for advanced imaging in movie production. The main advantages of that format are up to 32-bit floating-point pixels and multiple lossless image compression algorithms up to 2:1 lossless compression on film grained images.
.fh	vector	Macromedia Freehand Document	Vector format for Macromedia Freehand.
.fla	vector	Flash® Source File	Shockwave® Flash® source file, only usable by Adobe® (previously Macromedia) Flash® authoring software
.gif	raster	Graphics Interchange Format	GIF is used extensively on the web. Supports animated images. Supports only 255 colours per frame, so requires **lossy compression** for full-colour photos (dithering); using multiple frames can improve colour precision. Uses lossless LZW compression, which used to sometimes make GIF undesirable due to LZW patent (now expired) issues.
.igs	vector	Initial Graphics Exchange Specification	IGES is an ASCII text neutral data format used extensively for CAD/CAM data exchange. It supports 2D and 3D curves and surfaces, as well as solid models and annotation.
.jpeg/.jpg	raster	Joint Photographic Experts Group	JPEG is used extensively for photos and other continuous tone images on the web. Uses lossy compression by trying to equalise eight by eight pixel blocks; the quality can vary greatly depending on the compression settings.
.jpg2/.jp2	raster	Joint Photographic Experts Group 2000	JPEG 2000 is the successor of popular JPEG. A new wavelet-based file format that includes both lossy and lossless compression options. It is commonly considered the actual state-of-the-art lossy format for photographic imaging, but its support in modern systems is still weak due to heavy requirements for hardware and many patents for software.
.mng	raster	Multiple-image Network Graphics	Animation format using data streams similar to those of PNG and JPEG, originally designed to replace the use of animated GIF on the Web. Free of the patent (which expired in 2003) associated with animated GIF.

File extension	Graphics type	Proper name	Description
.pcx	raster	PCX	Developed by ZSoft Corporation. Uses a simple form of run-length encoding. Supports palette-based and 24-bit RGB images.
.pdf	raster/vector	Portable Document Format	A page description language (loosely based on PostScript, but not a programming language), which allows for files containing multiple pages and links. Works with Adobe® Acrobat® Reader or Adobe® eBook Reader, or third-party compatible software. It is the native metafile format for Mac® OS X.
.pict/.pct/ .pic	raster/vector	Picture	Default for Macintosh® operating systems before version OS X.
.png	raster	Portable Network Graphics	PNG is an image format with lossless compression, offering bit depths from 1 to 48. It was mainly designed to replace the use of GIF on the Web. Free of the patent (which expired in 2003) associated with GIF.
.ps	vector	PostScript®	Generic vector-based page description language, created and owned by Adobe®. PostScript® is a powerful stack-based programming language. Supported by many laser printers.
.psd	raster	Photoshop® Document	Default proprietary format for Adobe® Photoshop® documents. Has many extra features, such as image layering. Also supported by some other image editing programs than Adobe® Photoshop®.
.sgi/.rgb/ .rgba/.int/ .inta/.bw	raster	Silicon Graphics Image	Native image format for Silicon Graphics workstations.
.svg/.svgz	vector	Scalable Vector Graphics	An XML-based vector graphics format, as defined by the World Wide Web Consortium for use in web browsers.
.swf	vector	Small Web Format (referred to as Shockwave® Flash®)	Flash® is a web page plug-in that displays vector-based animations contained in SWF files. Several applications can create SWF files; these include the Flash® authoring tool from Adobe® (previously Macromedia).
.tiff/.tif	raster	Tagged Image File Format	TIFF is used extensively for traditional print graphics. Lossy and lossless compression are available, but many programs only support a subset of available options.
.wmf	vector	Windows® Metafile	Stores vector graphics and raster graphics as a sequence of commands to be issued to the graphics layer of the Microsoft® Windows® operating system.
.xaml	Vector	XAML	The XML-based file format for representing a document built using a Windows® Presentation Foundation application (pre-installed on Vista). Can declare 2D vector graphics (and include references to external bitmaps for imaging), textual documents (with or without page fidelity), 2D user interfaces and renderings of 3D models (with a fair amount of baseline support for lighting, materials, etc).

