

Eye for Design: Pixel Haze: Fundamental Resolution

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Years ago, I worked for a sign company. We owned one of the only printers in town with the ability to produce large graphics, so as a result, many of our clients wanted posters created for trade shows or presentations. One day we had an unusual request: A customer wanted a picture of himself with Jimi Hendrix blown up into a three-foot poster. The customer had scanned the decades-old photo and brought the resulting computer file into our shop on a computer disk. The original hard-copy of the picture was already slightly deteriorated at the time of the scan and had since been lost. But, being a novice designer, I agreed without hesitation. I mean, how cool was this picture, man? The file was a tad small, but I was sure I could scale it without any problems.

The next day, a very disappointed Woodstock veteran declined to pay for the blurry 36" disaster, even though I had printed it at least four times the day and night before. The skimpy resolution of the Hendrix image shined a harsh spotlight on my lack of experience. My boss was not pleased at the time and materials wasted, but I learned a valuable lesson: garbage in -- garbage out.

In order to turn my trash to treasure, I had to learn some lingo. People frequently refer to images as "low-res" or "high-res." These "resolution" terms are used to describe whether an image is small and more suited for a web page or large enough to print. Resolution is simply a measure of how well visual data is perceived by the human eye, so a basic understanding of it is crucial to successful graphic design projects. Optimal image resolution requires a balance between image input (current size and file type) and image output (desired size and destination). For example, a jpeg image taken from the web might not be the best choice for library signage printed on a professional press. Conversely, a 100 megabyte photo needs to be sized down before it is used on your web page.

Various projects will cross your desk that will require a myriad of image types and sizes. Some images, like your library's logo, will be used for business cards, newsletters, web pages, and fifteen-foot banners. Your job is to make the best choice of the computer file for that image to achieve the input/output balance. You want to achieve the design tri-fecta: time, clarity, and expertise. Doing so will save you time by using the appropriate sized image, ensure your project has clarity and readability, and let your professionalism take center stage. So what is the first step to becoming a resolution rock star?

Learning the difference between the two types of graphic data structures: raster and vector.

Raster Images

Raster images, which often have the file extensions of .jpg, .gif, .psd, .tif, and .png, are the most common file type you encounter on an everyday basis. Digital photos, scanned documents, and images on the web are in the raster format. Raster images are composed of a collection of pixels – small dots of color information on a grid – and these "bits" of dots are why rasters are also known as "bitmap" files. Pixels are measured by the square inch, so you will frequently see resolution defined in terms of dpi (dots per inch) or ppi (pixels per inch.) The "per inch" part of this equation makes a raster image's quality wholly dependent on its size and whether it is viewed on a screen or printed. The reason behind this contingency is the way the human eye views images on different media. A computer screen can produce a high quality image using very few pixels per inch, or about 72dpi. Not so on paper. In order to get the same apparent quality in print form, an image requires more pixels per inch, typically 300dpi. So for example, if an image is 144 pixels wide and 144 pixels high, it can best be viewed on a web site at 2" by 2". If you need to use the same image in a brochure with the comparable clarity, it should only be about 1/2" x 1/2".

This is why a picture you might find on the web looks great on the screen at 6 inches high, but appears blurry when printed on a laser printer at that same height. The two pictures on the next page are the same, except that Picture A is the correct resolution for the web (72dpi) and Picture B is the correct resolution for printing (300 dpi.) They both contain the exact same amount of pixels. If you're viewing this page in print form, the picture on the left is noticeably fuzzier; if you're displaying this page on a computer screen at a zoom level of 100% or lower, the guitars look no different in terms of fuzziness. It's only when zoomed in at a high level (e.g., 200%, which most people don't do on websites) that the more dpi on the right become useful on screen.

Since there is a finite amount of pixels to look at, you can only enlarge a raster image a little bit before compromising clarity. Image editing software attempts to improve clarity during file size enlargement by interpolating (adding pixels based on information already present), but pixel stretching has its limits.



