Soft Proofing – More Than Just a Pretty Color

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Abstract: The widespread and increasing adoption of soft proofing on electronic monitors over the past several years at the expense of hard proofing on paper is the natural evolution of the previous shift in the graphic arts industry towards desktop publishing. Proofs in the graphic arts workflow are intended to carry both form and content information from one location to another for various purposes including design collaboration and process sign-off. The bulk of soft proofs used to date have been for content purposes. Content-only proofs make up only one portion of proofing. In the past few years, systems have advanced to the point where the color of a soft proof can approach that of a hard proof, making soft proofs applicable to a greater proportion of proofing. In order for soft proofing to completely displace hard proofing in any given workflow, mere color duplication is only the start. The checks and balances of a hard proof workflow need to be duplicated, among other factors. This paper discusses the additional non-color considerations which must be taken into account in order to produce a successful soft proofing system.

Introduction

Proofs are used in the graphic arts to perform a number of functions, both to predict and to guide the final printed work. Different proofs generated at different stages in the workflow from creation to press fill different needs, from content approval to color specification. Traditionally, proofs have been created on a physical substrate of some sort – either the final printing medium or a reasonable analogue. By contrast with these so-called “hard proofs” are “soft proofs” which exist only on the screen of a computer monitor.

The past few years have seen a significant shift in the way in which proofs are made. As noted by TrendWatch (2001, 2003), the use of soft proofs is steadily increasing even as the use of more traditional hard proofing systems (such as analog halftone proofs) is decreasing. Although the increase in soft proof usage is comprised primarily of PDF files sent via email for content collaboration, there is a definite trend towards the use of soft proofs in more color critical applications as well. Both the ongoing digitization of the graphic arts workflow

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as well as the need to decrease workflow processing times have driven the market towards this increased desire for soft proofing.

Soft proofing, while bringing speed of transmission, reduced environmental impact, as well as a host of other benefits, also raises a number of issues which are not as problematic for hard proofing. Functionally, soft proofing workflow behaves most like remote hard proofing, with the similar challenges of data distribution and color stability (both across multiple instances of proofing devices distributed across space and for a single proofing device over time). Moreover, soft proofs are by their nature transient, which raises issues of data approval and verification quite different than what is the norm for hard proofing. These workflow issues lie above and beyond the more basic issue of obtaining a color and appearance match between a soft proof and hard copy such as is discussed by Leckner (2002).

Recent technology advancements in a number of areas related to soft proofing, notably displays and workflow management software, have combined to allow soft proofing to actually become a viable supplement or alternative to traditional hard proofing. In making the transition from hard to soft proofing, though, a shift is required in the structure of the proofing workflow because of some fundamental differences between soft and hard proofing, beyond the rather obvious surface differences like color. This paper discusses the workflow issues raised by integrating soft proofing throughout the graphic arts workflow, and how these issues can be resolved.

Background: Graphic Arts Workflow

The graphic arts workflow generally refers to the production of printed pieces. This workflow goes through three functional phases once a print buyer has decided to create a printed piece. (Stocking, 1990; TrendWatch Graphic Arts, 2003) The three phases are:

1. Creation
2. Prepress
3. Production

The creation phase, also referenced by such labels as “concept” or “design,” is the stage at which the concepts for the piece are shaped by the graphic artist, and the content, layout, color, and other attributes of the final printed piece are decided. Often, the print buyer will not have decided upon a particular printer when entering the creation phase and sometimes even when leaving the creation phase. This phase is characterized by rapid flux in the creative design and a need by the designer to get feedback on the results of creative changes as rapidly as possible. For any given final printed piece, there may be multiple parallel creative processes taking place concurrently being run by different actors

possibly in different geographical locales. Soft proofing has a good fit here, as the creation phase benefits from being able to run through multiple proofs without consuming vast quantities of paper or spending an undue amount of time on generating each design iteration.

The role of prepress is to produce the specification and materials used by production to create the final printed piece. Although it is possible for some content change to take place while the job is in prepress, the degree of change is much less than in creation. The focus in prepress is to integrate all of the graphic design files and information into a single entity which can then be used as an input into the production phase. Prepress is focused on assembly and approval – ensuring that all the pieces are in place and that the customer or print buyer has signed off on the whole before sending the job off to production. As mistakes in specification become increasingly costly as they get made closer to final production, the job of prepress is to prevent mistakes from propagating into production as much as possible. Soft proofing is useful to rapidly and accurately communicate production concepts between prepress and the print buyer.

The production phase is when the final piece is printed. (For the purposes of this discussion, we'll include printing but exclude post-production physical conversion steps such as bindery.) Any changes required during production are highly expensive, so changes are economically discouraged. The focus in the production phase is on, well, production – ensuring that a maximum amount of time each job is spent producing salable product, and a minimum of time is spent getting the machinery ready to print (make-ready time) or correcting a mistake by re-printing the job. Soft proofing in the production phase ensures that a high level of process control has taken place in the rest of the production chain, and that the same proof used for creation and prepress will be used in production as well.