Table 30.4: Graphic file formats

Key terms

Lossless compression – allows the original image to be rebuilt from the compressed (reduced-size) image.

Lossy compression – does not allow the original image to be rebuilt from the compressed (reduced-size) image.

Proprietary – owned, often by a company. In computing, proprietary often refers to the way a document file is structured, eg CorelDRAW® uses a CDR format for its vector files, which are structured so that CorelDRAW® can open them.

File management

File management involves the methods used to look after work saved to disk or USB drive, including the following.

- File naming simply means giving names to your files. Learners often give files joke names, making them very difficult to identify later. IT learners and professionals recognise that naming a file is important because the name must represent what the file is. Look at Table 30.5. Which type of file name would you rather see if you were looking for the second assignment for Unit 30 about vector software?

Joke file name	Professional file name
Itchy	Unit 30 assignment 1 Bitmap software
Scratchy	Unit 30 assignment 2 Vector software
Bart	Unit 30 assignment 3 Utility software

Table 30.5: Showing filenames

- Folder structure is one of the most powerful tools that IT professionals can use to help organise their work. Folders give a structure to the disk that can be used to help locate files easily and quickly. There are many ways to organise folder structures. The correct one is usually the one that is most obvious to the user.
- Moving a file involves cutting it from a folder then pasting it to another folder or drive. You may need to move files when tidying up your folder structures, so that the files are in their correct locations.
- Deleting a file removes it from the drive so it cannot be used again.

Compression techniques

Compression techniques are used to reduce the disk size of a file. File size is important if the file is to be transmitted to another location (a small file arrives faster) or if there is a small amount of storage space and the file needs to be reduced in size to fit.

2.2 Graphic images

Vector graphics

Vector graphics follow mathematical rules. Shapes are understood by vector graphic software as coordinate points joined by lines with a defined fill (see Figure 30.10).

A line joining points may be straight or curved and has properties such as thickness, colour, solid or dashed and so on.

There could be no fill, making the shape transparent, or it could have a colour, more than one colour, texture, etc.

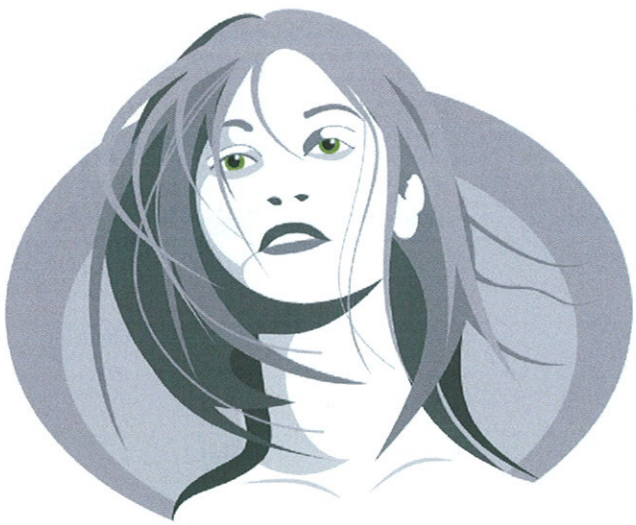


Figure 30.10: A vector image

Bitmaps

Bitmap (or raster) graphics are pixel-orientated, meaning that a bitmap image is made from lots of pixels. Each pixel is a tiny dot in the image with a colour.

Bitmap software can usually zoom the graphic large enough to edit individual pixels (see Figure 30.11).

