

The
Non-Designers Guide
To
Successful Graphics

By Jez Hunt

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While we're at it, I'd like to keep the movie rights too. Unless you can get Russell Crowe to play me.

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Introduction

With so many different types of graphics available for use on the web and in print, how do you know which one to use for a particular task you have?

It can seem a daunting task to learn the differences between them, why they exist, what their purpose is and which one will be the most suitable.

Each of the different graphic types was developed for a specific reason or to solve a particular problem.

Not all graphics are equal!

The purpose of this report is to explain the differences between the graphic types, so you can learn when and where to use them - and just as importantly when and where NOT to!

I haven't included every possible graphic type which is in existence, but I have focused on the main ones which you are likely to come across.

The information here and the Quick Reference Table at the end of this report should make it very easy for you to find the right graphic to give you the best results for your particular task.

A handwritten signature in blue ink, consisting of a stylized 'J' followed by a horizontal line.

Web or Print?

The first thing you need to think about is where the graphics are going to be used.

Many of the differences between the graphic types are dependent on whether they are going to be used electronically on the web, or in hard copy printed material.

When you know where the graphic is going to be placed you can cross-reference the characteristics of the different types and choose the one most suited to your application.

A note on Resolution

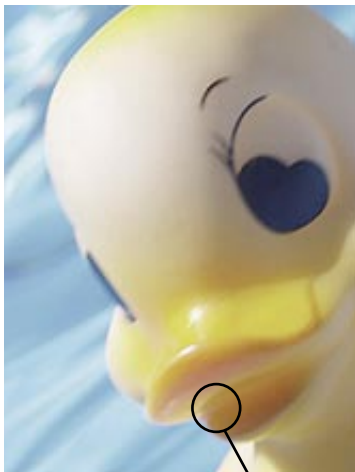
Resolution refers to the sharpness and clarity of an image, and it is a measurement of the output quality.

The terminology for image resolution is usually in pixels, dots, or lines per inch, and varies according to the intended output device.

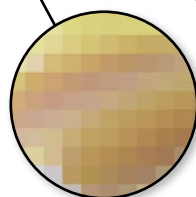
These include monitors, printers, digital cameras, scanners and bitmap graphic images.

You may well have heard people talking about 72 dpi and 300 dpi.

Typically 72 dpi is the resolution used on screen and 300 dpi the resolution for printed material.



Bitmaps are made up of small coloured squares called "pixels"



Web based graphics

When it comes to using graphics for the web, they tend to fall into 1 of 3 broad categories:

Raster bitmaps, Vector images or Flash.

Raster bitmaps

Rasterised bitmaps ("Rasters") are "fixed size" images which are displayed in 2 dimensions (height and width) and are made up of tiny coloured dots (called pixels).

Typically these will be photographs and other similar graphics.

Vector

Vector images on the other hand, are images which are made up of lines, shapes and/or text.

The main benefit of this type of file is that they can be scaled to any size at any time without losing the quality of the image - regardless of size.

Because these images are calculated at the time of drawing, they also usually produce small file sizes.

The most commonly recognised version of vector graphics is Clipart.

Macromedia Flash

Flash is a whole different ball game. It is in the most part vector, so it can usually be scaled to more or less any size, but it also handles raster images/bitmaps as well as sound and moving images such as video.

Flash is the preferred choice when moving images such as animations or video are required.

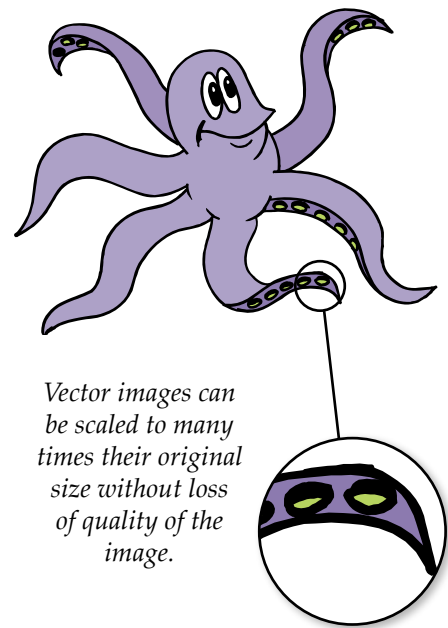
Video and audio files can be “streamed” over the internet, which means even large files can be watched by most people regardless of their internet connection speed.