Picture A: 72 dpi

Picture B is 1/4
as tall as Picture A



Picture B: 300 dpi

Why the improvement limit? Imagine a small white saucer filled with fifty sweet peas. Side by side, the peas form a solid green circle that covers the entire saucer. Now put those same peas on a dinner plate. The peas can easily be spread apart and more of the plate can be seen. Finally, put the peas on a large serving platter. The peas are even farther away from each other, and now the platter is dotted with green specs. Pixels are like the peas in our example. Even when you resize an image to make it appear larger, you are never really adding any real data. The software program is just mashing your peas and spreading them to make the plate appear fuller. Yuck.

Vector Images

Vector images, which have the file extensions .ai, .eps, and (sometimes .pdf,) are created mathematically and can be output to super large sizes (as big as the side

of a building) without losing any clarity. The only limitation is that of the actual output device. However, because the vector format uses points on a line and geometric shapes to create images (think 9th grade math here), it is not used for photographs. Illustrations, logos, and line art are created and manipulated in a vector software program such as Adobe Illustrator. The most common type of vector file we use every day is text. Many fonts are created with vectors, which is why their size can be increased with ease. Also, your library's logo might be a vector file, allowing it to be easily resized for various projects. Going back to the sweet pea analogy, using vector graphics is like adding more peas whenever you want to fill your plate. Vectors are the horn of plenty, no mashing required.

An example: when vector is better than raster

So, how can raster and vector affect your own designs? Perhaps you are asked to work on an advertising campaign promoting a new library service for undergraduates. You create an awesome slogan for some table tents and have the image saved as a jpeg (Picture C, see page 12). You can use this image on the web page, brochures, mailers, and emails. But then your supervisor asks you to design a 25 foot banner that will hang in front of the student center. Going back to the previous example, you know you can't stretch the jpeg to fit the banner. The raster file doesn't have enough resolution.

So, you go back to the drawing board and recreate your slogan as a vector file in Adobe Illustrator (Picture D, see page 12). Not only is the image now a bit more crisp and less fuzzy on the table tents, it is markedly sharper and more professional-looking on the banner (in fact, Picture C would not even be readable if it was blown up to 25 feet). And if need be, you can still take a vector file and save it as another graphic file type (e.g., .jpg) if that file type fits your other needs better. Very cool. Although vector files may not be available in every instance, use them whenever you can.

Good Enough

There will be many times when you will have to work with an image that does not have input/output balance. Sometimes, you just have to use with what you've got and move on. Other times, you will have to be experienced enough to say, "No, we can't do that." If any area of the design tri-fecta (time, clarity, expertise) is overly compromised, then you need to seek another graphic solution.

(Pixel Haze...Continued on page 12)

streets and through rain sodden forests, narrowly evading would-be captors with sheer cunning and deceit? For many of our students trying to navigate a library's home page, or search our databases, I'm sure the similarities are not too far afield.

Or is information fugitive in the sense of its elusiveness; its ability to slip away just at our grasp? Is it its transitory nature, its transient quality, that makes it both alluring and frustrating to its pursuers? And, does it so much flee from our pursuit or is it really pursuing its own aims? How often have we seen graduate students more keen on finding information than on using it?

Or perhaps it's fugitive in a Road Runner way, taunting the stubbornly persistent, and amazingly recuperative Wile E. Coyote. Just when all appears within his grasp, the plan collapses and all is lost. (How often students ask us to help them find that article they saw last night on the web, but now can't remember what it is or how they found it.)

For the water, for the coyote, for information, for all fugitives, nature takes its course. And while there may be distractions and obstacles, transformations and diversions, inevitability will not be halted. The water may not make it to the sea this time, but it may next. The Road Runner will never be caught and information... well... it will find its way into our students' heads for a moment or a month or a lifetime.

"I don't think your sister is old enough to ride on your bike," I say to Julia and remind her that she can't even hold her great, giant head very steady.

"I'm thirsty," she says. "Can you get me some water?"

Of course.

(Pixel Haze...Continued from page 3)



Picture C: Raster



Picture D: Vector

Before you begin any project that involves graphic images, ask yourself these questions:

- what type of file am I dealing with?
- what is the current size and resolution of the image?
- how will the image be output? (web or print)
- what will be the final size of the images?
- is the image raster or vector?
- can I obtain the vector image?

Images at the correct resolution will help ensure high quality graphic projects, and will decrease frustration during the design process. Your designs will reflect the awesomeness of your library so well, your boss might even want to have her picture taken with you! Now, excuse me, while I go kiss the sky.