

SUMMARY

- ◆ Discusses color properties and color systems
- ◆ Re-examines and supports Jan V. White's advice to technical communicators to use color to increase document usability
- ◆ Discusses what technical communicators should know about color to work effectively with professional printers

Color: The Newest Tool for Technical Communicators—Redux

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INTRODUCTION

Although using color in print documents is no longer as uncommon as it was when Jan V. White's popular article, "Color: The Newest Tool for Technical Communicators," appeared in *Technical communication* in 1991, many of us still do not feel comfortable in using it. Most of us technical communicators did not go to design school, thereby acquiring a nuanced understanding of color theory. Similarly, many of us have not worked in professional print shops, thereby acquiring a keen understanding of printer output. Even the textbooks we read in technical communication courses usually devote just one or two pages to color (Reep 2006, 158–159; Smith-Worthington and Jefferson 2005, 152–153). Although most of us are not as "chromophobic" as we once were, we may lack background knowledge about color and, therefore, lack confidence in our choices.

As technical communicators, we realize that we should know something about color theory so that we can choose colors and color combinations that increase documents' usability. We know that color can do more than just dress a document or create visual interest. We also realize that we should know something about the practice of using color effectively and methods of obtaining the colors we intend. In this article, I expand on White's important article (so important that it was republished in STC's fiftieth anniversary issue of *Technical communication* in 2003). From White's focus on the practice of creating usable documents, I zoom out to discuss a broader spectrum of both theory and practice related to color in technical communication, particularly in relation to print documents. That is, in this article, I examine research and best practices to provide some of that confidence-building background knowledge about color.

THEORY AND PRACTICE OF COLOR

On a very basic level, we can divide our understanding of color into two categories: theory and practice. Color theory informs us, helping us understand underlying, universal principles that govern all situations. Color practice directs us, telling us how to use color most effectively. Figure 1 diagrams theoretical and practical knowledge about color that is of interest to technical communicators. White (2003) focused mainly on four branches of this diagram; these four fall under the "creating usable documents" node (and appear in italics in Figure 1). This article discusses the rest of the branches—more considerations about color for technical communicators.

COLOR THEORY

It is easy to be put off by mention of color theory; it seems a bit precious to those of us whose first concern is making sure our intended users easily and efficiently use our documents. However, a little bit of theory in this case can go a long way. For example, understanding color's components could help a technical communicator choose a more accessible color combination and then explain that choice to others.

Understanding color properties

Essentially, as Sir Issac Newton showed when he split a beam of white light with a spectrum, colors are wavelengths of light. Objects around us absorb and reflect different wavelengths of light, and we perceive the reflected ones as color. These visible wavelengths—the visible light spectrum as opposed to ultraviolet light and infrared light—are the wavelengths to which we attach names: red,

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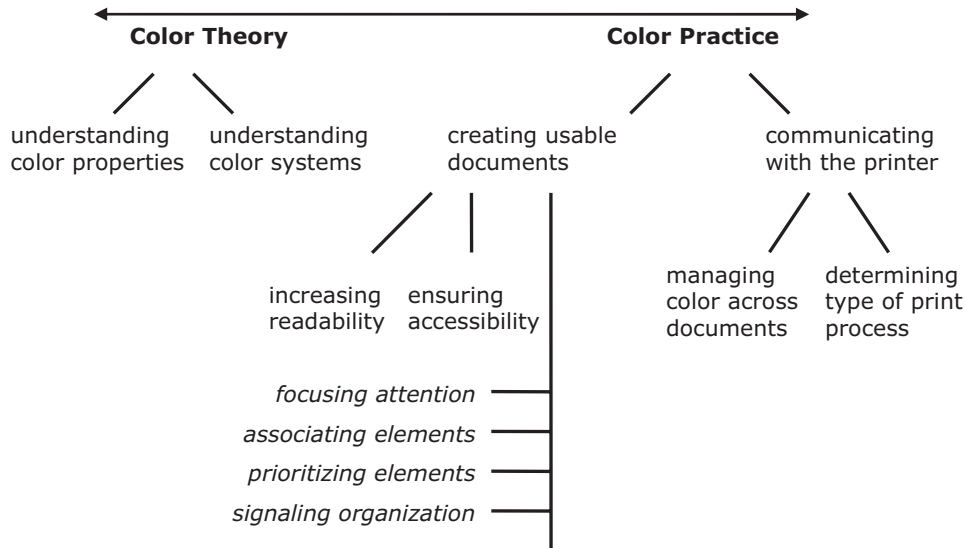