Depending on the particular market segment (e.g., commercial offset sheetfed, packaging, web offset publication, etc.) the particular actors involved and the actions within each phase attributed to each of these actors may vary, however the relationship and order between the three phases is mostly the same, as is their relevance. One can fit these three functional phase descriptions to practically any existing graphic arts workflow by merely changing the names of the actors, albeit in some cases several functional steps, and sometimes even a couple of the phases listed are compressed into one.

Background: Evolution of Proofing Technology

One way to approach the topic of soft proofing and why there has been such a drive towards it by the industry is to take a technocentric look at how color proofing has been driven by the need to reduce cost and time without sacrificing accuracy. Historically, proofing innovations have been adopted first by the

creation-phase segment of the workflow, with the high stakes production-phase users tending to be the most conservative towards new technology.

The earliest proofing, as such, was ink-and-paper sketches for conceptual design supplemented by press proofs. Given the well-known drift in presses, this combination resulted in a good illusion of accuracy at press prediction and tended to be costly to implement due to the high fixed cost of setting up a press and the low print volumes associated with printing press proofs. This setup cost also contributes to the cost prohibition of running more than one or two proofing cycles, increasing the chance of extending the press production phase because the right content/color/layout was not established earlier on.

The first group of color proofing innovations revolved around the film-to-plate workflow, wherein film used to expose plates for printing could also be used to expose proofing materials which could then be used laminated together, as with the Matchprint® (Imation, now KPG), Cromalin® (DuPont), or ColorArt® (Fuji) analog color proofing systems. The color proofing system in particular was designed in order to hit a midpoint of all presses, making it a good fit for press prediction and color contract work. Being imaged from the plate-ready film also means there will be excellent physical structural correspondence (halftone dots, trapping) with any plates for the job. It can be fairly said that these analog laminate proofing systems were responsible for the acceptance of off-press proofing into the pressroom.

Unfortunately, analog laminate proofing is slow, environmentally unfriendly, labor-intensive, and doesn't provide as close a color match to the final printed piece as is possible with a press proof. For single or a few proofs, analog laminate proofing is less expensive than press proofing, however press proofing is less expensive when dealing with many proofs, as the incremental cost per additional proof for press proofing is very low, on the order of a few cents.

With a high degree of manual labor involved in creating the proof, the analog laminate-based color proofing methods were subject to multiple variables on production. Digital thermal transfer methods (e.g., Kodak Approval®, Creo Spectrum®) help reduce the variability proof-to-proof and the labor required to produce a single proof, with no reduction in quality from an analog laminate proof, but only moderately address the cost issue.

The second group of proofing innovations sprang from inkjet technology, both the continuous inkjet (CIJ) style of the IrisPrint® (Iris/Scitex/Creo) and Digital Waterproof® (DuPont) systems as well as more recent descendants and cousins such as the Veris® (Creo) and various drop-on-demand (DoD) inkjet systems from Epson, Hewlett-Packard, Canon, and others. Inkjet systems in general are more flexible with respect to color than laminate systems (analog or digital),

able to easily realign themselves towards any of a myriad of different color simulation targets.

Beyond the simple proof structure differences (e.g., lack of exact replication of halftone dot structure, lower physical resolution), the very color flexibility of inkjet proofers has proven to be their weakness as a critical color proofing system. This flexibility results in a greater possibility of the wrong or unintended color being applied to a given proof, more so than is the case with the relatively inflexible analog or digital laminate proofing. In addition, technical limitations in the early days of inkjet proofers made achieving a perfect match to some other standard excessively difficult. These perceived weaknesses in inkjet proofing acted as a barrier towards their acceptance in the pressroom as a contract proof, with the situation really only changing over the early 1990s.

A greater barrier has existed for the acceptance of soft proofing into the graphic arts workflow. With the rise of PDF as a standard file format in the late 1990s, the use of PDF files as a means to exchange concept proofs or content fragments has skyrocketed (TrendWatch, 2001), using e-mail as the interchange medium. Such PDF files are typically viewed on monitors only, or perhaps printed out on relatively low-quality laser or inkjet printers (color or black & white).

For content-only proofing, image quality and color consistency are less important than for color critical proofing. The main concern is that for two or more such content proofs laid side-by-side, they all display the same content. PDF has been instrumental in ensuring content integrity.

For color accurate proofing, the similar concern is that all the calibrated monitors should look the same. Color consistency has had no similarly-pervasive force like PDF. As a result, the use of soft proofs for color accurate applications such as contract proofing has been practically non-existent up until the past couple of years. All of the solutions previously on the market either required near-constant expert-level user intervention (aka “tweaking”), didn’t result in critical color matches, cost an exorbitant amount of money, or some combination of all three.

