


THE ROADMAP TO COLOR TRANSACTION OUTPUT

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EXECUTIVE SUMMARY

The high-volume black-and-white transactional print marketplace is poised to transition to color output. To date, cost and complexity have inhibited many organizations from investing in color. At the same time, many companies are recognizing the power of digital color as a means to increase revenue, eliminate preprinted forms and improve customer service. Leading industry analysts are predicting significant growth in color adoption, due in large part to the marketing opportunity.

For companies that have adopted color, costs are perceived to be high because of capital equipment expense, uncertain reliability and quality and, often, the need for pretreated paper. Complexity results from formidable challenges in four areas—the “pillars” of color transition: color management, workflow, the IT infrastructure and the integration of 1:1 marketing programs with traditional transaction production environments.

Our strategy helps companies simplify the transition to color and surmount the related challenges. InfoPrint Solutions Company™, a Ricoh-IBM® joint venture, can help you minimize both cost and complexity through the thoughtful, collaborative development of a standards-based, color-integrated output architecture, print controller, print engine and workflow solution.

At the industry level, the AFP Color Consortium is defining the color management portion of the InfoPrint® Advanced Function Presentation™ (AFP™) architecture. The consortium currently consists of 31 members who represent document composition and creation, servers and transforms, and printers and controllers that leverage the AFP standard. At the user level, InfoPrint Solutions Company seeks customer feedback and recommendations to help meet present and emerging requirements—an essential step to address cost control, mitigate risk, ease integration, support compliance and improve efficiency.

In addition to helping companies save time and streamline planning and implementation, InfoPrint Solutions Company has developed a four-pillar evaluation matrix, a readiness questionnaire and a solution checklist. Accurate environmental assessment is essential to an effective and efficient transition to color. These tools illuminate many of the considerations—and decisions—that can affect the success of a color transaction output solution.

The roles of color management, workflow and 1:1 marketing expertise are integral to color transactional output, but ultimately, we believe that infrastructure is the key to “simpler and easier.” The right infrastructure is the cornerstone of a scalable solution that can deliver accurate color output at up to rated speeds with investment protection.

Transaction output—statements, financial documents and bills—is undergoing a major change as it transitions to color.

THE TRANSITION TO COLOR

Transaction output—statements, financial documents and bills—is undergoing a major change as it transitions to color. While it is unlikely that all high-volume black-and-white printing will be replaced with full color, many organizations like yours expect to transition a subset of their volumes to color devices for output to print or to the Web. By combining color and customized marketing messages on transactional output, you can more effectively up-sell, cross-sell and communicate to your customers.

The widespread adoption of digital color printing in office and graphic arts environments has paved the way for broader acceptance of color. In the graphic arts space, for example, the reduction in cost and complexity has reached a level that is acceptable to printers and their customers. As a result, color output has generally increased.

A similar scenario is expected to unfold in the high-volume black-and-white transaction output marketplace as color technology begins to approach current black-and-white capabilities in areas of reliability, lower cost and speed.

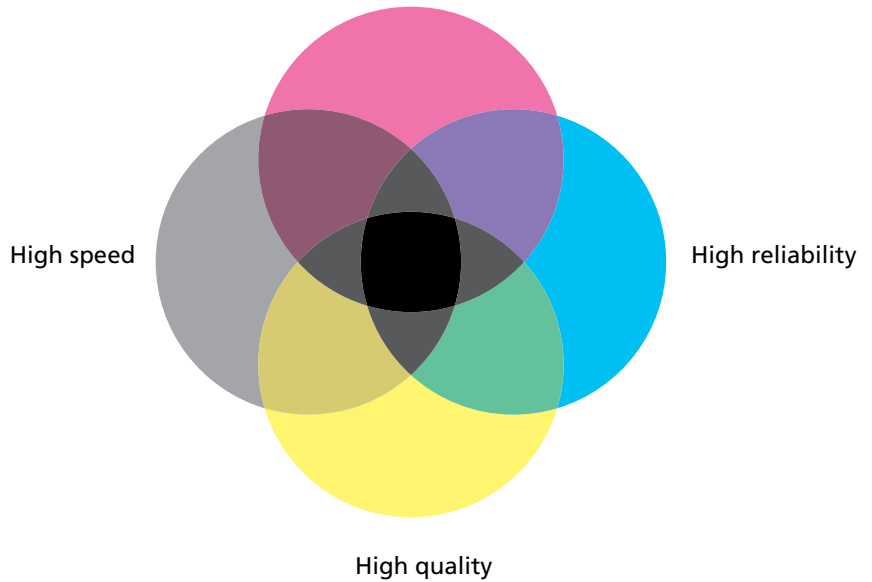
Some companies have already adopted color, and some will transition to color during the next few years. This paper, however, demonstrates that the transition is not expected to be simple or easy for high-volume black-and-white printers that lack expertise in color management, workflow, a color-enabled IT infrastructure and the management of complex 1:1 marketing programs.