Also, because of the built in programming language, there is an abundance of features which can be used to produce fully interactive websites, games and e-learning packages to name but a few.

Probably the biggest growth area in using Flash has come from the use of streaming audio and video files direct to the users computer without the need for a lengthy file download.

Although it is easy relatively easy to produce a basic Flash file using the correct software, there is a steep learning curve with this file type if you want to make the most of the features available.

By using the programming language you are able to create some amazing things, but mastering it isn't for the fainthearted!



Vector images can be scaled to many times their original size without loss of quality of the image.



Flash is more than just a graphics format, but the powerful features come at the cost of a steep learning curve.

Print based graphics

Like graphics for the web, graphics for professional printing fall into 2 categories, Raster and Vector (as previously described).

Examples of these file types include TIF, EPS and Illustrator.

Graphics types in depth



Raster images at print resolution produce relatively large file sizes. This one is 1.53Mb.

Although it depends on the final size required, when used for print, Raster images can become rather large (especially when compared to vector files).

For example, look at the picture opposite...

This picture of a Butterfly is sized at 50mm wide by 35mm high, with a print resolution of 300dpi. The colour setting (which we will come onto later) is set at CMYK because it is going to be printed.

This means the picture is made up of 591 pixels across by 413 pixels high and in TIF format (one of the industry-standard file types) generates a file size of 1,513Kb (1.53Mb).

The advantage of large files for print is that they hold more information (hence the large file size), and therefore print a much better quality picture.

However, if you want to use the picture for the web, but still want to keep a good quality image, you have to reduce the file size.

This is done by compressing the file, which can be done in various ways. The compression types used fall into 2 categories - "lossy" and "lossless" compression.

Files that use lossy compression tend to have smaller file sizes, but this comes at a cost.

To get the file size so small, these formats actually strip information out of the file which can dramatically reduce the quality. This gets progressively worse each time the files is saved - this information is lost - hence "lossy"

Lossless compression (as you would expect) means that all of the original data is kept so at any time the image as good as it was, when it was first created.

These files tend to be larger and are more typically used for print.

Typical formats used on the Web

JPG

JPG, pronounced “jay peg” stands for Joint Photographic Experts Group.

This is the most common format which most people will have heard of, particularly with the progress in digital camera technology and the fact they are now widely available - and affordable.

The JPG format is best suited for images that involve smooth colour gradients like photographs or naturalistic artwork. It was developed specifically to compress 24-bit photographic-type images.

Note: The term “24-bit” is used to explain the number of colours available in the image. For 24-bit JPGs it means that there are 16.7 million colours available which more-or-less covers the human visual range. This means it can replicate what we see in terms of pictures extremely well.

JPGs use a lossy compression to keep the file size down and can produce some of the smallest file sizes of all of the file types mentioned in this report.

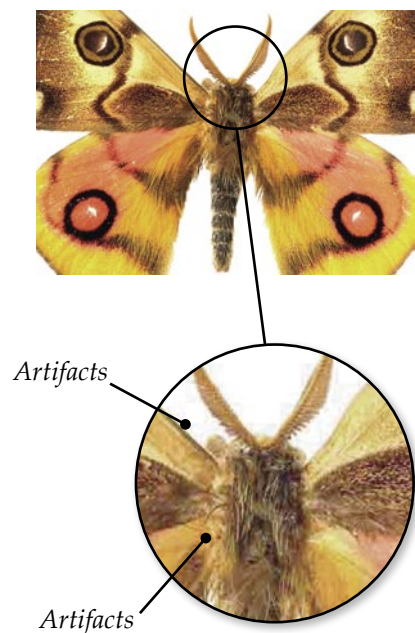
However, because this type of compression strips information out of the file, the smaller size does come at a price...

The accuracy of the final image will depend on the amount of compression used. The more you compress the file, the smaller the image but the more image detail you will lose.

Because information is removed from a JPG during the compression process, imperfections called “artifacts” can start to appear.

These artifacts become a part of the image and cannot be easily removed.

Even a skilled graphic artist using a professional image manipulation package won't find it easy to create a useable image from one which has heavy artifacts.



Artifacts start to appear when the image has been compressed badly.

