



Grocery stores' bright lighting and subtle flooring intentionally divert attention toward colorful products on shelves.

Design Aspects of Color Management

Essential considerations when producing color-critical work.

“Make it pretty.”

Anyone who has ever worked as a graphic designer has probably heard that statement more than once. Don't misunderstand — a big part of a graphic designer's job is to create an image or project that is visually appealing, but there isn't a “make it pretty” button that makes that happen.

Perhaps the most important variable in the decisions that a designer makes is choice of color.

Color Theory: Color Is A Feeling

Color is much more than a visual observation. It's science and math and — maybe most significantly — emotion. That's something every graphic designer needs to understand about basic color theory. Color is a feeling, and that feeling often results in action.

Every design is about trying to attract attention, convey an idea, and sell a product or service. Colors are chosen for

a design to enhance the message to the consumer. But oftentimes, those colors or their attributes are chosen without much thought. If given a choice between a bright yellow and a dull brown, people know the bright yellow will likely garner more attention.

Humans have also been trained to attribute certain words or meanings to different colors. An everyday example of this is a school bus — why is it yellow? Yellow represents caution, so people automatically regard that vehicle with hesitancy since it could stop at any time to allow children to board or exit.

This same philosophy applies to just about every roadway experience. From brake lights to stop signs to traffic lights, the color red is associated with stopping or warning. Meanwhile, green roadway signs point people in the right direction and green traffic lights allow them to proceed to their destinations. Color association, however, extends beyond the roadways. ▶

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By Shelby Sapusek, Consultant & Chief Marketing Officer, ColorCasters LLC



SpectroPad measuring device.

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Think about what is seen when first walking into a grocery store. There is probably a produce department, deli, bakery, and meat counter on one end, with aisles and aisles of brightly colored pre-packaged food, condiments, beverages, etc., filling the rest of the space.

What about the floor color? It's not surprising if people never notice, because it's not supposed to be noticed. It's probably a subtle color, such as a light cream or tan tile, specifically chosen so as not to distract customers from the products on the shelves.

Since humans understand the relationship between color, feeling, and conveying ideas, color is even used in everyday language. For instance, when someone is told they have "the green light" on a project, they instinctively know they can go forth and proceed. If someone says they are "feeling blue," others liken that to mean that individual is sad or depressed.

Humans experience the feelings and actions that colors can provoke, but designers have to understand those associations so they can choose colors appropriately.

Don't Get Lost in The Language

While color is used to convey certain ideas in everyday conversation, it's almost impossible to determine and recognize a specific color in words. It is generally agreed that grass is green and the sky is blue, but the blue sky one person sees in his or her mind's eye could be very different than someone else's perception of the sky.

This also applies to the many descriptions, like "pretty," that designers try to discern from their clients. "Make it pretty" isn't much to go on since "pretty" can mean different things to different people. Same goes for interpreting what someone means when they ask that an image be brighter or warmer.

While everyone generally agrees on hues of color (i.e. red, green, blue, orange), describing specific colors with only words will rarely result in an agreeable outcome and, if it does, it will likely take a very long time.

Color is a feeling, but it is best described and compared mathematically, and one must first understand the science behind color.

The Power of Light

There are three necessary elements for the perception of color: the observer (i.e., a

human being), an object to observe, and a light source.

It's difficult to stress how important lighting is to viewing color. A light's intensity, its surroundings, and its direction can all affect how colors are perceived. If there is absence of light, there is absence of color. When people wake up in the middle of the night to get a glass of water, they can navigate their way to the kitchen partly from memory and because eyes can make out shapes and shadows — but not color — in the absence of light. Designers need to not only understand how light affects color but take into consideration the lighting conditions of their final projects.

Thinking back to the grocery store, what is the lighting condition inside? It's likely lit by bright, fluorescent overhead lighting. That's because the grocery store owner wants to attract customers' eyes to the brightly colored product packaging in all those aisles. And the subtle but light-colored tile flooring reflects that bright light from the ceiling without taking attention away from the products. It's all done by design. Therefore, it's important to know where a final product will be displayed. Will it be under a grocery store's bright fluorescent light, or will it be outdoors in the California sun?

Designers who work with critical color and want to improve color quality within their projects should also consider investing in a light booth. Using a light booth to view printed work allows designers to see color under the standard lighting conditions.

