



Every day, we make split-second decisions whether to read, save, or discard the printed materials that land on our desk. Color can be an important business tool for strategic sales or marketing. When used effectively, color helps speed learning and increase information retention by drawing attention to key information and creating a lasting impression.

In my environmental consulting practice, I need to produce high-quality color documents for executive presentations, investor presentations, and software training manuals. I want certain documents to last, including photos. But I don't need the same high-quality output for everyday charts, graphs, and printouts. So, what options are available?

### A CORNUCOPIA OF COLOR PRINTERS

The color printer market is brimming with hundreds of choices, so let's limit this discussion to laser and inkjet printers, in standalone and multifunction formats. Color laser printers offer sharp, permanent images, with blazing-fast print speeds that compare to fast monochrome printers. They are good for text and low-end graphics. Color LED printers are similar to laser printers, but use light-emitting diode arrays rather than lasers. Laser printers are rugged and suitable for workgroups, with high output volumes, network interface options, larger paper sources, multiple paper trays, and advanced finishing options.

Color inkjet printers are the best choice if image quality is a chief concern. Most organizations use color inkjet printers for photos. These printers use either organic dyes or pigments. Organic dyes, like those used for textiles, fade over time with exposure to UV light and the environment. Some printer manufacturers use pigment-based dyes, which are more permanent, but can clog the printer. Photo printers are inkjet printers designed specifically for high-quality photographic output. They offer multiple colored ink cartridges rather than one black and one multicolor cartridge typical of business inkjet printers.

Multifunction printers (MFPs) combine a printer, scanner, and copier (and sometimes a fax). They are ideal for a small office/home office, since they require less space than

three or four separate devices, are easier to maintain, and typically make better copies than an analog copier. MFPs range from low-end inkjets to high-end, high-speed color laser units.

### QUALITY AND DURABILITY

The durability of printed digital images or photos depends upon the technology used to print them—the type of ink and paper. Ink reacts chemically with the paper. I was surprised to learn that color images will last longer if the ink and the photo paper are from the same manufacturer as the printer. Printer vendors have invested in developing inks, papers, cartridges, and print heads that work well together. This might cost more up front, but should extend the life of the prints.

While printer and paper vendors claim that their products produce archival quality prints, "archival" refers to the acid-free paper, not the inks. Some experts say that how long an inkjet-printed photo lasts depends on whom you ask (Tom Spring, "Lack of Standards Sparks Inkjet Photo Fade Debate," *PC World*, July 8, 2005). However, this is changing. Wilhelm Imaging Research Inc. (WIR; www.wilhelm-research.com) researches the stability and preservation of traditional and digital color photographs and motion pictures. The firm has been active in ANSI/ISO workgroups and has developed respected tests for projecting inkjet photo print longevity. Last year, the firm began to certify printers, inks, and papers. To qualify for a WIR certification seal on its packaging, a product must be projected by WIR tests to produce prints that will last 25 years in standard illumination conditions, and at least as long in album/dark storage conditions. Products from Epson, Hewlett-Packard, and Lexmark earned the first WIR seals.

Paper or other media also affect image quality. Paper quality can impact an inkjet printer's quality more than a laser printer. This is because ink wicks into paper; special inkjet papers control wicking. Laser printer toners do not wick, so paper quality is generally not as important. Laser printers accept a wider variety of paper types than inkjet printers. For example, inkjet printers produce poor output on recycled or copy paper, but excel at photo printing on special papers.

### Paper Terminology

**Brightness** — reflectivity of the paper; higher numbers are brighter and work better for photographs and text.

**Finish** — color photos and marketing materials look better on high-gloss paper, while black and white photos and text look better on matte paper.

**Weight** — measure of paper density in g/m<sup>2</sup> or lb equivalent; 20 lb and 24 lb are typical weights for office paper.

**Opacity** — measure of light transmission; the more opaque the paper, the less the image shows through. Opaque papers work better for two-sided printing.

**Roughness** — affects image sharpness; inkjets are more forgiving with textured papers while laser printers work better on smooth papers.