JPGs are not really suited for simple illustrations, line art or any flat-colour art, type, or images with sharp, well-defined edges.

Note: Something else to bear in mind... Each time a JPG is saved - even at the least compression setting - information is lost. If you intend to use the image again and again, the best option is to save it as a TIF or other lossless format, so you always have a good quality Master to work from.

Remember - converting to a TIF WILL NOT replace any missing information!

GIF

GIF - pronounced "giff" - stands for Graphic Interchange Format and also uses lossy compression.

Although this may be a less commonly known format - except for those with web experience - This file format has many advantages over the JPG when it comes to line art and logos etc.

They are best for images with sharp-edged areas of flat colour, line drawings, simple icons and buttons, and textual images that don't use more than the 256 colours.

Because of the high compression and small file sizes, GIFs are particularly suited for the web.

Unlike JPGs they have the ability to have a transparent background which easily allows you to use "cut-out" images onto different colour or even patterned webpage backgrounds.

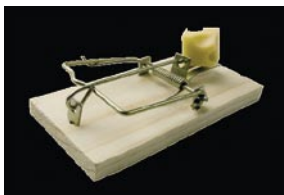
You can, however end up with an undesirable Halo effect around the cut-out outline.

Tip: One way to reduce the halo effect which is produced is to switch off the anti-aliasing before you select the background colour to be transparent.

Another advantage of GIFs over JPGs is the ability to create simple animations.



In this image, we want the mousetrap to sit on the black background.



Converting it to a GIF means we can set the background to transparent. However this often causes a "halo" effect.

PNG

PNG is pronounced “ping” stands for Portable Network Graphics. Unlike JPGs and GIFs, this type of graphic uses a lossless form of compression.

This format is even less well known except maybe by the web community.

It was created initially to replace GIF for web due to its 3 main advantages over the GIF format:

- 1) It contains alpha channels (which allow variable transparency) so you can smoothly anti-alias onto any background.
- 2) It has gamma correction (which is the cross-platform control of image brightness between Apple Macs and PC's)
- 3) It also has two-dimensional interlacing (a method of showing the image progressively so you get a clear idea of the image before it has fully downloaded).

PNGs were created as a single image format which means that multi-image applications such as animation or moving graphics is not possible.

PNGs compress in a “lossless” way which means there is no loss of quality of the image once it has been compressed and each subsequent time it is saved as a PNG.

BMP

BMP stands for “Bitmap” and was one of the original graphic types.

It was originally created as a standard format for computers running the Windows Operating System.

BMP files can ONLY contain RGB information and therefore are NOT suitable for professional printing work.

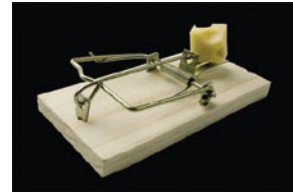
This file type is still used, but not widely

Typical formats used in Print

TIF

TIF pronounced “tiff” stands for Tag Image File Format.

This file type is the design and print industry's standard format and has the advantage of being truly cross-



Here is the picture from the GIF example converted to PNG. By using transparency here there is no halo effect...



... which means you can drop it onto any background - no matter how complex.

platform so will retain all of its information regardless of whether opened on a an AppleMac or a PC.

It has the option to use LZW compression which is a lossless format so it retains all of the image data.

It does, however, produce some of the largest file sizes. I have used TIFs in my work for clients which have been as big as 1.2Gb - which, believe me, is BIG!

EPS

EPS stands for “Encapsulated PostScript” and is also a lossless format.

This is the standard format for importing and exporting postscript files.

Note: Postscript is a language which was developed to act as a common language for converting graphical output to a language printers (such as laser printers) could understand.

EPS files have the ability to incorporate both raster AND vector information in the same file, while keeping the Vector information editable. This means that you can combine text, graphics and pictures together in one image.

EPS, along with TIFs are the most commonly used file types for professional design and print.

AI

AI which stands for Adobe Illustrator.

This is the industry standard when it comes to vector formats (although there are other formats available).

As previously stated, vector images are calculated at the time of drawing, always retain their quality regardless of size and so are a lossless format.

RAW

Another format worth mentioning, although not used directly for print (without first converting to a print format such as TIF) is the RAW format.