Grounded in open standards, the InfoPrint Solutions Company approach to color includes assessment, infrastructure, high-speed printers, productivity software, workflow automation and services.

During the past 10 years, InfoPrint Solutions Company has gained insights into high-volume color printing by advancing the AFP architecture and by developing the industry's first AFP-based color production print solution in 1998. Grounded in open standards, our approach to color includes assessment, infrastructure, high-speed printers, productivity software, workflow automation and services—all designed to work together to provide investment protection and scalability. This approach can help reduce the complexity associated with color workflows and simplify your transition to color.

CUSTOMER REQUIREMENTS

Low cost and flexibility



Customers are looking for color solution components that more closely match their experience with black-and-white printing. InfoPrint Solutions Company has brought a device to market that balances these requirements—the target is the black middle area, or at least what should be black with CMYK.

Digital production color is entering a rapid growth phase of 20 percent a year through the end of the decade.

COLOR TRENDS

According to a study conducted by industry analyst company InfoTrends/CAP Ventures, digital production color is entering a rapid growth phase of 20 percent a year through the end of the decade.¹ InfoTrends' forecasts indicate that monochrome volume printed on color devices will increase from 7.1 billion pages in 2004 to 23.8 billion pages by 2009.

A recent InfoTrends presentation² also indicates significant growth: digital color printing is expected to increase from US\$3 billion in 1995 to US\$49 billion in 2009—a 22 percent compound annual growth rate (CAGR)—compared to black and white, which is expected to grow from US\$3 billion to more than US\$11 billion in the same period, which is a CAGR of 10 percent. Further, InfoTrends believes that new business models in the printing industry will be driven by software innovation. The presentation shows projected growth of 3 percent to 98 percent for global production software during the period between 2003 and 2008. Software categories include datastream transformation, controllers/raster image processors (RIPs), digital workflow, variable data and more.

In the conclusion of an article about transactional printing, *Digital Publishing Solutions* magazine stated that “many vendors are finding new ways to strengthen the impact of their transactional printing, by including color marketing messages for other goods and services within customer statements and other communications. Color will appear more and more frequently.”³

THE CASE FOR COLOR

Businesses engaged in transaction output are interested in color for a number of reasons. Several industry analyst firms, including Caslon & Company, report that companies justify color based on a combination of factors:

- Cost savings that result from the elimination of preprinted forms and inserts, and the expenses of warehousing and obsolescence
- New revenue from banner advertising on statements and from personalized inserts that are part of the print stream of the job
- Soft benefits such as the power of color to attract attention, speed payments, reduce customer service calls and increase customer retention rates⁴

Color capabilities can provide companies with marketplace differentiation and the ability to respond to competitive pressure.

In addition, color capabilities can provide companies with marketplace differentiation as well as the ability to respond to competitive pressure, especially from service bureaus that have been quick to embrace evolving color technologies for transaction output.

In spite of the growing recognition of color as an effective business strategy, few transaction printers have adopted color technology. Why? Cost and complexity. The high capital equipment cost, as well as the high operating expenses of many of today's color technologies, has limited the majority of color volumes to graphic arts applications. In these environments, customers are willing to pay a premium, and therefore higher costs per page, for superior print quality—unlike high-volume transactional printers, which require lower costs. Further, high-speed digital color devices in the marketplace today have limited appeal compared to existing high-speed black-and-white devices. The limited appeal is due to uncertain reliability, print quality limitations and, often, the need for expensive pretreated papers. In addition, many components of the business case, such as improved marketing ability, are hard to quantify.

Complexity also inhibits adoption. The addition of color workflows to traditional black-and-white statement environments presents four areas of formidable complexity and challenge: color management, workflow, the IT infrastructure and the management of 1:1 marketing programs.