The Gamut of What's Possible

When it comes to color management, there are many other variables besides lighting that can affect a project's end result. One of those variables is a printing device's color gamut.

Humans see color in the RGB (red, green, blue) color space and can see many millions of colors. Computer monitors can reproduce just over 16 million colors — dramatically less than what humans can actually perceive. Worst of all, CMYK (cyan, magenta, yellow, black) output devices or printers can only reproduce thousands of colors.

Therein lies the problem. Designers try to replicate colors that they can see with their eyes, but they face limitations with their RGB monitors. They are then further limited by the print process because

CMYK printers can only produce a fraction of those colors. Those limitations are the device's gamut.

Every device, whether it's one that captures an image (camera) or outputs an image (printer), has its own unique gamut. That gamut is that device's limitation when it comes to color. If a color falls outside a device's gamut, it simply cannot be captured or reproduced. Unfortunately, there are just some colors that people can see that can't be printed. That's where color management comes into play.

Color Mathematically: L*a*b* and Delta E

Accurate color management is reliant on science and math. Although not every color seen can be printed, designers want to try to get as close as possible. And since everyone sees color just a bit differently, there needs to be a more accurate way to describe and compare colors instead of "warmer" or "brighter."

The coordinate system L*a*b* is what enables people to describe colors on an even level. L* refers to the lightness of a color, a* refers to the redness or greenness of a color, and b* refers to the yellowness or blueness of a color. Assigning L*a*b* values to colors allows for better defining and comparing them.

Delta E is used to effectively communicate color differences. If someone has

the L*a*b* values of two colors, he or she can use a Delta E formula to mathematically describe the distance — or difference — between those two colors. By using a device, such as a colorimeter, each color can be measured, with their L*a*b* values then compared.

What designers really need to know is that when comparing the L*a*b* numbers of two colors with Delta E, the colors are most closely matching when the Delta E is a smaller number. For instance, if the Delta E between two colors is 2, they are fairly close. If the Delta E between two colors is 6, they are further apart in color match.

Setting Up for Success

When designers understand the basics of color theory and color management, there are other steps they can take to set themselves up for success.

First, designers should look at the environments in which they do color-critical work. Is the workstation in a spot where windows can produce a glare on their computer screen? Are the walls and flooring neutral in color? What kind of lighting is in the workspace?

After setting up the optimal work environment, designers can turn their attention to the software and tools that will help them achieve consistent, quality color in their projects. They should determine ▶



Spectro1 measuring device.



Test prints in a light booth.

It's a good idea to invest in a measurement device. Depending on designers' needs, they may only need an inexpensive colorimeter for comparing colors and determining Delta E, as well as for calibrating monitors, or they may want a spectrophotometer that is more accurate.

what kind of monitor they'll be using to view critical color. Some considerations are purchasing a higher-end standalone monitor and installing a shade hood to keep out extraneous light.

Next, designers will want to decide which color management settings to use in their design software — and hopefully the printer's RIP. Most designers know that files can be assigned and converted to different profiles such as RGB and CMYK in software programs. What they might not know is their software's color management settings might be set to a default color space that is actually limiting their color quality.

Most design software programs have similar color management settings menus. For instance, in the Adobe Creative Cloud and CorelDRAW programs, these settings can be changed by going to "Edit" and then "Color Settings."

Some settings may default to an older color space such as U.S. Web Coated SWOP. That profile is more than 20 years old, and also very small. By changing just that setting to GRACol2006 or GRACol2013, designers will open up their color space and will be able to hit more colors.

It's also a good idea to invest in a measurement device. Depending on designers' needs, they may only need an inexpensive colorimeter for comparing colors and determining Delta E, as well as for

calibrating monitors, or they may want a spectrophotometer that is more accurate.

Consistency Is Key

When designers have a color management strategy in place, they can effectively communicate it to clients, print operators, colleagues, and especially fellow designers. While explaining their commitment to color quality, designers should also discuss what limitations there may be. They can help restructure the work environment for viewing color and advise others working on similar projects to set their color management parameters in their software programs and RIPs to the same profile and/or color space. Consistency is key in color management.

When it comes to color, it's important to know a little about everything and not necessarily everything about everything. Finding consistency in one's approach means a better chance of having a successful color management strategy that results in consistent color. ■

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