RAW is the system used by many top quality and professional digital cameras, to capture the highest possible quality - a “digital negative” if you will.

Unlike the other formats we have mentioned, RAW can store image information in either 12 or 14 bits.

This means that the colour range and brightness information contained in each image produces pictures which have a lot more colour depth and vibrancy.

Lower specification digital cameras tend to favour JPGs because they can save more images into the memory, and the majority of images taken on these cameras will be used for non-professional purposes, so the final quality is less important.

RAW files can be transferred to a computer but need to be converted and saved through specialist programs such as Photoshop to retain all of the image information which was captured.

Compressed versions of the image can then easily be created, but still keeping a high quality copy.

Note: If you want to produce good quality prints, my recommendation would be to set your digital camera to the highest resolution available (and the least compression). This way you stand the best chance of getting a decent quality print.

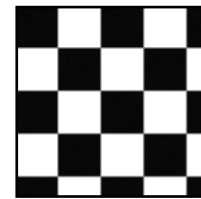
Some of the more common terms and Frequently Asked Questions

Q. What does DPI actually mean?

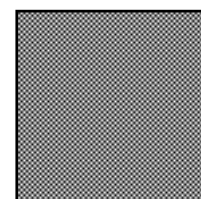
When understanding the role of graphics in print and for the web, one of the most misunderstood things is the “DPI” of a graphic.

DPI (or “dots per inch”) is a traditional printing term which was used to specify how many dots of ink are placed every inch.

If you look at the first chequered image, you can see how it is made up of alternating squares of black and white, each 1 pixel in size.



Here is a chequered image where each dot is a pixel across.



Here the chequered image is shown as an inch square and is set at 72dpi.



*Here the chequered image is shown as an inch square and is set at 300dpi see how it appears almost solid grey.
(try zooming in on the page)*

If you then look at the second image, you will see the same chequered image at 72dpi which appears blocky when you look closely - you can see the individual pixels.

The third image set at 300dpi appears to be grey, but if you zoom in as close as you can, you will see that it is also made up of the chequered image.

This is the main reason you cannot use 72dpi screen resolution pictures to print a good quality image on paper.

So, when talking about graphics...

For use on a computer or the internet, remember 72dpi.

For use in printed material remember 300dpi.



Optimisation of graphics is a must - particularly when your website is graphics heavy..

Q. What is “optimisation” and why do we need it?

Optimisation of web graphics started in the early Internet days when everyone used slow “dial-up” Internet connections.

This was to make web pages download onto the users computer screen as fast as possible.

Nowadays most people have a much faster connection, but the need for optimising still remains.

Statistics show that even with faster connections, website visitors don’t stay around too long if the site doesn’t get their attention or takes too long to download graphics to the landing page.

As the saying goes, “You only have one chance to make a first impression”...

Q. What is Anti-Aliasing?

Anti-Aliasing is the “get-around” that graphics packages use to give the illusion of smooth curves and lines, usually on text or vector graphics which have been converted to display as bitmaps.

Because images on screen are made up of pixels, straight lines which are at angles or especially curves tend to show up with stepped jagged edges (called “jaggies”).

Compare these 2 versions of the letter “a”.

a

Aliased text (above) showing “jaggies” and anti-aliased text below showing a smoother edge.

a

The top one is aliased, i.e. it has jagged steps where the curves are. The one below it has had anti-aliasing applied and the curves look a lot smoother to the eye.

Anti-aliasing fools the eye by giving the appearance of smoothing these edges out by adding shades of grey (in the case of black and white) or colour to fill the steps.

The first picture (a) here lets us visualise a diagonal line across a set of pixels as we would imagine it to be:

The next picture (b) shows the computers aliased interpretation.

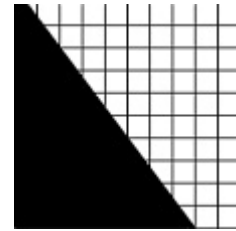
Notice how the “straight” line is actually interpreted as a series of steps through the pixels.

The third picture (c) now shows the same image with anti-aliasing.

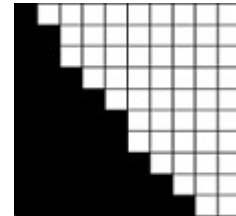
The varying shades of grey which have been added helps to fool the eye into seeing a much smoother line.

