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#### Overview

Research shows that printing with color :

- Increases comprehension by up to 73% (1)
- Raises readership by up to 40% (2)
- Accelerates learning by up to 78% (3)

Make information attractive to read and increase retention of that information by using color. And to keep the cost of color printing low, it's crucial that you use the right printer for the job. The topics that will help you match the right network color printer to your user's needs include:

- » **Evaluating your organization's color printer requirements:** learn to match user needs with the right printer based on the printer's capabilities, paper handling and media compatibility options, networking options, performance, reliability, and design for personal or workgroup use.
- » **Selecting the right printer:** understand the differences in HP's complete line of color printers that includes personal inkjets, business inkjets, color LaserJets, large format, and photo printers.
- » **Reducing color printing TCO:** find out what you can do in addition to choosing the right technology to lower your total cost of ownership.
- » **Product information:** shop for the products that can help you implement your color printing solution.

<sup>1</sup> Johnson, Virginia, "The Power for Color," *Successful Meetings*, June 1992, Vol. 41, No. 7, pp. 87, 90.

<sup>2</sup> "Business Papers in Color. Just a Shade Better," *Modern Office Technology*, July 1989, Vol. 34, No. 7, pp. 98-102.

<sup>3</sup> Embry, David, "The Persuasive Properties of Color," *Marketing Communications*, October 1984.

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#### Evaluating your organization's color printer requirements

Once you understand what your users expect from their color printer, you can match their requests to a particular color printer family. You must match "what can the printer do" and "what do the users need" for a successful color printing program.

#### Print quality

Everyone wants "good" color print quality, but no one defines "good" clearly. The three most important factors that influence print quality are:

- **DPI:** Dots per inch has been the traditional measurement and indicator of a printer's output quality. Color printing, however, changes the rules a bit by working on a sub-DPI scale. Inkjets can fit more colors inside a dot than can color LaserJet printers.
- **Number of colors per dot:** The modern inkjet produces a droplet of ink so small (4 to 5 picoliters) that over 40 can fit inside a single dot of the DPI measurement. Mixing colors inside each dot using the PhotoREt technology greatly enhances the range of colors available inside a single dot, giving truly photographic results. Confusingly, printers with a lower DPI rating may produce higher image quality output than printers with a higher DPI rating because of the color droplet control available.
- **Dot growth:** Media use also affects image quality, and inkjet printer's image quality may be more affected by media than a LaserJet printer. This is due to wicking, or dot growth, as ink spreads when absorbed by paper. Inkjet printers reduce the amount of ink delivered when printing on plain paper because the paper fibers spread the ink so much. Special media for inkjet printers reduces the absorption rate of the ink to better control wicking. LaserJet printers use micro fine plastic spherical particles that adhere to the paper surface and don't spread like ink does.

#### Paper handling and media compatibility

Just as users demand different media, they also demand a variety of paper handling options and media compatibility. Some pages must be sorted, some stapled, and some printed on both sides. A few inkjet printers, personal or business class, offer duplexing. Because of the similarity to copiers in paper handling, LaserJet printers usually offer more options for paper handling, including expandable input/output capacity, advanced finishing, mailboxes and sorters, stackers, and staplers. Additionally, large format inkjet printers can handle very wide media, often up to 60 inches wide, which may be a for posters, layouts, banners, or schematics in graphics, HR, marketing, or technical departments.

Although white, 8.5x11-inch paper is the norm, users often require a variety of output media. Some print jobs require wide-format paper, card stock, thick cardboard, or transparencies. LaserJets, because of the way they fuse ink to the paper with heat and pressure, usually do best handling plain paper while inkjet printers typically handle a wide range of media from regular paper to cloth to CD/DVD labels to photographic paper. To be sure your printer solution supports the variety of media your users need to print on, refer to the following table to match your media to a compatible printer.