Color management includes issues such as the accurate rendering of a particular color in print or online, color matching between devices and the ability to move color to black-and-white printers for disaster recovery or multisite operations. These tasks can best be accomplished through the use of industry standard International Color Consortium (ICC) profiles; however, there currently is no solution that automates high-speed variable-data printing and color management to an acceptable degree. That requirement is addressed by the AFP Color Consortium's architecture, which brings ICC profiles into the AFP MO:DCA™ datastream.

Workflow encompasses the end-to-end management of the color-enabled digital print and mail production process, including composition tools, datastream conversion and manipulation, postal optimization, print server, print engine, inserters, online viewing tools, automation, and tracking and reporting systems.

To support color, IT infrastructures often must be bolstered to accommodate the increased file sizes of color objects, especially full-color images. An enhanced infrastructure may include increased network bandwidth, disk storage, and print controllers and servers capable of processing full-color applications and driving high-speed printers at rated speeds, along with tools to ensure security and regulatory compliance. The management of 1:1 marketing programs requires expertise with data mining tools to leverage customer insight and to manage complex affinity programs and their tight integration with the color solution.

IT infrastructures are often bolstered to support the increased file sizes of color objects, especially full-color images.

At InfoPrint Solutions Company, we recognize that in order for companies like yours to successfully adopt color technology, investments must provide:

- Cost control—the key to survival and future success.
- Risk mitigation based on a measurable, reasonable return on investment (ROI).
- Ease of integration of hardware and software in multivendor environments.
- Conformance of processes and platforms to evolving industry standards.
- Auditable risk and compliance tools for regulatory and corporate requirements.
- Process automation to minimize errors and improve operational efficiencies.
- Support for ever-shrinking service-level agreement (SLA) windows.

If you fail to achieve one or more of these objectives, you could expose your business to risk, waste resources, disappoint customers and lose revenue opportunities. We believe these objectives are best-practice benchmarks for the design and implementation of color transaction output solutions.

FOCUS ON THE FUNDAMENTALS—OUR STRATEGY

The InfoPrint Solutions Company strategy is an architected approach that can help simplify your transition to color and help you surmount the related challenges. With a thoughtful, architected solution, many companies can discover that print devices are more likely to maintain rated speed, manage color fidelity and improve data and output integrity. This experience can be enhanced by relying on the robustness of AFP, which preserves your freedom to choose the hardware vendors with whom you want to work, and continues to deliver outstanding levels of accuracy, security and performance.

Our strategy is an architected approach that can help simplify your transition to color and help you surmount the related challenges.

Our color strategy for transaction output includes four key components whose purpose is to provide an end-to-end solution to simplify the transition to color for high-volume variable data printers:

1. An output architecture that integrates color management within the composition tools, application, print server and print device to help reduce complexity
2. A print controller that can support the new architecture and provide tremendous scalability to process large amounts of data for high-speed, fully variable, full-color workflows
3. A print engine designed to meet your requirements for quality, cost, speed and reliability
4. A modular workflow system that allows you to more seamlessly integrate color into your production processes

With a strategic, architected approach, IBM can deliver a color transaction print solution that helps you minimize cost and complexity. You can address cost issues with high reliability and quality that help reduce rework and downtime, and through flexibility in paper choices. In addition, it can reduce complexity with open standards, tight integration of color management into the infrastructure, workflow automation and expertise in 1:1 marketing.

The InfoPrint Output Environment establishes a framework for technology advances in color.

AN ARCHITECTED SOLUTION—THE INFOPRINT OUTPUT ENVIRONMENT

The InfoPrint Output Environment establishes a framework for technology advances in color, print controllers, workflow management, business integration and productivity management tools. The AFP architecture and the work of the AFP Color Consortium are the cornerstones of this framework.

AFP Color Consortium

Formed in October 2004, the AFP Color Consortium currently unites 31 industry-leading hardware and software vendors, and is responsible for the development of the color management portion of the AFP architecture. Member companies represent document composition and resource creation, servers and transforms, and printers and controllers that currently leverage the AFP standard.

To continue the reliable, secure and consistent black-and-white output that AFP provides today, the AFP Color Consortium is expected to move the complexity of color management into the architecture and away from programmers, administrators and operators. The following consortium goals aim to provide effective color management through ICC standards-based architecture that permits you to select the hardware and software partners you prefer:

- More accurate and consistent color rendering across AFP output devices through the use of rendering intents, so you can intelligently and automatically control how the colors are converted from one color space to another
- Tunable colors and grayscales
- High-speed color conversions

Further, as a result of the work of the AFP Color Consortium, you can preload images into printer memory using a Resource Environment Group (REG) AFP structure. The REG allows resources to be preloaded before the job starts printing, and it can greatly improve printer performance and help minimize huge bandwidth requirements. By leveraging the AFP architecture for full-color output, you can optimize output by tuning images; caching large, reusable objects; and linking ICC profiles across color spaces to more accurately produce color output.