Figure 1. Theoretical and practical knowledge about color.

orange, yellow, green, blue, indigo, and violet. All of us, of course, have heard of these color terms before, but what sometimes goes unnoticed is that these terms really refer to just one of three color properties that together create the different colors we perceive. That is, color has three properties: hue, value, and saturation. Terms like “red” and “green” refer to a color’s hue (also called pigment). Non-specialists tend to use the terms “color” and “hue” interchangeably, but when we technical communicators differentiate between color and hue, using the terms correctly, we are able to discuss our rhetorical and design intentions exactly. Figure 2 shows a spectrum of hues.



Figure 2. A spectrum of hues.

Differentiating between color and hue is important because two different colors can have the same hue. For example, Figure 3 shows an array of colors, all with the same hue. These colors differ not in hue but in value. Value is a property of color that is also called lightness or luminance. Value is related to the amount of light a color reflects. Low value colors appear more blackish, and higher value colors appear whitish; therefore, pastels are high value colors.



Figure 3. Colors with identical hue but different value.

The third property of color is saturation (also called chroma). Saturation is the degree to which a hue is present. In conceptualizing saturation, it helps to think of ink being absorbed into paper. The more ink, the more saturated the paper becomes. Saturation is usually measured as purity in relation to gray. Figure 4 shows colors with identical hue and value but varying saturation (from more green to more gray).



Figure 4. Colors with identical hue and value but different saturation.

differences among colors. After such analysis, we can talk to professional printers more easily because we understand their jargon.

Understanding color systems

Also under the aegis of color theory are color systems—tools for understanding relationships among colors and color combinations. One tool that is particularly helpful to technical communicators (as well as artists) is a color wheel. Different color wheels for different purposes exist, but one of the very first color wheels, created by Johannes Itten, shows how colors contrast in hue (Figure 5).

Itten’s color wheel, often called the mixing color wheel



Figure 5. Itten's color wheel.

because of its use to painters, contains 12 hues and is based on the primary hues red, yellow, and blue. Itten's wheel is particularly useful for analyzing combinations. For example, hues across from each other on the wheel are complementary colors. Blue and orange juxtaposed complement each other. So do red and green, and so do yellow and violet. Myriad other relationships among hues exist, and Itten's wheel helps explain those relationships.

Although Itten contributed enormously to our understanding of color, his system is not the one most professionals in graphic and online design use today. Itten based his wheel on red, yellow, and blue, but for most technical communicators, two other color systems are more common and more important. The first, the RGB (red, green, blue) color system, applies to documents viewed on screen. As it turns out, all of the colors human beings see can be produced from red, green, and blue. These three hues are this system's primaries. The RGB system is also called the direct color system because it systematizes colors produced by light we see directly, as opposed to colors we perceive based on light that is absorbed. In this system, red and blue together create magenta, red and green together create yellow, and blue and green together create cyan. Red, green, and blue together create white, as shown in Figure 6.

Technical communicators who produce print documents need to understand the RGB color system because they write and design documents onscreen before printing them on desktop printers or packaging them for professional printing.