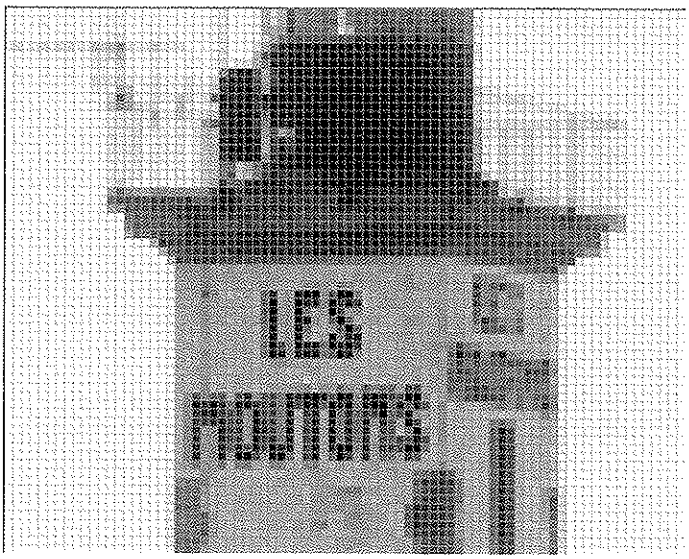


Figure 30.11: Bitmap pixels

Comparison between types of image

There are big differences between vector and bitmap images (see Table 30.6).

	Vector	Bitmap
File size	Small	Large files sizes, especially big pictures with large colour depth
Scaling	Very scalable to any size	Pixellation occurs
How created	User created with mouse or graphics tablet	Scanner or digital
Typical uses	Diagrams	Photographs

Table 30.6: Relative features of vector and bitmap images

The mathematical way in which vector images are stored and manipulated by software makes them easy to edit and resize and results in small file sizes.

Bitmap images allow editing that is much more complex than that possible with vector images, which means that skilled IT professionals can manipulate photographs into anything they can imagine.

Resizing a bitmap needs software to analyse the pixels in the image, then recreate a new set of pixels to make the image the new size. Modern software can be amazingly good at this complex task, but there will still be a loss of quality. There will always be a limit to how large a bitmap image can be acceptably enlarged.

As the colour information of every pixel needs to be stored in a bitmap image, the file size can be enormous.

File format features and typical uses

Vector file formats are usually **proprietary**, with few open or common standards to share between vector software applications.

There are many file formats commonly used for bitmap files – bitmap applications can usually open, edit and save many of them. Bitmap file formats are less likely to be proprietary than vector files.

BMP bitmap files are often used for scanned images that need to be saved at best quality. For this reason, BMP files are often quite large.

JPEG bitmap files are often used when a smaller file size is needed, for example so that Internet graphics take less time to download and to show in the browser.

Assessment activity 30.1

P1 P2 M1 D1

BTEC

You have always enjoyed creating computer graphics, ever since the first computer was brought into your home. Friends and family are very impressed and encouraging towards the images you've created, so you have decided to set up as a freelance graphics designer.

To do this, you will need some financial investment to purchase the hardware, consumables and software needed for your business, as well as some other spending on marketing, such as business cards and advertising.

The owner of a small chain of convenience stores, where you have a part-time job, is interested in sponsoring your start-up but needs to be convinced that you know what you are doing and are not going to incur debt by spending on anything that is not essential.

You are to produce a report with the following sections:

- Hardware
- Software
- File formats
- Comparisons
- Output media.

1 Create the Hardware and Software sections of your report.
   - The Hardware section needs to focus on components such as the graphics card and how their features impact upon graphical work.
   - The Software section needs to identify the vector and raster software applications you would wish to use as well as other software. P1

2 Create the File formats section of your report, explaining how different types of graphic images relate to file formats. This should include sections explaining differences between vector and raster images, with some examples of the file formats that can be used to save them to storage media. P2

3 Create two sub-sections in the Comparisons section of your report, one for hardware and the other for software packages used in graphics work.

Add to the hardware sub-section, identifying the limitations of the following devices compared to others in the bullet point:

- file storage media: CD-ROM, hard drive, flash cards, USB storage devices
- input devices: graphics tablet, mouse, digital camera, scanner.