Consortium members are committed to solving the challenges related to high-speed color output and the need to bring a comprehensive solution to market.

In February 2006, 14 months after its formation, the consortium announced the publication of the architectural framework. This rapid pace demonstrates the commitment of the consortium members to solve the challenges related to high-speed color output and the need to bring a comprehensive solution to market.

The InfoPrint Output Environment

The InfoPrint Output Environment, which embodies our color strategy, is also composed of a group of products based on open standards that link the latest hardware, software and services with legacy solutions:

- **The scalable InfoPrint POWER™ Controller engine:** The evolution of our patented AFCCU™ architecture, this controller is the power behind our production printers. The POWER Controller enables higher levels of multiprocessing performance and provides a foundation for full-color printing at up to rated device speeds. You can, for example, create a single application for printing on both black-and-white and color printers and design applications using TIFF, JPEG, GIF or FS45 color objects and process them natively on the POWER Controller.

With the AFP Color Emulation feature driving an InfoPrint 4100 printer, you can design applications using TIFF, JPEG, GIF or FS45 color objects and print them natively with 256-level grayscale technology. Save application development costs by creating a single application for printing on the InfoPrint 4100 and color printers.

- **Color engine:** The InfoPrint 5000 full-color, drop-on-demand inkjet printing system will, in a phased release, over time, leverage server and controller technology, advancements from the AFP Color Consortium and the InfoPrint Workflow portfolio.⁵

The InfoPrint 5000 is a high-speed, full-color, variable-data, continuous-form printer that uses inkjet print heads, piezo-electric drop-on-demand technology and water-based pigment inks that are designed to resist fading and smearing.

- **Workflow:** The InfoPrint Workflow portfolio includes three levels of workflow management software—printer, job and document—that are designed to lower overall costs and help improve operational productivity. Each level can be integrated into the one above it to allow for a seamless extension of operational efficiencies.

At the base level, InfoPrint Manager software is designed to manage transaction, distributed and print-on-demand output in small, single sites or large, multisite operations. InfoPrint Manager software can improve utilization of printer assets through centralized print management and provide full accounting of printer resources.

At the next level, InfoPrint ProcessDirector software is a scalable, customer-configurable output process management system based on the Linux® platform. InfoPrint ProcessDirector software enables job-level control of print processes, and it can simplify operations and support the reengineering of transaction output processes.

At the highest level, the InfoPrint Workflow solution is an end-to-end, customized consulting engagement and workflow management and control solution. It can help you automate and transform the output process to increase its value to your business. InfoPrint Workflow software focuses on document production and distribution to increase efficiency and improve integrity.

The InfoPrint Workflow portfolio includes three levels of workflow management software that are designed to lower overall costs and improve operational productivity.

- **Productivity management:** The productivity management tools in the InfoPrint Output Environment include the InfoPrint Productivity Suite Productivity Tracking Feature, designed to automate the collection of operational data. With information on demand, you can analyze printer, operator and job statistics and identify ways to improve productivity and reduce cost.

Our color roadmap consists of an architected solution—a vision for color transaction output in which the right infrastructure is the key to a simpler, easier transition to color workflows. The architected solution includes the InfoPrint Output Environment, which provides workflow and infrastructure components, AFP with color management capabilities, and 1:1 marketing expertise. This balanced triad of architecture, technology and management is the foundation for our color transaction output solution.

INFOPRINT SOLUTIONS COMPANY COLOR ROADMAP

The InfoPrint color roadmap consists of an architected solution—a vision for color transaction output in which infrastructure is the key to a simpler, easier transition to color workflows.

Color management	AFP Color Consortium and Advanced Function Presentation architecture		
Workflow	InfoPrint Manager, InfoPrint ProcessDirector, InfoPrint Workflow		
Infrastructure	InfoPrint 4100, POWER Controller, engine technologies		
Managing 1:1	Integrated data mining and CRM tools, affinity program management		
Solutions	Yesterday	Today	Tomorrow
Architecture	Line data	AFP color management	Open, scalable, integrated
Technology	Print	Print, transform, view, archive, retrieve, e-deliver	Wireless, RFID
Management	Pages to printer	Job control	Process workflow

THE FOUR PILLARS OF COLOR TRANSITION

Look before you leap—the transition to color requires thoughtful planning and execution. Our approach requires that you evaluate the areas listed below.