More important to many technical communicators, however, is the CMYK (cyan, magenta, yellow, black) color system. This system, based on hues secondary to red, green, and blue, is also called the subtractive color system because it is based on light that is absorbed. Cyan absorbs

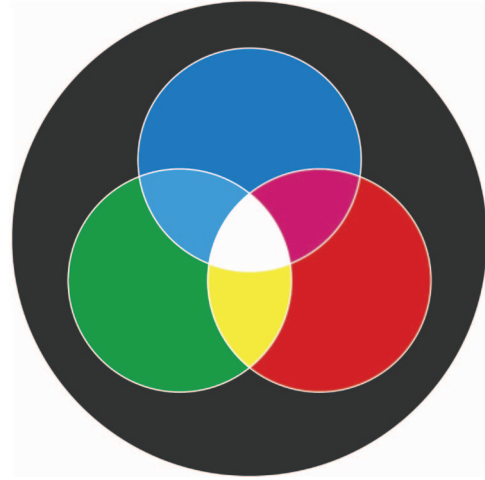


Figure 6. The RGB color system, in which red, green, and blue together create white.

red light, magenta absorbs green light, and yellow absorbs blue light. In this system, adding one hue to the other makes a darker hue. Therefore, adding magenta and cyan together creates blue. All three hues together, in theory, absorb all light and generate black, as shown in Figure 7.

We have to say that cyan, magenta, and yellow added together create black “in theory” because in practice—in the real world of print shops for instance—the three do not necessarily make a black that is black enough for the printer's and client's purpose. Therefore, printers and designers reconfigured the system to accept additions of more black (the K in CMYK represents “black” but stands for “key”) to achieve the dark black they want. Using black ink makes it possible to use just one ink to create black, a rather ubiquitous color, rather than mixing cyan, magenta, and yellow to get the same or even less satisfactory results. That said, as Nancy Schoon, Art Director of Communications and Marketing at Illinois Institute of Technology, points out, clients often want (and printers want to supply) a truer black than one (black) ink alone can achieve; instead, clients and printers want a “rich black.” To get a richer black, printers combine a given amount of black ink with about one half as much cyan, magenta, yellow inks combined. With approximately a 100% K to 50% CMY mixture, printers achieve a black that absorbs more light and, thus, achieves a truer, richer black.

One reason that it is important to understand basic differences between the RGB and the CMYK systems, particularly differences in our perception of color from light within the two systems, is the difference in the ranges of colors—the gamuts—they produce. Monitors display a gamut of RGB colors, and inks and toners on print docu-

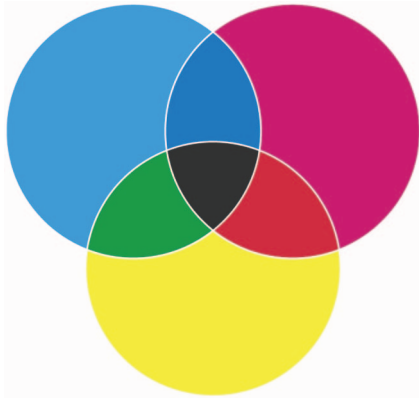


Figure 7. Cyan, magenta, and yellow together create black (in theory).

ments display a gamut of their own, but these ranges are not identical. As technical communicators who want to use color in print documents, we must account for the difference between RGB colors that we see onscreen and the CMYK colors that we want to achieve in print. That is, moving from online to print or print to online may generate color shifts. For example, an online yellow may look quite different in print.

Understanding these two common color systems and their important differences from the familiar system that Itten pioneered makes us better able to understand and use software our organizations already own. For example, we may be less likely to keep a RGB color setting when using digital images in print documents; the RGB gamut may be too wide for print. We will better understand why professional printers talk about cutting back on CMY ink to add K when converting from RGB to CMYK. To maintain the same amounts could mean too much ink.

EFFECTIVE COLOR PRACTICE

In 1929, when William Faulkner completed his novel *The Sound and the Fury*, he told his publisher that he would like to see the first chapter, the Benjy chapter, printed in ink of various colors. Faulkner wanted to use colored ink to differentiate among lines that related Benjy's present time and his memories of occurrences that took place in widely ranging times. His publisher, by the way, said "no" to his request, saying that using colored ink in such a way would be too complex an endeavor (Padgett 2006). Perhaps Faulkner was a closet technical communicator; essentially, what he was asking his publishing company to do was use the visual cue of color to organize text relating to the same time periods. If the publisher had granted Faulkner's request and used colored ink to indicate Benjy's time shifts, the publisher would have eased readers' understanding of

Benjy's consciousness, at least in relation to how his thoughts slip back-and-forth from one time to another. The novel would have had characteristics of a good technical document, in that it would have become more reader-focused, facilitating readers' easy comprehension.