Add to the software sub-section, comparing the limitations of vector and raster software applications. M1

4 Create the Output media section of your report, evaluating the impacts of evolving output mediums on the design and creation of graphic images.

Research the marketplace to find current developments in both hard and soft copy for graphical work. D1

Grading tips

- Make sure all the hardware and software you describe relate to creating graphics. P1
- You must relate the graphic images you use to their file formats. P2
- For the merit criterion, limitations need to be compared, both of the hardware and software packages used for graphics. M1
- You may find it useful to find actual products used as output media. D1

PLTS

You can show you are an **independent enquirer** when you analyse and evaluate information, judging its relevance and value by creating the Hardware and Software sections of your report.

Functional skills

Choosing graphical software will utilise your **ICT** functional skills when you select and use software applications to meet needs and solve complex problems.

3 Be able to use editing tools to edit and manipulate images

Editing tools are designed to help the user change a graphic and can be very powerful. This section explains the uses of some of these tools.

3.1 Graphic creation

Graphic images can either be obtained from another source, or created using specialist software.

Obtaining images

Many digital graphic artists use editing tools to enhance an image that is obtained from somewhere else, usually photographs or other sophisticated graphics. Images may be obtained by:

- scanning – using a scanner to capture an image from paper or other hard copy
- importing – using the File Import menu option to bring in a graphic file from another place
- digital camera – transferring photographs taken by yourself or another person using the camera to your computer system.

Image creation

Many tools exist to help the user create an image, including freehand drawing techniques, which allow the user to draw with a mouse or graphics tablet directly into the application.

It is more common to create images from scratch with vector software rather than bitmap software, as vector graphics are often logos, diagrams or similar that do not already exist and so need to be created.

Using vector software to create images often involves assembling shapes such as rectangles, circles, curves or similar into the graphic. These shapes can be grouped together so they can be used as a single object.

Pre-existing material can often be found in clipart or other sources. It is always important that any copyrights are honoured.

3.2 Tools and techniques

The computer can be a very powerful asset in creating or editing graphics, enabling the user to do things that would be very difficult otherwise.

Standard software tools

Most graphics software applications offer several standard tools, including freehand draw, rotate, flip, crop, group/ungroup and resize.

Freehand draw

This tool is best used with a graphic tablet, rather than a mouse. Freehand draw allows the artist to draw directly into the artwork with an on-screen pencil. Most software offers a choice of colours and line width.

Rotate

Rotate is a common tool for both vector and bitmap applications. As you might expect, this tool turns the selected image round by a specified amount. The rotation might be done using the mouse to drag it round or by selecting an angle to rotate.

Flip

Flip is a common tool for both vector and bitmap applications. It is used to create a mirror image of part of an image. Often there is an option to create a new flipped image while keeping the existing selection, or to change the selection so that it is mirrored. Mirroring an object horizontally flips it from left to right; mirroring an object vertically flips it from top to bottom.

Crop

Crop is usually a bitmap tool used to cut off the edges of an image so that the parts of the image that are not wanted are removed. The overall size of the image becomes smaller, but the contents of the image remain the same size. For example, a photograph of a person may be cropped to remove some of the background but the size of the face stays the same.

Group/Ungroup

Group/Ungroup is usually a vector tool. As vector images are created using many objects, it is often sensible to group some or all of them together to make it easier to work with them. For example, if a logo is created using several objects, then grouping them creates a single object that is much easier to select and work with. Grouped objects can be

ungrouped to split them up into the original collection of objects – this is useful if one or two of the objects in the group need changing. They can then be grouped again once the changes have been made.

Resize

Resize is a common tool for both vector and bitmap applications. Using this tool makes the selection bigger or smaller. Vector images resize without losing quality because the image is kept inside memory as coordinates, with the computer recalculating the image to whatever resolution is needed for the screen, printer or any other device. When a bitmap is resized the software needs to examine the existing pixels, then determine the colours of the new pixels to reproduce the image – this is a complex operation that inevitably reduces image quality. Resizing bitmaps well is one of the benefits of using expensive, professional software applications.