#### HP media compatibility list

LaserJet compatible media	Inkjet compatible media

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LaserJet paper	Printing paper
Multipurpose paper	All-in-one paper
All-in-one paper	Multipurpose paper
Office recycled paper	Office paper
Printing paper	Tri-fold brochure
Color laser paper	Brochure & flyer paper (matte and glossy)
Copy and print paper	High-gloss film
Soft gloss laser paper	Transparency film
LaserJet tough paper	Banner paper
High gloss laser paper	Iron-on transfers
Cover paper	Greeting cards (textured and linen)
Color LaserJet transparency	Photo greeting cards
LaserJet monochrome transparency	Photo paper (glossy and matte)

To meet a wide range of paper handling and media compatibility demands, you may benefit from a mix of printers. For example, you might choose to scatter personal and business-class inkjet printers through a department, centralize a color LaserJet to handle larger print jobs and those with complex paper handling needs, and include a large format printer in your company's in-house print department.

#### Networking options

Often, adding a printer to the modern office often means adding another network device. When you choose those printers to add to your network, you will need to consider:

- Printer languages
- Connectivity
- Network protocols
- Operating systems
- Software applications

LaserJet printers were initial the default choice for network printers because they were the only models that included network connections and built-in print server. However, many business and personal inkjets ship ready to connect to a network, so you can focus on selecting printer features instead of worrying about networking connectivity.

Need a workgroup scanner, fax machine, and copier? All-in-one and multifunction products from HP include all these features as well as either inkjet or color LaserJet printing in a product you can connect and share over your network.

#### Performance

Pages per minute (ppm) guides have been the rule for printer performance, but more details are needed today. Why? The PPM figure only takes into account the speed of the print engine and how many pages it can produce if all else is perfect. All else is rarely perfect. You should consider the following when evaluating a printer's overall performance:

- **Pages per minute:** The number of pages printed per minute is dependent mainly on engine speed but also affected by document complexity, spooling time, contention, transmission speed, language processing, and paper handling. Each of these factors affect overall print job time.
- **Throughput:** Whereas the print engine speed represents the printer's performance potential, output after all the aforementioned variables is the "throughput speed." This number will be the most accurate performance predictor for your color printing projects.
- **Other variables:** Add the variables listed above, and then add such details as computer speed, paper handling, network transport options, print queue capacity, and even network bandwidth restrictions to get a true printer performance rating.

#### Reliability

Users don't care about metrics, they just care about their printed pages. When determining printer reliability, consider device readiness, availability, and job request completion. Intervention at the printer, for whatever reason, lessens reliability in the eyes of the users. The factors that affect a printer's reliability include:

- **Volume:** Buying an inexpensive printer for a high-volume location may result in higher TCO (total cost of ownership) for repairs and replacement than buying the correct printer for the job. Match the size of the printer to the printing needs of the workgroup while allowing some room for output requirements to grow.
- **Duty cycles:** The maximum usage level per month for a printer is the duty cycle. This rating takes into account printer specifics such as the paper-handling capacity and cartridge replacement. Running a printer at the top end of its duty cycle will require users to intervene with the printer to replace supplies more often. You should choose a printer with a duty cycle that exceeds your current production needs by a substantial margin to minimize interventions and maximize printer life expectancy.
- **Maintenance requirements:** Every device requires maintenance at times, and printers are certainly no exception. All moving parts wear, and business-class printers with embedded Web server software enable printers to send e-mail notification messages or pager alerts to signal the need for preventative maintenance. After you

acquire several printers, you will save time by using HP's Web JetAdmin software to manage all intelligent printers through a single Web page.

**Note: HP is the only printer vendor to receive an "A" rating in PC Magazine's service and reliability survey for 11 consecutive years.**

#### Shared or personal printer?

Although a printer's duty cycle indicates whether it should be used as a shared or personal printer, that's not always the best decision point. Higher-volume users may benefit from a business-class color inkjet rather than overloading a personal inkjet.

Personal inkjets and personal color LaserJets usually have small footprints and fit better on desktops. Many companies find a mix of personal, workgroup, and departmental printers are necessary to support all of their monochrome and color printing projects.