In his article, White (2003) discusses how technical communicators can use color to organize documents, and with an understanding of color theory and color systems, we move to the practice of using color to create usable documents by returning to and expanding on White's advice. White made clear technical communicators can and should use color to "create usefulness" in their documents by using color for the following purposes (2003, 485, 487–488):

- ◆ Focusing attention
- ◆ Associating elements or sections of the document
- ◆ Prioritizing document elements
- ◆ Signaling organization

Research bears out White's advice. For example, prior research attests to the ability of color to attract attention (D'Zmura 1991; Wickens and Hollands 2000). In a study of people's ability to locate target words in a list of colored target and colored nontarget words, text color significantly affected search time, and not surprisingly, when participants knew the target color, their search times significantly decreased (Nes, Juola, and Moonen 1987). Clearly, because humans are limited in the amount of stimulus that they can process at one time, they must be selective in what they focus on, and they must ignore, or filter (Ashcraft 1998) competing stimuli. Used effectively, color can help them in the process.

In addition, White notes that coloring verbal elements such as headings and visual elements such as text boxes or icons allows readers to comprehend relationships among document elements more efficiently. For example, he says, user manuals—notoriously lengthy—become less daunting if their authors use color to subdivide them "into segments" (487). Winn (1991) agrees, saying that exploiting color to group information, what he calls "color cueing," can clarify a document's structure (183). White's advice is supported by the work of others. Indeed, besides the four ways that color can create usefulness discussed above, White also briefly argues that technical communicators should consider the cultural associations of the colors they choose, and research backs him up on this point as well. For example, researchers have noticed a preference for blue across cultures, the so called "blue phenomenon" (Choungourian 1968; Madden, Hewitt, and Roth 2000). Because I (Mackiewicz 2007, 147–148) and others (Aslam 2006) have discussed color's cultural associations elsewhere, I bypass further discussion here and instead focus on other ways that technical communicators can use color to create usability.

Four score and seven years ago our fathers brought forth on this continent, a new nation, conceived in Liberty, and dedicated to the proposition that all men are created equal.

Figure 8. Positive polarity of dark text on a light background.

Four score and seven years ago our fathers brought forth on this continent, a new nation, conceived in Liberty, and dedicated to the proposition that all men are created equal.

Figure 9. Negative polarity of light text on a dark background.

Increasing readability with contrasting colors

Likely the main concern of technical communicators who choose the background colors for their print and online documents is readability—how well verbal and visual elements show up in relation to the colors “behind” them. Readability research makes clear that a document’s background and its foreground elements, particularly its verbal elements, must contrast. That is, for foreground elements to be salient, they must be salient in relation to their background. Readability research shows that, regardless of color combination, more contrast equates to greater readability in print (Bruce and Foster 1982; Radl 1980) and online (Hill and Scharff 1999).

It is possible to be more specific about background text color choices, however, by turning to recent research on online documents. In studies of Web pages, positive polarity, the contrast of dark text on a light background, has been found to be more readable than light text on a dark background (Shieh and Lin 2000; Wang, Fang, and Chen 2003), what is called negative polarity. Figures 8 and 9 show examples.

That said, it seems that to use contrast effectively, we technical communicators should do more than eyeball different hues for contrast. Rather, we can put our knowledge about color and its components, hue, value, and saturation to work in choosing contrasting background and foreground elements. Differentiating color’s properties is important in light of recent research that makes clear value accounts for readability as much or even more than hue, as was previously thought (Lin 2003). For example, two versions of negative polarity design, white text on a black background and light blue text on a dark blue background, were found to be equally readable, even though the light blue on dark blue version contrasted in value rather than hue (Hall and Hanna 2004, 192). On the other hand, as Figure 10 shows, two colors may contrast starkly in hue but may not generate readable text if they do not contrast in value.