Special effects

Special effects give you a lot of control and power over the image. The skilled IT professional can use these bitmap tools to make a bad picture spectacular – unfortunately, an unskilled user can use the same tools to make a spectacular picture bad!

Soften

The soften tool is used to smooth and tone down the harsh edges in an image without losing much of the important image detail.

Sharpen

Sharpening an image can increase the contrast, enhance image edges or reduce shading.

Watermark

A watermark in a word processor such as Word® places an image behind the page giving the appearance of printing using watermarked paper.

Similarly, specialist graphic software may also have this tool, which can be used, for example, for adding a translucent copyright watermark over the image to identify it as your own work.

Invert

The invert tool reverses the colours of an image. Inverting an image creates the appearance of a photographic negative.

Colour

Specialist IT professionals can use colour tools to enhance and edit images.

Colour balance

The colour balance tool or filter lets you adjust an image by shifting colours between complimentary pairs of primary RGB (red, green and blue) colour values and secondary CMY (cyan, magenta and yellow) colour values. For example, to tone down red in a photo, you can shift the colour values from red to cyan.

Colour depth

Colour depth is also important as it controls the file size and overall quality of the image. **8-bit** (256 colours) is still popular for web images as they load up a lot quicker than 16-bit (64,000 colours) or 24-bit (16.7 million colours), while still maintaining an acceptable picture quality.

Key terms

8-bit – where a single byte is used for each item of data. A byte has 8 bits, each of which can be set to a one or zero. This gives 256 different combinations of bit patterns.

Wire-framing – used to draw an image of a 3D object that shows only the edges of the object.

Mask – a tool you can use to select a certain area of an image to protect it from changes, such as applying colour, filters or other effects.

Layering

Layering is a very useful technique for creating and editing images. An image can be divided into layers, and then a single layer can be selected for editing with all the other layers locked. This makes it impossible to accidentally change part of the image that has been completed.

Layers can also be set as not visible, allowing the user to see only the part of the image they want to work on.

Printing is another operation where layering can help the user. Unwanted layers can be marked as non-printable, so the hard copy will only show the parts needed by the user.

Advanced techniques: 3D images

There are many ways of representing 3D images using digital graphics, including:

- 3D drawing tools in a vector drawing package
- rendering a wire-frame model in a CAD application
- defining a digital landscape using games generation software.

3D drawing tools

Using 3D drawing tools in a vector drawing package can produce some excellent effects. For example, CorelDRAW® offers the Extrude dialogue box. This gives control over how the 3D effects are applied, including from which direction the object is lit and the position of the vanishing point – shown in Figure 30.12 as x under the shape.

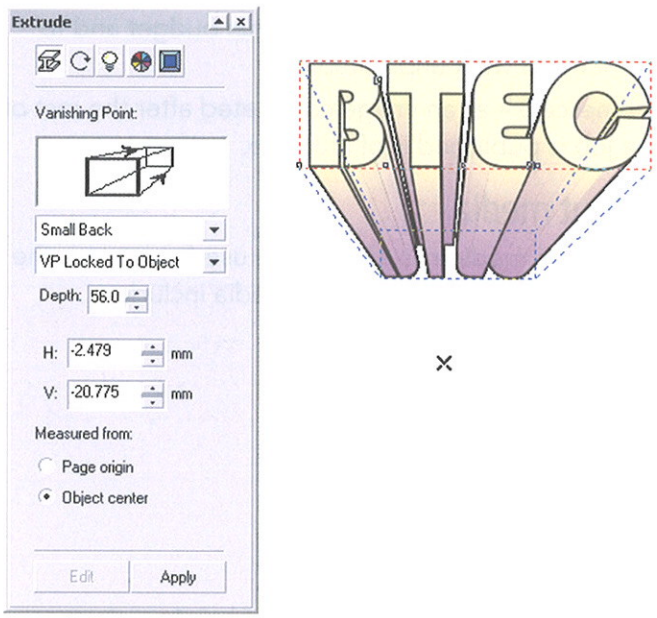


Figure 30.12: CorelDRAW® 3D Extrude tool

Rendering a wire-frame model

CAD applications such as AutoCAD® allow the user to define complex and precise objects using **wire-framing** (see Figure 30.4 on page 225 for an example).