Because our brain is expecting a straight line, our brain now “sees” a straight line.

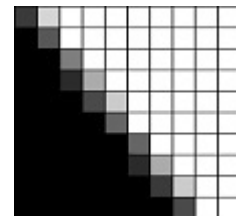
NOTE: the colours used in the anti-aliasing process depend on the colour of the line or text and the background it is sitting on.



a) A diagonal as we would expect to see it.



b) A diagonal as the computer sees it - complete with “jaggies”.



c) The various shades of grey help to smooth out the “jaggies”.

Q. What is dithering?

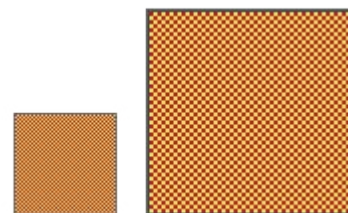
Dithering is where a colour is made up of tiny dots of other colours. This is particularly noticeable in limited paletted graphics such as GIFs.

If the required colour (in our example Orange) isn't available in the users colour palette settings, then the computer will mix yellow and red to simulate the orange.

As you can see, this can lead to a visibly dotted and speckled (and in most cases undesirable) image.

The best way to avoid dithering is to stick to the 216 “Websafe” colours wherever possible.

This is actually a similar process to full colour printing where dots of the four colours of ink (Cyan, Magenta, Yellow and Black) are mixed together to create the illusion of colour pictures.



When you look closely, this Orange colour is actually simulated by mixing red and yellow, but dithered colours can appear “grainy”.

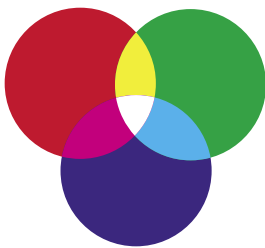
Note: For those of you with an enquiring technical mind, you are probably expecting there to be 256 websafe colours in the palette, but because Windows and AppleMacs use slightly different palettes, this reduces to 216 colours which are truly cross-platform compatible.

Q. How does transparency work and what would I use it for?

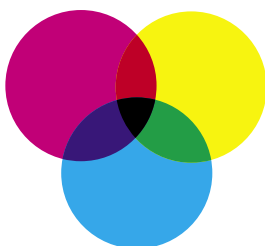
The use of transparency in images is useful because you can remove unwanted pixels and then have a colour or image show through from behind or you can even fade pixels so that background shows through.

The mousetrap examples on pages 9 and 10 cover this subject with some clear examples, although it is incredible what is possible to create by using transparency in different ways.

As previously mentioned, GIF and PNG for the web and TIF, EPS and all vector formats all support transparency.



The image above shows the Primary colours for a monitor, Red, Green and Blue. Where they overlap produces the secondary colours and where all three meet produces white.



This image shows the colours for print, Cyan, Magenta and Yellow. Notice that here where all three colours meet produces black (almost).

Q. RGB or CMYK - What is the difference?

Colour for screen and print is made up from a series of coloured dots.

For screens (monitors) they are called pixels and all colours are made up from various intensities (0-100%) of the 3 primary light colours, Red, Green and Blue (RGB).

By mixing various combinations of each of these colours you can create all other colours from the screen palette.

When you mix all three colours together you get white.

For print they are ink dots which are made up of 4 colours Cyan, Magenta, Yellow and Black (CMYK)

Again all colours are made up of different combinations of the 4 print colours, but “intensity” is created by changing the size of the dots.

When you mix CMY together you get black (you actually get a dark “muddy” colour so Black was added as a 4th colour to make the blacks appear richer).

The 6 mistakes you need to avoid making when working with graphics.

1 - Using the wrong resolution

One of the most common issues I see is when clients send me graphics for inclusion in their brochure, which have been set to be used on the web.

It is amazing how often customers send me a 320 x 240 pixel image at 72dpi and then wonder why we can't get a good quality and well sized print from it.

So now I'm going to try and explain why they are not suitable without getting too technical:

At 72dpi (screen resolution) there are approximately 3 pixels in a 1mm

An 800 x 600 pixel image would print at approximately 267mm x 200mm which would appear to be quite large.

However, the printed image will appear very blocky (refer to the section on resolution on page 5).

At 300dpi (print resolution) there are approximately 12 pixels in 1 mm so a 800 x 600 pixel image would print at approximately 67mm x 50mm (approximately a quarter of the size).

