

DIGITAL IMAGES: QUALITY



Image Size – Dots/Pixels Per Inch

DPI means dots per inch and PPI means pixels per inch. DPI technically refers to printed resolution, but most people use it to refer to print and screen.

The default “screen” PPI of 72 is actually a misnomer and means nothing because display Pixel Density varies widely. However, if you’re making graphics for a HiDPI display, you will still need to double or triple pixel counts and follow filename conventions to have the images render correctly.

When talking about image quality, you’ll often see and hear references to an image’s DPI—like, “don’t print 72 dpi images.” Well, it is a little more complicated than that. DPI/PPI isn’t an intrinsic property of images. It is just a handy divider for the image’s pixel dimensions, and it’s used to calculate the printable size of the image in inches. What actually matters for image size is the total number of pixels in an image—its resolution—and where you are printing/displaying the image.

The standard for print is 300 dpi (though it actually varies), so every 300 pixels is 1 inch. An image that is 2700x3600 pixels can be printed at 9x12 inches (2700/300 by 3600/300).

Be cautious when changing the DPI in Photoshop. **Always turn off image resampling**, since that will either upscale the image (by making up pixels) and can lead to an image that lies to you about its quality until you print it.

When working with raster images in InDesign and Illustrator, look at a link’s “Effective PPI” which you, again, want to be over 300. Here the number becomes a good shorthand for knowing if your image has a enough resolution for a given physical size.

Image Quality – Lossy versus Lossless

Uncompressed bitmaps are enormous files, so a variety of image formats exist to deal with their file sizes. Most of them use compression, which comes in two types: Lossless and Lossy. This applies for all digital media, including audio and video files.

Lossless means exactly what it sounds like. No information is lost (or thrown out) in order to make the file smaller. It does this by looking for strings of similar information and using shorthand in their place. Some lossless image formats are TIFF, PSD, and PNG.

Lossy is the opposite. These make a file smaller by averaging together information that is almost identical. This is done by understanding how human sense perception works, and simplifying the information in the ranges of brightness where we have trouble distinguishing between values. The only lossy format to really familiarize yourself with is JPEG. Used right, JPEG is a good and acceptable format for sharing your images. That said, JPEGs that have been compressed too much, or compressed repeatedly, will have compression artifacts. So it is best to work from a lossless format and only save the version you share online in JPEG.

DIGITAL IMAGES: COLOR SPACE

The Fundamentals of Making Color

There are two ways to make color. **Screens use additive color.** They emit red, green and blue light to make a range of colors. Areas with all the colors are white. Print uses **subtractive color.** Pigments absorb incoming light, and what remains is the color that you see. The subtractive primaries are cyan, magenta and yellow. Theoretically, areas with all three colors will appear black, but our ink pigments aren't perfect and it actually makes a dark muddy brown. So, when printing, we add a black ink which gives us the K (for key) in CMYK color.

Color Models

There are many, many technical specifications for producing color, down to the exact monitor and printer you are using, but all you need to know for most work are three big classifications: Grayscale, RGB, and CMYK.

Grayscale is obvious. It is for black and white images. You might use it for black and white scans or logos.

RGB and **CMYK** are the two for color. Are you making something for online, video, or to be displayed on a device? Then you'll want to make it in RGB. If you're making a print design, then you'll want to use CMYK. You can translate between colorspaces, but be wary of doing this with black text, as that will be converted to a rich black. See the Design Guide for Printing Color that I've provided for examples of rich black text, and what can happen when you use them.

Color Accuracy

We can see more colors than RGB screens and CMYK printing can reproduce. A CMYK blue or green, for example, will never be as bright and vibrant as the ones that a display can output. And neither can match the brightness and vibrancy your eyes can take in. Every color space has a range of colors that it can describe, this is called its color gamut.

Some specialty printers add extra inks to CMYK's 4-process color. Sometimes it is premixed batches of an exact color or specialty inks, like metallic colors and even varnish. Other times it is for wide gamut printing, where extra inks are added to fill in the colors that CMYK has difficulty producing.

White Point, Black Point, and Toned Paper

If you ever end up printing on toned or colored paper or need to present work on a dim projector, then you'll need to know about how these change the colors and brightness of your designs. Nothing on a page can be whiter or brighter than the paper itself. Newspapers are a great example of this extreme. Photographs that appear on newsprint have to have their mid and low tones lightened before printing, otherwise all the detail in dark portions will be lost. Projectors are the opposite extreme; they can only make dark areas through contrast with the areas they light up.

When printing on colored paper, another thing to consider is that the paper will cause a hue shift to your printed colors. Even light cream and unbeached paper will do this, if to a lesser degree.