<sup>1</sup> Based on independent testing by SpencerLab Digital Color Laboratory

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#### Selecting the right printer

HP's extensive line of color printers includes five different categories of printer so you can find the right mix of printers to meet all of your organization's networked color printing needs.

#### Personal inkjets



- Lower acquisition price
- Higher cost per page than business inkjet or color LaserJet printers
- Designed for personal use (higher intervention and lower duty cycle)
- Small footprint
- Special media flexibility for photo paper, greeting paper, glossy media, etc.

For one individual, or a department with few requirements for color printing, a low cost personal Deskjet will be the best choice. The low initial cost, along with the flexibility to print on a variety of media, will satisfy the vast majority of color printing job requirements. For example, in a small company, the sales and marketing manager might have a color Deskjet for promotional materials.

#### Business inkjets



- Offers the lowest color cost per page among HP color printers
- Higher duty cycle for power users or shared printing
- Lower cost per page with HP's modular ink delivery system
- Special media flexibility just like the personal inkjets

For a larger company or a company with more demands for color output, a personal printer will not handle the workload. While a manufacturing company may use color printing rarely, an advertising agency or design firm will use color far more often.

Moving up to a business inkjet color printer provides the same media flexibility for print jobs but lowers the printed cost per page by using advanced technology like HP's modular ink delivery system. In fact, HP business inkjet printers, provide the best value per color page among HP's printers.

#### Color LaserJets



- Most durable print outs
- Print quality less dependent on media type
- Lowest cost per monochrome page among HP's color printers
- High duty cycles
- Color LaserJet line scales from personal to network printer use
- Highest supplies yield for fewer interventions
- Generally has higher performance (speed)

Large companies demand more output of all kinds, and higher demands for color output on standard-size paper may be addressed with a color LaserJet printer. Additionally, the LaserJet family offers lower costs per monochrome copy than the business inkjet, so you can save on your standard office printing as well.

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**Large format printers**



- Handle oversized printing needs, up to 60" wide
- Exceptional line quality plus photo-quality images
- Support a wide-range of standard and specialty media for indoor and outdoor printing
- Multifunction solutions available for a complete copy/scan/print solution
- Choice of models that support local, shared, and centralized deployment
- Designed to help reduce costs and improve productivity by bringing large-format color printing in-house

Productivity and communication within and across departments can be enhanced by the addition of large format printers:

- Oversize output in meetings facilitates interaction and provides focus
- Posters and banners grab attention
- Presentations and signage persuade clients and impress visitors
- Layouts and drawings are vital engineers, designers, and facilities managers.

In-house capability saves money vs. outsourcing and delivers just-in-time capabilities to accommodate last minute requests, changes, or improvements. Your choice of large format printer will be based on the size and content of your images, the number of pages you expect to print, your network and connectivity needs, and your need for additional large format functions such as scanning and copying.

**Photo printers**



- Printed photos rival traditionally processed digital photos 1
- Provide direct photo printing with or without a PC; slip a memory card from a camera into the printer and print your photos+
- Up to 7-ink printing reduces grain for clear, sharp photos
- Optional automatic two-sided printing accessory (not included) on some models saves up to 50% on paper cost and office file space
- Connect easily to your network with a USB external print server like the HP JetDirect 175x or 310x series

Photo printers can be useful across several areas of your organization, from marketing to internal training. If your organization needs to communicate with images, photo printing can make those images rival film images and get the message across more effectively.

For a complete review of how digital photos can impact your business, and to help you decide if you need to include photo printers on your network, visit the Digital Photography and Your Business site linked at right.