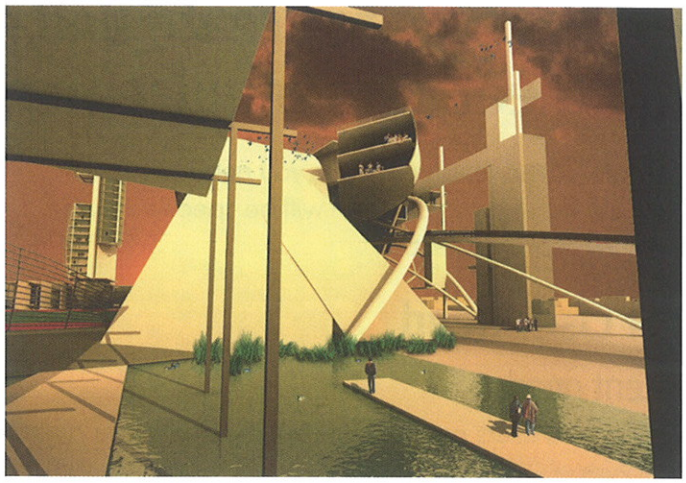


Figure 30.13: A 3D graphic created using AutoCAD®

The object might be a component designed for manufacture, an architectural drawing or other 3D design. Many CAD applications can add texture to the wire-frames to produce a realistic impression of what the design will look like when it is produced (see Figure 30.13).

Masking

A regular **mask** is a selection tool, such as a simple rectangle, circle, freehand shape or lasso, to isolate the area that you want to protect from changes.

The image can be cropped to a mask, so only the part inside the mask remains.

A colour mask is used to protect colours in an image – the mask will apply only to the pixels within the colour range that you specify in the mask, using the magic wand, lasso or colour mask tool. This technique can be used to separate part of an image such as a car or person from the background.

3.3 Editing graphics

Editing a graphic is when an existing image is changed in some way using some of these tools and techniques to improve the image or to correct identified problems.

4 Be able to create and modify graphic images to meet user requirements

In professional graphical work, you need to meet the user requirements, which will be specified at the beginning of a project.

4.1 User need

Client needs

Clients and users may have different needs from digital graphics.

The client is the person or organisation that has commissioned and will pay for the job, so their needs are the most important. Their needs might include such aspects as:

- keeping to a corporate style
- using file formats that are compatible with their software
- keeping within their guidelines for file sizes that are appropriate for website download times and any other bandwidth or storage considerations.

The user is anyone who sees the digital graphics. Their needs include:

- images having enough resolution to make the picture quality acceptable
- images that clearly convey intended information.

Target audience

Identifying the target audience is important because it will help you to be clear about who will be seeing the completed images and why. Understanding this makes a big difference to the effectiveness of images, as knowing the reasons for creating them will help you to target them better.

When the images are near to completion, you can show them to people selected from the target audience for feedback on how well they meet the user needs.

User requirements

You will need to set out the user needs in a document or part of a document stating what is wanted by the people who will be viewing the end result of the production.

Constraints

Most graphic productions have constraints to help make the production practical and useful. Constraints may include:

- house style – so the graphic fits in with the rest of the document and other publications from the client organisation
- image size – to ensure that the graphic meets requirements such as acceptable load times for web pages or acceptable resolution for printing
- intended use – to make sure the graphics are appropriate for their target audience
- file size – particularly important for web page load times, but may also be an issue if the graphics are to be delivered on CD-ROM or other media where there is a limited amount of space
- production costs – to keep within budget and to not make work unprofitable
- timescale – as an image completed after the rest of a job is published is of little use.