Saturation plays a role in readability as well. More saturation in foreground text can generate greater contrast, as Figure 11 shows.

In short, we technical communicators need to pay

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Figure 10. Contrasting hues in text and background.

Four score and seven years ago our fathers brought forth on this continent, a new nation, conceived in Liberty, and dedicated to the proposition that all men are created equal.

Figure 11. Light violet with less saturation than the violet text with more saturation.

attention to all three color components as we attempt to create contrast and maximally readable documents. When we do, we get added value: black and white reproductions of our documents will be more readable too.

Ensuring accessibility of color

This discussion of contrasting colors and emphasizing information with color alludes to the need to make documents—print as well as online—maximally usable. However, another component of usability is accessibility, making sure that all users are able to access all of the information from documents. Our use of color can threaten document accessibility if we do not consider the needs of people who have visual impairments such as partial sight and impairments brought on by aging and congenital deficits. Indeed, some people’s impairments may lessen their ability to distinguish among all three color properties. For example, people with deuteranomaly, a difficulty differentiating red and green, may have trouble using a manual that employs colored tabs to group and organize sections and trouble matching a pie chart’s wedges to its key if those tabs or chart elements are red and green.

An important step in maintaining the accessibility of all

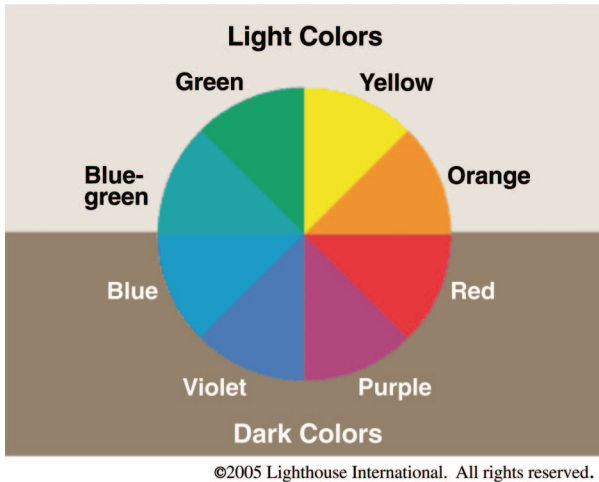


Figure 12. Arditi’s (2005) illustration of “light” and “dark” colors to contrast for accessibility.

information in our color documents is to ensure that “the information conveyed with color” is also conveyed “through another visual means” to make sure that “users who cannot see color can still perceive the information” (Caldwell and others 2008); that is, the information that color conveys should be redundant. Technical communicators can design manual tabs, pie charts, and other document elements so that the information these items convey with color is conveyed through other means as well. For example, in addition to using color on a manual’s tabs to signal discrete sections, the manual’s colored tabs could show an icon or state section names explicitly. In this example, providing the information conveyed with color through another visual means ensures that users who cannot see color can still perceive the information.

Another important strategy in designing for accessibility is contrasting foreground elements with background, paying attention once again to value. A background and a foreground color that are of equivalent value, even if they differ in hue and saturation, can be less accessible to people who have visual impairments.

To distinguish background from foreground color in a manner that enhances accessibility, Aries Arditi, a researcher with Lighthouse International, recommends first choosing colors that contrast in hue. His illustration of colors that should be contrasted against each other is used by permission and shown in Figure 12. The hues blue-green, green, yellow, and orange (hues Arditi calls “light colors”) should be contrasted against blue, violet, purple, and red (hues Arditi calls “dark colors”).

The second step in creating contrast is to “lighten the



Figure 13. Examples of Arditi’s (2005) accessible color contrasts.

light colors and darken the dark colors” (Arditi 2005). Figure 13 shows how light colors (green and yellow) can be made lighter and dark colors (purple and blue) can be made darker to create more contrast.