COLOR MANAGEMENT	INFRASTRUCTURE	WORKFLOW	MARKETING
<ul style="list-style-type: none"> • Education • Tools • Risks • Opportunities 	<ul style="list-style-type: none"> • Storage • Network • Content management • Composition • Print servers • Print hardware • Inserters • Security • CRM 	<ul style="list-style-type: none"> • Output requirements • Application development environment <ul style="list-style-type: none"> – Design – Prepress – Composition – Application segmentation – Postal sortation/ optimization – Datastreams – Print server • Production environment <ul style="list-style-type: none"> – Offset web/cutsheet – Digital web/cutsheet – Color/black-and-white devices – Advanced finishing – Prepost – Insertion – Proofing • End-to-end process tracking • Productivity (job, operator, device) tracking • Audit readiness/ compliance 	<ul style="list-style-type: none"> • Data mining tools • Affinity program management • CRM tools • Integration
HARDWARE Reliability – speed – quality			

A READINESS QUESTIONNAIRE

Every organization is different, so one of the most important steps in your transition to a color workflow is the completion of a comprehensive environmental review. The questions in the checklist that follows focus on your operational requirements, tools and processes. As you evaluate your operational readiness, remember these general guidelines:

One of the most important steps in transitioning to a color workflow is completing a comprehensive environmental review.

- The further from the printer the color files are fully formatted, the greater the cost—of distribution and processing—and the time delay to transmit page-ready files. An added downside is that you must manage required resources at each print location. Compare this approach to AFP, which can assemble files on the fly in combination with the print server and the print controller. The AFP approach is fast—and, more important, device independence provides flexibility in your operation.
- The AFP color architecture can help reduce sizes, but a fully formatted color file can be up to 10 times larger than the black-and-white file, even with the use of compression.
- Colorizing images is the primary contributor to large file sizes, unlike colorizing charts and text, which does not significantly increase file size.
- The quality of the composition engine and the method of color file composition are critical in determining the file size and CPU time required for processing.
- Other critical factors that can impact performance of both black-and-white and color applications include:
 - Image rotation
 - Image scaling
 - Image resolution
 - Resource synchronization/version management
 - Datastream type

OPERATIONAL READINESS

Output overview	<ul style="list-style-type: none">• What is the volume of impressions (A4 or letter image, single side) formatted?• What percentage of printed impressions need color?• What is the average percent of color coverage per impression?• What volume of formatted impressions are received from customers?• What percentage of received impressions are in color?• What is the current formatting platform?• How are files transmitted to the printers?• Does the environment consist of a single site or multiple sites?• Do multiple sites work independently or via a central hub?• Do the sites support each other for business continuity and disaster recovery purposes?• Are disaster and recovery services outsourced?• Does disaster recovery require color output, or can all or some output be produced on black-and-white equipment?
Impact on timeliness of service	<ul style="list-style-type: none">• What is the increase in composition time required to generate AFP color files?• Is there an impact on SLAs?• Does the increase in composition time impact other jobs on the platform— print and nonprint jobs?• What is the additional time required to transmit files to the printers, and what is the impact to SLAs?• Are print files transmitted on a shared network? If so, what is the impact on other work?
Impact on infrastructure costs	<ul style="list-style-type: none">• What is the additional cost of processing on the current-state platform?• If SLAs are at risk:<ul style="list-style-type: none">– What is the cost of additional processing power?– What is the additional network cost?– Is the current-state platform the correct platform for formatting AFP color files, or is there a requirement to migrate to an alternative platform?

Continued...

OPERATIONAL READINESS (CONTINUED)

- Impact on quality of service
- What composition best practices need to be employed to mitigate time delays and unnecessary costs?
 - What skill sets and training are required?
 - Is the current-state composition tool suitable for color?
 - Is the current-state workflow suitable for receiving data, formatting, performing postal sortation, printing, inserting and tracking?
 - What alternatives have been proposed?
 - What training is required for operators of black-and-white devices to understand acceptable color quality and to achieve consistency?
 - What specifications for originated images can maximize the output quality?