Output media

The output medium is whatever is used to convey the image to the end user. Output media include:

- paper
- vinyl
- textiles
- display screens
- plates (for printing).

User feedback

User feedback is useful at every stage of producing professional computer graphics to confirm that the work is progressing towards a satisfactory end-product and to guage how effective the work is in meeting the user needs.

4.2 Reviewing

Reviewing is a vital part of the design and creation of graphical work to ensure the work meets acceptable standards and meets the client needs.

Checking work

When a job is close to completion, it should be checked against the client and user needs to ensure it is fit for purpose and suitable for release. The client

will be meeting the cost of the job, so it is particularly important to check that the work meets their need. This will involve looking again at the client needs document and carefully considering each of the requirements to ensure the work matches them.

The user need is what the work should actually achieve. This check will be to make sure the end-product has the desired effect on people who see or use the graphic.

Proofing

Proofing is when the image is output to see (roughly) what it will actually look like when completed. An image may be proofed to an inkjet printer by the designer to check that the parts of the image look right before sending the image to a **bureau** for the final print.

Key term

Bureau – an organisation that carries out services, such as printing, for other businesses or clients. A design studio may not have expensive specialist printing facilities, so sends work to a bureau to make use of their printing equipment.

Image resolution

Part of the review process is to confirm that the image resolution is appropriate for the purpose of the digital graphic.

Graphics for web pages need to have an acceptable balance between the resolution and picture quality. Lower resolution means poorer picture quality but faster web page loading and downloads.

Graphics for publication need to match the resolution to the printer. Either a lower or higher resolution will result in poorer picture quality when printed.

File formats

The review process should involve checking that the file format meets the needs of both client and users. The file format should not cause any compatibility issues that would result in problems loading or using the graphic.

Other needs

Any other identified needs from the image specification, such as the speed of loading, should also be reviewed to confirm that all the image design needs have been met.

Assessment Activity 30.2

P3 P4 P5 M2 D2 BTEC

You have set up as a freelance graphics designer and received financial investment from the owner of a small chain of convenience stores.

The owner has commissioned you to produce a flyer advertising the stores that can be used for pushing through letterboxes in the area.

The flyer must contain:

- at least three photographs of products on special offer
- maps showing where the stores are located
- an overall colour scheme using the shop colours of purple and white
- telephone, email and website contact information for the stores.

1 Create a flyer using original graphic images to meet the user need. P4

2 You need to show your flyer to your tutor for their opinion, then modify the images as a result of this user feedback. P5

3 The owner's children are interested in computer graphics so you are to produce a collection of some annotated screenshots demonstrating the use of editing tools to edit and manipulate images. P3

4 Add a section to your document with annotated screenshots to justify the software, tools, file format, image resolution and colour depth used for creating your graphic images. M2

5 Add another section to your document discussing the impact that file format, compression techniques, image resolution and colour depth have on file size and image quality. D2

Grading tips

- There must be evidence that you've used some tools to edit and manipulate images. P3
- Your graphics must meet the defined user need. P4
- You need to respond to actual user feedback. P5
- This merit criterion needs you to justify the choices you made to create your graphic images. M2
- You need to relate how choices around file size impact on image quality. D2

PLTS

When you demonstrate the use of editing tools, you will try out alternatives or new solutions and follow ideas through showing that you are a **creative thinker**.

When you create original graphic images to meet a defined user need, you will generate ideas and explore possibilities showing that you are a **creative thinker**.

When you modify images as a result of user feedback, you will adapt ideas as circumstances change showing that you are a **creative thinker**.

By modify images as a result of user feedback, you will invite feedback and deal positively with praise, setbacks and criticism showing that you are a **reflective learner**.

Functional skills

You will practise using your **ICT** functional skill to select, interact with and use ICT systems safely and securely for a complex task in non-routine and unfamiliar contexts when you demonstrate the use of editing tools to edit and manipulate images.

4.3 Legislation and guidelines

Identifying ownership

Identifying ownership is an important first step towards finding out whether a graphic can be reused. Many images have the owner name or copyright printed on or close to the image, which makes this task easy.