This is because for print, to get a good quality picture, you are squeezing more dots into a smaller area.

2 - Taking pictures from websites and the Internet

There are actually two issues involved with taking images from the internet - one of copyright infringement and one of quality.



Above at 72dpi. Below at 300dpi which prints at approximately a quarter the size



Copyright infringement is a highly complicated subject in itself, and it still amazes me how people still generally view it as an “okay thing to do”.

I want to make something clear right now...

Just because the Internet is regarded by many as public domain (i.e. that everything on there is copyright free) that is actually NOT the case.

Copyright laws (which do vary country to country) are both applicable AND enforceable.

People assume that if they download a picture from an obscure website off the internet “no-one would know”. This is NOT the case.

There are ways of putting digital signatures into pictures which can still be read regardless how many changes are made to the original image.

There are ways of tracking image downloads and tracing IP addresses.

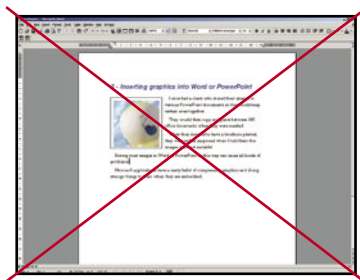
People are becoming more aware of their rights and we are living in a “Sue ‘Em” culture and these methods are becoming more readily available.

There have now even been a number of successful prosecutions against people who decided it didn’t matter.

They soon realised that it did.

My advice would be to go to an image library and download it from source where you know that you have been granted the rights to use the image for your requirements.

I have listed 4 such libraries at the end of this section, ranging from completely free to only a few dollars each.



Avoid using Word or PowerPoint to store graphics if at all possible

3 - Inserting graphics into Word or PowerPoint

I once had a client who stored their images in various PowerPoint documents so they could keep certain ones together.

They would then copy and paste between MS office documents when they were needed

When they decided to have a brochure printed, they

were rather surprised when I told them the images were not suitable!

Storing your images in Word or PowerPoint in this way can cause all kinds of problems.

Microsoft applications have a nasty habit of compressing graphics and doing strange things to them when they are embedded.

It may look great when printed on your home/office printer, but believe me - it won't look good when you try and use them for a brochure which will be professionally printed.

Trying to extract graphics from Microsoft applications and get a good quality image is almost impossible.

My advice would always be to keep your images in a separate folder and send the original picture along with the Word or PowerPoint document.

If you want to organise your pictures into a library, there are many programs available which do just that including Picasa which is free from Google.

Take a look at <http://picasa.google.co.uk/>

4 - Using RGB images for print

As previously mentioned, the technologies for producing colour for the web or for print are completely different.

Pictures which are set to RGB can be printed on home/small office printers because the quality demand is lower and they have special software drivers which allow for an acceptable quality.

For Litho printing however, the pictures need to be converted to CMYK at source so they can be split out to the individual plates, and enable them to print correctly.

5 - Scanning pictures from publications

There are many issues when it comes to scanning pictures using a flatbed scanner - far too many to go into all of them here.

However, it is worth mentioning the 2 main issues I see

when clients send in images which they have scanned themselves.

Firstly, typically they have scanned at the wrong resolution for the requirement they have for the graphic.

NOTE: As I have mentioned before, if you want an image for the web use 72dpi or if you want it for print use 300dpi.

The second issue causes a problem known as “Screen Clash” which is a little more serious.

Without getting too technical...



Scanning an image from a magazine creates interference which is called “screen clash”. It can otherwise be known as the “moire effect”

When a picture is printed Lithographically, the image has to be converted to a series of dots which is called half-toning. This is done using a group of screens (typically 1 for each colour C - M - Y - K).

The image is then printed as a series of dots (differing in colour and size) to reproduce the picture.

If you then scan a picture which has been printed, you are actually scanning the sequence of printed dots, rather than the “original” high quality digital image.

Now when the picture is set for print, another set of plates is made and you get a mis-alignment of the original dots to the new dots on the screens, which produce what is called a “moire pattern” effect (see example image opposite).

There are a few “tricks” that graphic artists can try which may reduce the risk of this happening, but there are no guarantees.

The best option is still to use original images wherever possible to guarantee great print quality.