-
- Environmental suitability for color printers
- Are humidity and temperature levels suitable for color printers and paper stocks?
 - Is the current-state lighting suitable?
 - Are lighting conditions correct and standardized for measuring color quality?
 - What light tables and/or densitometers are required?
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PLATFORM AND FORMATTING OPTIONS: CONTROLLER, PRINT SERVER OR MAINFRAME?

You can maintain or enhance the level of automation and resilience that currently exists for black-and-white printing by evaluating your platform and formatting option.

The evaluation of your platform and formatting option—controller, print server and composition environment—centers on maintaining or improving the level of automation and resilience that already exists for black-and-white printing.

Regardless of which option you choose, investments may be required for resource maintenance, version control and lifecycle management. Increased bandwidth requirements can be reduced if all images are transmitted once in the header of the color formatted files instead of being imbedded in each document using AFP capabilities. Then the controller can process the file and ready it for print. In addition, business continuity and disaster recovery planning are essential.

Consider the following points about each option:

Formatting on the InfoPrint POWER Controller

Holding resources on the controller may allow you to retain the current-state formatting platform.

Holding resources on the controller may allow you to retain the current-state formatting platform. If you use more than one printer, however, you may need to implement an automated process for managing the resources across platforms. An alternative option is to create a shared storage device for all resources, but this approach requires scaling to ensure that the resource management utility processing time does not negatively affects SLAs. A shared storage device, however, may create a single point of failure.

Formatting on the server

Composition tools for servers are typically less expensive than tools for mainframes. The network bandwidth from the server to the printers probably needs to be increased to accommodate the compressed but still larger-than-monochrome color files. Business continuity and disaster recovery activities may require a backup server that is synchronized.

Formatting on the mainframe

The cost of formatting on the mainframe is determined by the amount of required input/output (I/O) and million instructions per second (MIPS). The time required for I/O may not exceed significantly the I/O for monochrome, excluding full-color images. Business continuity and disaster recovery activities require a backup server that is synchronized. Increased demand upon the network may create a conflict with other traffic on the network, so a separate network may be required. Depending on the cost of supporting color on the mainframe, it may be more viable to migrate to a server environment.

A SOLUTION CHECKLIST

Before you implement your solution, check it against the following questions to evaluate readiness of management, IT and employees.

SOLUTION CHECKLIST

Architecture	<ul style="list-style-type: none">• Does the proposed architecture match the current architecture?
Service quality	<ul style="list-style-type: none">• Does the solution meet the requirements for SLAs and key performance indicators?
Security and compliance	<ul style="list-style-type: none">• Does the solution comply with corporate standards?• Does the solution comply with contractual obligations for disaster recovery and business continuity?
Flexibility	<ul style="list-style-type: none">• Is the solution contractually scalable and future-proof for technological enhancements?
Standards	<ul style="list-style-type: none">• Is the solution documented?• Is there a formal change control/version management process?• Is the solution auditable to ensure corporate/legislative compliance?• Are third parties involved in compliance?
Staff	<ul style="list-style-type: none">• Does your staff have the required skill set to support the technology?• Does the training plan/project plan ensure that the solution can be executed correctly?• Are managers who touch the solution actively involved in the decision-making process?

"SIMPLER AND EASIER" HINGES ON INFRASTRUCTURE

Full-color printing is the easiest part of the solution. Implementation is far more difficult.

After a thorough and accurate evaluation of your environment, you may realize that full-color printing is the easiest part of the solution. Implementation is far more difficult. Only an efficient and effective infrastructure allows you to deliver the correct color solution to your customers at up to rated speeds, and permits you to scale your operation over time, without discarding your initial investment.

AFP allows color to be added to your existing statements in an incremental way—with stepwise refinement.

Our approach can help remove complexity, minimize risk and emphasize ROI—throughout the project phases of architectural/environmental review, implementation, support and upgrades. The solution, which leverages the proven AFP architecture, is grounded in open standards and in broad industry support through the AFP Color Consortium. AFP allows color to be added to your existing statements in an incremental way—with stepwise refinement.

The products and services that make up the InfoPrint Output Environment are designed to work together in diverse environments. Many products are available today. More are planned for release in the near future. In combination with experienced, knowledgeable people, the products bring to life our strategy for full-color transaction output that embodies integration, high speed, quality, reliability and control.

FOR MORE INFORMATION

To learn more about the color strategy and associated products and services from InfoPrint Solutions Company, contact your sales representative or visit:

www.infoprint.com

To learn more about the AFP Color Consortium, visit:

www.afpcolor.org

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June 2007
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Endnotes

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