If there is no name printed near the graphic, then the ownership will probably be with the publisher of the web page or book where you found the image.

Copyright

A piece of work such as an image is copyright when it has an owner with control over how the work is used or copied.

It must always be assumed that an image already has copyright and that permission must be sought from the copyright owner before the image can be reused.

Copyright free

Copyright-free images can be freely used by anyone. Such images may be found on web pages that are clearly identified as copyright free, included with graphics software or from other sources.

Gaining permissions

Any image that is not clearly identified as copyright free needs the permission of the owner if it is to be used. Permission should be requested from the owner and this will often involve paying a fee before the image can be reused.

If you take your own photographs of people, you need them to sign a model release form, giving you permission to use the photographs as you wish.

Assessment Activity 30.3

P6 BTEC

Your sponsor is concerned that you have been breaking copyright with some of the images you have used, so has now asked you to produce a short document to show you understand the legal situation and do not break any laws.

1 Explain the potential legal implications of using and editing graphical images. P6

Grading tips

- You need to ensure the legal implications you explain all relate to using other people's graphical images. P6

PLTS

To explain the legal implications you may have to undertake some research, showing that you are an **independent enquirer**.

Functional skills

The document you produce will require your **English** writing skills.

WorkSpace

Jane

Graphic designer

I have always had a good eye for colour and composition, a love of technology, and enjoyed communicating ideas – so it was brilliant to get a job as a graphic designer in a well-known design studio not far from where I live.

I am responsible for a great variety of tasks, ranging from when a job is first discussed with the client through to creating the artwork and working with third parties such as printers to produce the end-product.

When we first receive a user requirement we meet to brainstorm how we approach the job and mock up some design ideas. I often meet with the client to present our ideas. We need to sell our ideas to the client and work with them to achieve the end-product they want, so may need to adjust our designs to fit in with their needs or taste.

Sometimes I am asked to produce the budget and schedule, but this is usually done by my team leader.

For me the best part is using computer software such as Photoshop® to actually execute the design. I really need to be organised here in order to meet our deadlines and stay within budget.

Even though computer software and technology have revolutionised the graphic design industry, there is no substitute for the artistic sensibility of people like me! Knowledge about design elements, such as colour and composition, is important for graphic designers but artistic ability and creativity are essential.

Graphic design is an exciting brainteaser. Choosing the exact right fonts, colours and lines, while also conveying the meaning, is complicated. If you want to succeed in a graphic design job, you must have strong problem-solving skills and love a good challenge.

Think about it!

1 Jane and her team like to brainstorm how they approach each job and mock up some design ideas. What methods do you think would be used to create the design mock ups?

2 Jane is sometimes asked to produce the budget and schedule for a new job. Can you produce a schedule for a job where the design studio is asked to create animated adverts for London Underground subway escalators?

3 Jane talks of how computer software and technology have revolutionised the graphic design industry. Can you find out what techniques were used before computers?

Just checking

1. How can photographs be captured and transferred to a computer system?
2. How can digital graphic files be stored?
3. What input and output devices are suitable for a computer used for editing graphics?
4. Identify some software applications suitable for creating and editing images.
5. What are the differences between vector and bitmap images?
6. Identify four graphic formats, with examples of where their use would be appropriate.
7. Give three examples of how a digital image may be sourced.
8. Identify and explain how four software tools may be used to edit digital images.
9. Identify and explain how four special effects may be used with digital images.
10. What is the client need?
11. What are user requirements?
12. What is meant by constraints?
13. What are the purposes of reviewing a completed job?
14. Explain the issues around copyright and digital images.

edexcel

Assignment tips

- You will need to obtain some real user feedback on your work before modifying it to respond to their comments.
- Remember, you need to compare the limitations of some different hardware and software packages used in graphics work.
- You will need to research evolving output mediums which are new on the market so you can evaluate their impact on the design and creation of graphic images.