6 - Using clipart

Clipart is NOT a good option to use if you want to appear professional to your clients.

While it may well have its place being used to illustrate

in-house presentations, it is generally perceived as “home produced” by the business community.

If you must use clipart, then try and get ones from an image library rather than the standard ones supplied with Microsoft Office.

I’ve even seen clients who have used a standard clipart as their company logo and then wonder why someone else has used in on a flyer they had received!

Summary

Having made it this far through this report, I hope you now have a clearer understanding of the differences between the different file formats, the importance of having the different formats and knowing when to use them.

For those of you who may want to refer back to this guide frequently, I’ve included a **Quick Reference Table** at the back, which cross-references the features of all of the different file types.

I really hope you will find this of use.

We are always looking at ways we can improve our information to make it even more helpful, so if you have any comments to make, please send them by e-mail to improveinfo@meta-morph.co.uk

Appendix

Quick Reference Table

	WEB				PRINT			
	JPG	GIF	PNG	BMP	TIF	EPS	AI	RAW
Compression								
Lossy	X	X						
Lossless			X	X	X	X	X	X
Graphic Type								
Raster	X	X	X	X	X	X		X
Vector						X	X	
Suitable for								
Website	X	X	X	X				
Printed Material					X	X	X	
File Type supports								
Transparency		X	X		X	X		
Animation		X						
Colour Scale								
8-bit (256 colours)		X						
16-bit (65.5K colours)								
24-bit (16.7M colours)	X			X	X			
32-bit (16.7M colours)			X		X	X	X	
Graphics Programs								
Photoshop*	X	X	X	X	X	X		X
Illustrator*						X	X	
CorelDRAW Suite	X	X	X	X	X	X	X	X

* Please note that these packages can open different graphics types but may not necessarily be able to work with them in their native format.

The above table shows a comparison of the different graphics types, and the features each one.

Low cost graphics libraries

Using the right photographs and other images on your website or in printed materials can make a real difference to the perception the reader has.

As I have previously mentioned, you cannot just take images from the web and use them for your work, for copyright reasons and because of the quality and formatting reasons we have already discussed.

Whilst you might be tempted to say “What the heck - no one will ever know” with the way graphics are indexed on the web nowadays and people taking their copyright and Intellectual Property more seriously, the chance of being found out is increasing at an accelerating rate.

There are many sites you can go to on the internet to get images you can use in your work - and they don't have to cost a fortune!

Here are just 4 library sites which could get you up and running for next-to-nothing.

Stock.Xchng

This site offers high quality images for free. You do have to sign up to use the site, but apart from an e-mail confirming your application, you don't get bombarded by spam.

www.sxc.hu

iStockphoto and Big Stock Photo

These sites are true low cost libraries with each image ranging from \$1 to \$10 depending on the resolution you require. What's more, once you have downloaded an image you have unlimited use.

www.istockphoto.com

www.bigstockphoto.com

Clipart.com

This site is a membership site but has a limitless (seemingly) supply of clipart and images for use on websites. If you are using a lot of small resolution images regularly then this is well worth joining.

Despite its name, it also has photos, fonts, illustrations, web button graphics.

www.clipart.com

NOTE: One thing I MUST point out. **ALWAYS** review the licensing information **BEFORE** using an image.

Sometimes there are no restrictions, sometimes the photographer just wants to be accredited when you use one of his pictures and some sites stipulate "not for commercial use" (read "commercial gain").

Always make sure you are clear how you are able to use an image - **BEFORE** you do!

Low cost graphics packages

Although there are many different programs out there which could be used, I would recommend the following if you are serious about creating your own graphics.

For Raster graphics, the industry standard, and best on the market is Adobe Photoshop (www.adobe.com). I'll warn you now that it is expensive, and there is a steep learning curve, but the results you can achieve are incredible.

Adobe Illustrator is the industry standard for vector graphics. As with Photoshop, this program is quite pricy and also has a steep learning curve.

Another set of programs worth considering is the CorelDRAW Graphics Suite which includes CorelDRAW which handles Vector and PhotoPaint which handles Raster as well as a number of other tools such as CorelTrace for tracing raster and turning them into Vector etc.

For what you get for your money, especially if you are wanting to get more advanced, this is well worth getting your hands on (www.corel.com).

