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PRINTtips



Graphics

Printing

Mailing

Under One Roof

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Picture This... Using Images in Documents

Imagine a page of text describing a product offered for sale. Now imagine that same page with images of the product added.

Even in your imagination there's a difference – the image adds interest to the page and improves its appearance.

That's the power of images, whether they are photographs, clip art, illustrations, charts, graphs, or symbols. To attract attention and improve reader comprehension, nothing beats an image.

An image has maximum effectiveness when it satisfies these four criteria: the image is worthy of being printed; it is of good quality; it is relevant to the text; and it is consistent with the design and layout of the document. In this issue of Printtips we will focus on what makes a good quality digital image for print.

What is a digital image?

A digital image is an image stored as one of two types: vector or raster. Vector images are lines created from mathematical calculations while raster images (also called *bitmap*) are created from numerical values – ones and zeros – organized as a fixed number of rows and columns of picture elements or *pixels*.

Vector images are created by illustration or drawing programs such as Adobe Illustrator or Corel Draw. Raster images are created by digital cameras or scanners and are edited by image editors or paint programs such as Adobe Photoshop or Corel Paint Shop Pro.



Color in images

The simplest images, called *binary images*, contain only two colors. Each pixel is stored as a single bit (either 0 or 1). These images are sometimes referred to as *black and white* or *monochrome*.

In a *grayscale* image, each pixel is a shade of gray that varies from black to white. Sometimes called a *monochromatic* image, grayscale requires 8 bits of storage for each pixel where each bit represents 256 possible levels of gray.

For a full color image, each pixel has 24 bits of storage and can display 16 million colors, shades

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and hues. This explains why files containing color images are so large.

The two most common color models are RGB (red, green, blue) and CMYK (cyan, magenta, yellow, and black). RGB color is the color model for computer monitors and the web, while CMYK is the color model for printing. If you are working with your images in the RGB model, you must convert them to CMYK before placing them in your document.

Image resolution

Image resolution is the amount of detail an image holds, expressed as the number of pixels in the image. Resolution for digital cameras is often expressed as the number of pixel columns (width) by the number of pixel rows (height), such as 640 x 480. For printing, resolution is expressed as *pixels per inch (ppi)*, meaning the number of pixels in a linear inch. The more pixels per inch, the higher the resolution.

The most important thing to understand about resolution is the relationship between an image's resolution (ppi) and an image's print size (actual width and height). For a photograph to reproduce well in print, it must have a minimum resolution of 300 ppi in its print size. Such a file is termed *high resolution (hi-res)*. In some cases we may be able to use a 200 ppi image, but we almost never can use a *low resolution (lo-res)* file (resolution is below 200 dpi) because there are not enough pixels to adequately represent the image.

Even if a file's resolution is high enough, it still may not reproduce well if the image resolution doesn't match the print size. If you ask us to enlarge the image to print in a bigger size than it was originally, the pixels that make up the image will move farther apart. This changes the number of pixels per inch, reducing the resolution. If the enlargement is significant, individual pixels may become visible, creating jagged edges in the image. This effect is called *pixelation*.

File size

The size of a file is determined by whether it is a vector or raster file and whether it is binary, grayscale,

or color. *File compression* is a way of reducing file size without compromising image quality.

There are two compression methods: one (called *lossless*) keeps all the pixels of the original image but finds more efficient ways to represent recurring patterns of pixels in the file; and one (called *lossey*) eliminates pixels that aren't needed to maintain quality.

File formats for printed images

The best file formats to use for images that will be printed are:

- For vector images: .eps (Encapsulated PostScript)
- For raster images: .tif (Tagged Image File Format)

Recall that vector images are constructed from mathematical formulas. This means that they are resolution-independent and can be *scaled* (resized) and manipulated (flipped, rotated, stretched, cropped, colorized, combined) with ease using programs like Adobe Illustrator and Corel Draw. This is an ideal format for initial design of logos and illustrations, and for clip art.

Raster images are composed of rows and columns of pixels (sometimes called a *bitmap*). Because raster images are hard to resize and manipulate, they are best used at the size and orientation of the original. Raster images can be cropped, colorized, converted to grayscale or monochrome using image editing programs such as Adobe Photoshop or Corel Paint Shop Pro. All photographs are raster images.

The .tif file format usually produces the best quality image from a digital camera. The other choice is .jpg (Joint Photographic Experts Group), a file format that has been optimized for continuous-tone full color photographs by incorporating file compression.

JPG compression looks at blocks of 8x8 pixels and selectively reduces the detail in each block. This maintains the physical size of the image, reduces the amount of space required to store it, but sacrifices the quality of the image. The extent of image degradation depends on the degree of compression (it is adjustable).

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If you are editing or manipulating digital photographs, work in .tif format rather than .jpg since each new save in .jpg compresses the file. By contrast, a .tif file uses lossless compression, so there is no loss of pixels.

The file formats .psd (Photoshop), .psp (Paint Shop Pro), .ai (Adobe Illustrator) and .cdw (Corel Draw) are proprietary. They are good to use while editing images in order to have access to all the editing tools in the program. However, after the image editing is complete, save raster images as a .tif file and vector images as an .eps file.

Use images successfully

For maximum effectiveness, any image you use in a document must reproduce well.

This requires attention to the file format and

adhering to production standards. When you are deciding among possible images to include in your document, call us for assistance, **we** will be happy to help.



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Copyright Considerations

To safely use images that you have found on the web without copyright infringement, you need to know the difference between images that are in the public domain and those that are protected by copyright. Here are the basics:

- All intellectual property (writing, images, illustrations, photographs, etc.) belongs to the person who created it, and that person may impose conditions or terms of usage on anyone else who wants to use the intellectual property. Failure to honor the terms of usage is a violation of the intellectual property owner's rights.
- After a certain amount of time, intellectual property passes into the public domain. A work in the public domain is a creative work that is not protected by copyright and which may be freely used by anyone.

Anything published before 1923 is now in the public domain. Unpublished works created before 1978 begin to pass into the public domain on December 31, 2002. The absence of a copyright notice on works published before March 1, 1989 puts them in the public domain (with some exceptions). Once an image has passed into the public domain, there are no restrictions on its use. You can make changes, add color, resize, or even resell the image.

There is a misconception that images available on web sites are in the public domain. Usually they are not. Images scanned from sources such as magazines, books, greeting cards, coloring books, etc. are copyrighted and should not be used without written permission. Most cartoon characters (Disney characters, for example) are copyrighted.



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Effective use of Images



“One or two key images that support the text will be more effective than a lot of distracting visual noise.”

A good rule of thumb is to include no more than 3 or 4 images on a single page of text. When counting the images, include photographs, clip art, charts, graphics, boxes and borders, and decorative special effects. One or two key images that support the text will be more effective than a lot of distracting visual noise.

To reduce the number of images, try these tricks:

- Unify decorative special effects by picking one and using it throughout the document rather than changing it on each page.

- Use font size, alignment, or color for emphasis rather than clip art.
- Instead of several small photos, enlarge and crop one photo so it dominates the page.
- Collect items that require reader attention into a single box with a background screen.
- If you must include many photographs to accompany one story, arrange them to indicate priority or importance.



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