**Comparing color printers**

The following table shows how these different printer types compare across the key evaluation criteria outlined in the previous section:

Printer type	Capabilities	Performance	Reliability	Shared or personal
Personal inkjet	Provides individual users with convenient, high-quality printing.	Excellent print quality, better for images than a LaserJet	Low duty cycle rating of less than 5,000 pages per month	Personal
Business inkjet	Offers the lowest cost per color page among HP color printers	Excellent print quality, better for images than a LaserJet on specialty media such as photo or glossy paper	Medium duty cycle of 10,000 to 30,000 pages per month	Shared or personal
Color LaserJet	Lowest cost per monochrome page among HP's color printers	Excellent print quality, better for text than an inkjet	High duty cycle of 30,000 to 120,000 pages per month	Shared or personal
Large format printers	Designed to handle oversized, often up to 60" wide	Excellent print quality on large format media	Low, medium and high duty cycle models available	Shared or personal
Photo printers	Provide direct printing—with or with out a PC—to produce sharp photos	Excellent photo quality printer, better than a LaserJet, on photo-specific media	Low duty cycle rating of 3,000 to 5,000 pages per month	Shared or personal

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#### Reducing color printing TCO

Calculate a printer's TCO by combining the acquisition price, cost per page, reliability, and support. Each printer will excel in one or more areas, but all must be considered when defining TCO.

#### Cost is more than the purchase price

If purchase price were the single criterion of TCO, everyone would buy personal DeskJet color printers. However, the design of a color Deskjet that keeps the initial cost down raises the cost of ink cartridges and other consumables. After a year of printing, a small Deskjet may actually cost more than a color LaserJet when operational costs are accurately counted.

#### Apparent costs

The initial cost of acquisition focuses almost completely on hardware purchase. Low-end Deskjets offer low cost of acquisition by design because they are built to offer flexibility and high image quality in a low duty cycle environment.

Personal Deskjet users will replace their own consumables (ink and paper). The color inks are grouped in a single cartridge for convenience in a package that includes the print heads. This drives up the cost of each individual cartridge but replaces the print head each time to reduce later maintenance costs. In a color LaserJet, you might need to replace the toner cartridge after 3,000 pages.

Standard paper costs a penny a sheet or less. Deskjet users searching for high image quality will need special photographic paper media. Some of these papers can run as much as a \$1 per page.

Every device with moving parts needs maintenance at some time. Printers have more moving parts than any other computer device. The transfer belt, for example, which will print 100,000 pages before needing replacement, is considered a maintenance item.

Adding more users to an existing print device is the most effective technique for reducing the cost of printing. However, more users mean more print volume and more maintenance over time.

#### Hidden costs

IT managers new to printer acquisition projects sometimes forget the many costs incurred over a printer's lifetime. These costs must be considered to provide an accurate cost of printed materials to the company.

- **Network management:** Shared printers need network connections and management. This cost may be low for one or two printers, but a growing printer population will demand increased network management time.
- **Infrastructure:** Printers on the network require obvious infrastructure, such as a network node. Do you consider desk space as a cost? Your landlord charges by the square foot. Printers take space away from user's desktop or floor space for the printer and stand in a department. Some companies need an entire computer room to handle their printing needs, which obviously adds floor space costs, construction costs, and common infrastructure such as electricity and air conditioning.
- **End-use operations:** Users who spend valuable time using the wrong printer for their requirements cost time and therefore money to the company. Overloading a small printer will result in users constantly adding supplies such as paper and ink cartridges.
- **Software:** HP printers are the most compatible family of printers in the world, supported by every major (and minor) software developer. But special print projects may require special software, or new software upgrades to take advantage of increased printer capabilities may be required.

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**Reduce costs by choosing the right technology from HP**

With a wide range of printers of all types, HP can fit the printer to your print requirements that fulfills all expectations cost effectively. Choose wisely and experience these benefits:

- **Spend less on consumables:** HP Deskjet printers reduce consumable usage by dropping ink levels on plain paper. Business Inkjets use the modular ink delivery system to speed printing while reducing the cost of ink and the frequency of replacement. Color LaserJet printers benefit from advanced HP technology and experience to improve the cost versus output ratio.
- **Improve printer connectivity with JetDirect print servers:** Network connections for printers speed job transfer times and increase throughput. Many of HP's business inkjet and color LaserJet printers have JetDirect network print servers built in or available with a Plug-and-Play slot for an optional JetDirect printer module. External print servers can handle multiple printers while increasing management options and using a single network connection.
- **Streamline management with embedded Web servers and Web JetAdmin:** Managing printers via a printer's physical control panel makes sense for users adding paper and ink, but not for IT staff managing printers from across the building or across the country. HP's award-winning embedded Web servers give the same management options across the network as they do via the printer control panel. This allows IT managers to control printers remotely. HP's Web JetAdmin software gathers all the output from embedded JetDirect Web servers into a single management utility. IT managers with Web JetAdmin can efficiently manage a large number of printers from a single PC management console.
- **Simplify end-user operations and decrease help desk expenses:** End users expect to change printer ink cartridges, toner cartridges, and paper. They will also undertake minor management tasks such as changing fonts if they understand the printer control panel. HP's family of printers share common management and administration settings, making it easy for end users to work with different HP printers. If you understand one, you understand them all. This consistent user interface allows end users to perform some tasks normally pushed up to the help desk. Every call your help desk doesn't take for a printer question saves you money.
- **Reduce the amount of required printer interaction time:** On the flip side, every printer management task performed by IT saves the end users time and trouble. HP's family of color Inkjets, Deskjets, and LaserJets mix compatibility with common hardware and software to ensure a successful printing experience. Web JetAdmin allows IT print managers to automatically update printer drivers, relieving end users of that task and calling the help desk.
- **Deliver accurate color:** HP's experience with color printing via inks and laser toner means you can trust output from an HP color printer. Leading the world in personal, shared, and department printer technology means HP works with software developers constantly to ensure the colors the users sees in their software match the color they see on their output from an HP color inkjet, Deskjet, LaserJet, Photosmart, or Designjet printer.

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#### Product information

##### » HP Deskjet 5650



- Automatically selects paper type for best print quality
- HP Photo & Imaging Software makes it easy to add photos to brochures, flyers, documents and more
- HP Photoret III color layering technology for quality color at fast speeds
- Prints up to 21 pages per minute in laser-quality black, up to 15 in color

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##### » HP Business inkjet 2600



- Separate parallel and USB ports, HP PCL5C and Postscript 3 emulation, and a multitude of networking features bring superior connectivity and manageability to your workgroup printing needs
- With an embedded Web server HP Business Inkjet 2600 series is capable of sending and receiving e-services
- Print on a wide variety of HP printing materials in the sizes you need (up to 13 x 19 inches)
- Receive fast color print speeds over the network with up to 15 ppm black and 11 ppm color in draft mode and little user intervention with large input trays and two-sided printing (standard on the 2600dn)

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##### » HP Color LaserJet 3700 printer series



- 16 pages per minute in b&w and color
- Impressive output quality with HP ImageREt 2400, HP's latest color laser technology
- HP Smart printing technology precisely monitors toner levels for consistently accurate supplies status and notification
- Supports optional HP Jetdirect 615n EIO internal print server for Fast Ethernet and built-in automatic two-sided (duplex) printing

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##### » HP Designjet 30 printer series

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- A six-ink writing system combines HP color layering technology, 2400 dpi maximum resolution and a four-picoliter ink drop size for fine details, smooth tonal transition, a broad gamut of colors and gloss uniformity
- The HP DesignJet 30 Series printers can handle stock in weights up to 80 lb, as well as thick or rigid media (up to .015 in). Choose from a variety of media finishes, including gloss, satin and matte
- Standard interfaces and network capability with the Jetdirect 615n internal print server (standard on 30n) ensure smooth operation in virtually all environments

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- Six-ink color printing or up to 4800-optimized dpi (on premium photo paper) and 1200-input dpi when printing from a compute
- Print all of your photos, or new photos, directly from memory cards using front-panel buttons
- Prints up to 13 pages per minute laser-quality black and up to 12 ppm in color
- Use HP's Photo Proof Sheet to select and print photos - no computer required

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