COMMUNICATING WITH A PROFESSIONAL PRINTER

Technical communicators more often than not are responsible for document production. To maintain effective workflows and to generate the publication products we intend, we need to speak the language of the people who work in the printing industry. When we can discuss color management and print process with printers, we decrease the likelihood of inconsistent and incorrect colors, as well as printing runs that cost more than they should.

In preparing this section, I spoke to three experts: Nancy Schoon (referenced earlier) often works with professional printers on her university’s publications, and she has been working in publishing and higher education for 27 years; Mike Mackiewicz, digital graphic artist with Mark-It Graphics in Osceola, WI, has worked for 25 years in graphic production; Steve Johnson, president of the Glen

Ellyn, IL, printing company Copresco, has worked for more than 30 years in printing. These experts had some advice for better communication with printers. First, they all made clear that technical communicators should explicitly state their priorities for their documents. Schoon, for example, pointed out that if your images have flesh tones, making sure those tones are realistic will likely be your priority (e-mail message to author, January 14, 2007). Johnson exemplified the point this way: “On a fashion print, flesh tones are critical, whereas on a bar graph, exact matching of a shade of green is less important than that the green sufficiently contrast with the red and the blue” (e-mail message to author, January 28, 2008).

Second, these experts also stressed the benefits of showing the printer a hardcopy of the publication. According to Mackiewicz, this hardcopy will show the printer “your expectation of the final product” (e-mail message to author, November 1, 2007). Schoon agrees, noting that a hardcopy “gives the printer something to match” (e-mail message to author, January 14, 2008). Showing a hardcopy to the printer can also mitigate discrepancies between the copy the printer at the office produced and one the printer will be able to produce. For example, Johnson said that he cautions clients that “‘muddy’ ink-jet prints, as often produced on a writer’s printer, show greater contrast than final high quality digital or offset prints” (e-mail message to author, January 28, 2008).

Managing color across documents

One critical component of our color practice is ensuring that the colors we see on our screens match the ones our professional printer produces and ensuring that the colors we choose continue to match across a printing run and subsequent runs. Understanding how color can create more effective documents amounts to little if the colors we intend are different from the ones that our printer produces.

Of course, the first step in managing color is to pay attention to the specific RGB (for example, R = 89, G = 131, B = 103) or CMYK numbers (for example, C = 75, M = 24, Y = 65, K = 14) that we choose when using software like InDesign (in these cases, to create a greenish-gray color). Those numbers encode the intended amount of colorant—amounts of red, green, and blue or amounts of cyan, magenta, yellow, and black. However, even after we carefully choose colors, we must get those colors to appear on another device or in print, which can be tricky. For one thing, the gamut (or range) of colors that most printers can produce is far more limited than the gamut of colors (colorant combinations) that one can create with a given software application. As Fraser writes, “CMYK printers still deal with the idiosyncrasies of chemical inks, dyes, and pigments on sheets of mashed wood pulp that we call ‘paper’” (Fraser and others 2004, 57).

The newsletter layout includes the following elements:

- Header:** "december 2006" in a brown, lowercase font.
- Title:** "BRIDGEPORT" written vertically in large, black, uppercase letters on the right side.
- Section: our history**
 - Text: "In the winter of 2004, I was walking down 31st Street in the Bridgeport neighborhood of Chicago, when I noticed a FOR LEASE sign in the window of a beautiful, old, corner storefront. I thought, 'What a great spot for a coffee shop!' My best friends Tom and Ed agreed. Over the next few months, we converted this amazing space into the Bridgeport Coffee House and opened the cafe early in spring."
 - Text: "The coffee house features outdoor seating from April 1st to November 1st, as long as weather permits."
 - Text: "We roast our own coffee daily, and we also serve pastries, toasted sandwiches, ice cream, shakes, and a good variety of loose leaf teas."
 - Text: "In 2005, we added our wholesale facility which is presently supplying restaurants, cafes, and boutiques in the Chicago area with fresh roasted coffee, Adagio teas, and related equipment. We presently offer equipment manufactured by Wilbur Curtis and Brasilia."
 - Text: "Even though our neighborhood is a little bit off of the beaten path, we are often asked how we will reach when large coffee house chains arrive in Bridgeport. Our response is part of our mission statement. We will strive to be more than merchants, rather part of the community and the history of our surroundings. ~"
- Image:** A photograph of a historic brick building, likely the Bridgeport Coffee House.
- Section: our neighborhood**
 - Text: "When visiting a new place, people often wonder about its origins. Where did the name come from? How was the area settled? Who lives here? Well, there is no reason to keep these questions a mystery. Bridgeport's story is rich in Chicago's history, and should be shared with all who visit it."
 - Text: "The name 'Bridgeport' originated from the location of the neighborhood. Bridgeport lies next to a bridge which crosses the Chicago River. However, the bridge is too low for boats to pass underneath it, so instead, the cargo from the boats has to be unloaded, loaded on to carts, and then re-loaded back on to barges, which are waiting on the other side of the bridge."
 - Text: "The neighborhood is bordered on the north by the Chicago River, south by 39th Street, east by the Dan Ryan Express Way (190) and west by Ashland Avenue. All together, Bridgeport is approximately 3.9 sq. miles."
 - Text: "Other notable trivia about Bridgeport includes the fact that it has been the home of Chicago's 46-year dynasty of mayors from 1933 to 1979 (Edward J. Kelly, Martin Kennelly, Richard J. Daley and Michael Bilandic). Mayor Richard J. Daley lived his entire life in this neighborhood. When he died, he was living in a modest brick bungalow at 3536 S. Lowe Avenue, in the same block as the house he was born in. His son, Richard M. Daley, the present Mayor of Chicago - is in his 3rd term in office. ~"
- Section: featuring:**
 - Text: "coffee from Tanzania", "music by Chase Faber", "art by Kate Perryman"
- Image:** A graphic of a coffee cup with steam rising from it.
- Section: coffee company** in a large, black, lowercase font at the bottom.

Figure 14. A newsletter with two spot colors (brown and black) and a duotone image.

We increase our chances of getting the colors that we intend by following the main guidelines that Kelly (2007), president of PDF-specializing Apago, delineates. One important point he makes is that we should prepare files, such as our PDF files, to common standards. For example, he advises using a PDF/X setting rather than a standard PDF setting. PDF/X, which itself comes in several varieties with different purposes, is a subset of PDF that ensures compatibility between the document that the technical communicator intends and the printer's output.

In addition, if our budgets allow, we can vastly improve our chances of good print outcomes if we request a press check. In a press check, a printer will arrange a day and time that the job will be on the press and ready to run. The printer will give the customer copies of the document as it comes off the press and will give the customer time to inspect the document for content and color. If the customer is not satis-

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The neighborhood is bordered on the present Mayor of Chicago - is in his 3rd term in office. ☺

featuring:

coffee from Tanzania

music by Chase Faber

art by Kate Perryman

BRIDGEPORT

coffee company

Figure 15. A full-color newsletter.

fied, the printer can make some corrections to the press. If the customer is satisfied, the printer will ask him or her to sign off on the press sheets and will give the customer press proofs (Mackiewicz, e-mail message to author, November 1, 2007). It is important to know, however, that corrections made at the proof stage tend to be pricy. For that reason, according to Schoon, you may want to favor asking for a press check when

you need to correct a press run, such as when a heavily inked section of the document interferes with another section that follows it through the press run (e-mail message to author, January 14, 2008). For all intents and purposes, however, press checks guarantee that the printed document meets expectations and that there are no surprises (Mackiewicz, e-mail message to author, November 1, 2007).

Determining the type of print process

An important factor in creating quality publications and managing the cost of publications is determining whether our documents would be better printed with spot color or with process, or CMYK color. In offset printing, both choices are possible.

Offset printing, as opposed to digital printing, involves transferring ink from a plate to a rubber blanket and finally to the paper. Digital printing involves layering toner on the surface of the paper; toner, digital printing's "ink," does not absorb into the paper. With digital printing, only process color is possible.