**Thickness** — affects durability with repeated handling; thicker papers typically are more durable.

**Table 1.** Printer selection criteria.

Parameter	Recommended	Comments
Print Speed, pages per minute (ppm)	20 or greater	<ul style="list-style-type: none"> <li>Print speed is usually faster in black and white than in color.</li> <li>This is the maximum rated speed. Actual speed is typically less and varies based on percent of ink coverage.</li> <li>For MFPs, copy speed should be equal to print speed.</li> </ul>
Time to Print First Page (sec)	60 or less for photos, 30 or less for text	<ul style="list-style-type: none"> <li>Related to the amount of printer memory.</li> </ul>
Resolution (dots per inch; dpi)	600 or greater	<ul style="list-style-type: none"> <li>300 dpi used to be standard; today 600–1200 dpi is common.</li> </ul>
Resolution (droplet size) <sup>a</sup>	The smaller, the better	<ul style="list-style-type: none"> <li>As small as 32 drops per pixel.</li> <li>Droplet size can make lower dpi printers produce higher-quality images than those with a higher dpi rating.</li> </ul>
Resolution (colors per dot)	The more, the better	<ul style="list-style-type: none"> <li>Ranges from 2 to 32 colors per dot.</li> </ul>
Memory	32 MB or greater	<ul style="list-style-type: none"> <li>More needed for large or complex jobs and for shared printers.</li> <li>Impacts number of pages that can be scanned or copied (MFP).</li> <li>Affects ability to multitask (MFP).</li> </ul>
Modem Speed <sup>b</sup>	56 K	<ul style="list-style-type: none"> <li>Look for the latest in data compression in modem speed.</li> <li>Consider using e-mail feature vs. fax.</li> </ul>
Duty Cycle (pages per month)	Depends on intended use	<ul style="list-style-type: none"> <li>Duty cycle ratings are the maximum; stay well below this number to be productive and to allow for growth.</li> </ul>
Connectivity	Wired (Ethernet) or Wireless (Wi-Fi or Bluetooth)	<ul style="list-style-type: none"> <li>A must for shared printers.</li> <li>Look for built-in print server.</li> <li>Consider a wireless printer if you already have a wireless network.</li> </ul>
Output Format	Depends on intended use	<ul style="list-style-type: none"> <li>Documents, photos, envelopes, transparencies, wide-format, or heavy card stock.</li> <li>Advanced finishing functions like collating, stapling, or binding.</li> </ul>
Maintenance	Low-maintenance and easy to use	<ul style="list-style-type: none"> <li>Inkjet printers are relatively maintenance-free.</li> <li>Laser printers are more difficult to service.</li> <li>Some printers offer automated network setup and configuration by the system administrator.</li> <li>Some printers send alerts when consumables or replaceable parts require attention.</li> </ul>

<sup>a</sup>Inkjet printer; <sup>b</sup>MFP.

## PRINTER SELECTION CRITERIA

Should I choose laser or inkjet? Standalone printer or multifunction? What about photos? Should I have a network printer? Which printer will be most cost-effective? Table 1 presents a set of criteria that should make the decision easier.

When evaluating cost, look at the total cost of ownership (TCO), which includes the printer, setup and maintenance, and consumables (i.e., paper, ink/toner, print heads, fusers). Inkjet printers typically cost more to operate than laser printers. Ink and specialized papers account for most of the TCO.

## RECOMMENDATIONS

1. Do your homework, using printer manufacturer and technology Web sites.
2. Understand your needs. Balance performance, space, and TCO.
3. If you print photos often, consider a dedicated photo printer.
4. If you decide upon a MFP, ensure that it can multitask. When receiving a fax, you want to be able to send a print job at the same time.
5. If your plans include several computers, consider a network printer with a built-in print server.
6. Purchase the same brand of ink and paper as your printer. This is more important for inkjet printers

and photo printers than laser printers.

7. Avoid attempted cost savings by using generic inks or toners, and don't try to refill cartridges, as this can damage your printer.
8. Consider a service contract and/or extended warranty for high-end printers.

In the past, many organizations avoided color printers because of their high cost and slow speeds. Today, organizations need color printers to be competitive in the marketplace. Luckily, color printers are more affordable and more efficient than ever. The entry price point has dropped drastically to less than US\$500, with output at nearly 30 ppm. Multifunction printers are a good choice for small office/home office settings, though some organizations may be better served by selecting two or more printers. **em**



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