Spot color refers to inks that are mixed before the printing run; they are created according to formulae for specific colors, usually in relation to widely used color systems like Pantone® Matching System or Trumatch. For this reason, spot colors are often called "custom colors." Pantone 3258, a shade of green, is one example. Because spot colors are mixed before printing, they ensure that important and specific colors, such as colors in corporate logos, appear in print as intended. They are also useful for getting vibrant colors to appear in print. They are necessary for generating fluorescent and metallic colors.

In terms of cost, using spot color may be the better choice when a document contains just one or two colors, including black. (That is, black counts as one color.) Figure 14 shows an example of a newsletter that uses two spot colors: black and brown.

Besides showing the use of two spot colors, Figure 14 also shows the use of a duotone image (the newsletter's photograph of the building). Duotone images use two inks; black and some other color. Such images are more complex than two colors on distinct areas of a page, but they do indeed require only two colors. In fact, sepia-toned images, the kind associated with 1800's photography, are duotone images.

If a document contains full-color photographs or multicolored graphics, it requires process color. Process refers to the process of combining cyan, magenta, yellow, and black (CMYK) together to create a multi-color image. With process color, a document containing a wide range of colors gets the benefit of CMYK's ability to produce thousands of colors. Figure 15 shows an example of a newsletter that contains full-color pictures and uses process color.

Sometimes a document might require both process and spot color. For example, to increase the intensity of a particular process color, a printer may suggest adding a spot color.

In process color printing, an image is converted to halftones, tiny dots of color. Figure 16 shows halftones up close. Set in different angles and overlaid on top of each other, halftones trick our perception. They combine to create color, such as the light blue color in the background of Figure 16.

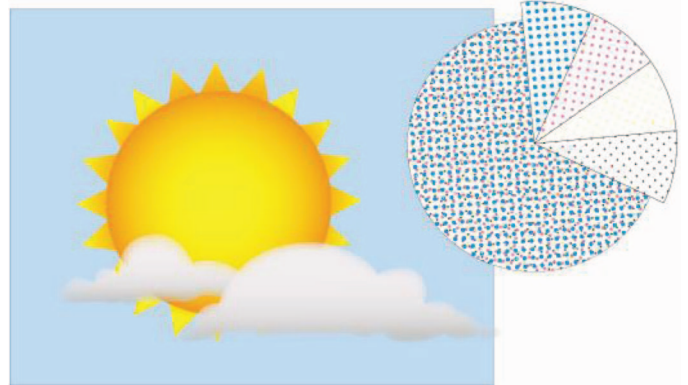


Figure 16. Halftones in process color.

In process color printing, the halftones of each of the CMYK colors are placed onto separate plates. Layered on paper, CMYK halftones combine to create the appearance of thousands of colors. Figure 17 shows how four plates of halftones in CMYK combine to create a process color image.

CONCLUSION

Since Jan V. White's article first appeared in *Technical communication*, color documents have become far more common as they became less cost prohibitive. Even so, many of us technical communicators remain a bit nervous about using color in our organization's documents, or we may use color in a haphazard manner, choosing colors on the fly or according to personal preferences. Although we have become more familiar with new software that allows us freedom when creating color documents, we may lack a foundation in color theory and practice that can guide our choices. In addition, for many of us, the science and art that professional printers blend to produce our color publications is a bit intimidating. It does not help that the printing industry seems rife with jargon, such as "rich black" and "halftone."

In this paper, I have built on advice of White (2003), advice so good it was reprinted 12 years after its first publication. I have expanded out from White's coverage of practices related to creating usable documents to theory—color properties and systems in particular. I have also expanded White's discussion of color and usability, examining research that suggests ways to increase document readability and accessibility. Finally, I have discussed color practices related to communicating with printers. In doing so, I have tried to alleviate some of the nervousness that comes with using color. It is of course impossible to address every topic related to color that technical communicators might encounter on the job, but it is clear that knowing these essentials about color theory and practice



Figure 17. CMYK combined to create a process color.

can enhance competence and boost confidence in relation to using color in print documents. **TC**

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