The introduction of more stable display hardware technology coincident with advances in the state of the art in cross-media color appearance matching have led to the introduction of a number of color accurate-capable soft proofing systems including KPG Matchprint Virtual®, ICS Remote Director®, and Creo Synapse InSite® with the InSite Color option. All of these systems have been SWOP®-certified, a good sign the industry is willing to accept the color generated by these soft proofing systems at the same level as hard proofs.

The raw color match between hard and soft proof is no longer an impossible issue. The real problem now in encouraging increased soft proofing adoption is ensuring that the right workflow infrastructure is in place.

Proofing Workflow Considerations

The different focus of each of the phases of the graphic arts workflow results in a different set of proofing requirements at each phase. There are many ways to categorize proofing requirements. Stocking (1990), concentrating on proofing at the press end of the workflow, talks about the basic usages of proofs as verification, press prediction, communication, and contract. TrendWatch (2003) talks about the different types of proofs which are created in the workflow (concept/comprehensive, visualization, prepress/laminate, blueline, press proof, contract, press check).

From a workflow perspective, though, it is perhaps more instructive to look at proofing primarily as an exchange of information. Looking at the workflow this way, there are two major uses of proofs: to communicate what is supposed to be produced, and to be referred to afterwards if something goes wrong with production and lawsuits start flying.

The rationale for this admittedly high-level view of proofing is that it provides a useful way of interpreting the exchange of information underlying proof production and usage. This will in turn allow us to analyze the structural issues which confront the usage of soft proofing in the workflow and fit the myriad of details involved in the various proofing encounters into a comprehensive framework. That's not to say that we should ignore other important physical aspects of proofing such as speed, accuracy, and repeatability which affect the shape of the workflow and are also useful lenses through which to view proofing. However, many of these physical attributes reflect more on the evolutionary progress of technology than on the underlying structure.

First, we'll establish what information is exchanged for different types of proofs, in order to fit proofing into the information exchange world. Then, we'll examine how the differences between hard and soft proofing affect that information flow. This examination will reveal what elements do or don't need to be added to soft proofing workflow systems in order to achieve parity with existing hard proofing workflow without giving up the gains made in moving from hard to soft proofing.

In normal communication, there is a sender, one or more receivers, some specific information to be communicated, occasionally some acknowledgement of receipt, and possibly a required response of further information from the receiver(s). In the proofing world, the types of information which a proof can convey from sender to receiver include:

- Content: includes imagery, text, and/or graphics.
- Color: describes source actual, intent, or destination actual
- Layout: describes physical relationship of content relative to each other, for a single or among several pages or pieces of artwork.
- Structure: includes physical attributes such as halftone dot shape, trapping, etc. which affect the macroscopic appearance of the piece.

Information returned from receiver to sender primarily consists of markup and approval. I.e., the receiver receives the proof, and can choose to: do nothing, accept the proof as ok for its purpose, or forward comments about what should be in the proof back to the sender. Although where one is at within the workflow determines what information is sent and its quality, all proof usage follows this basic pattern.

For example, in the case of a contract proof, the sender (printer) loads all the information he has about the color, content, layout, and structure of the page to the receiver (client), who can choose either to accept or reject the proof as the binding contract between the two parties for the way the printed piece should turn out.

In a concept proof, the sender (designer) injects varying amounts of content and layout information into the proof, sending it out to receivers who are mostly designers or other parties at the creative design phase of the workflow. The receivers in turn provide back to the sender feedback or further refinements on the design.

Differences between soft and hard proofing workflows

While seemingly obvious, the key difference between hard and soft proofing workflows is that the latter has no trail of paper proofs left behind after viewing by the various actors in the workflow. This lack of a paper trail has both immediate as well as forensic implications relative to the workflow and is the source of the workflow challenges confronting soft proofing.

In addition to the requirement regarding the type of information found in a proof, which defines what a particular proof is, practical workflows also have a number of requirements regarding what information needs to accompany the proof. Some of this meta-information includes:

- Positive verification proof was received and read
- Proof comments and annotation from reviewer(s)

- Verification proof was viewed under appropriate conditions

The proof receipt verification is important to the proofing workflow in order to help establish who has authorized any changes to the content, color, or layout. In a hard proofing workflow, the hard proof itself as well as documentation about its physical movement usually serves as a record of exactly whom has seen what when. As well, a set of hard proofs can be used to provide a history tracking how a particular design has evolved.

Without the trail of hard proofs left behind, soft proofing systems need to rely on a workflow database of some sort in order to track when information has been exchanged. The current practice of emailing PDF files for use as on-screen concept proofs has grown in popularity because the email itself serves as the proof receipt verification as well as the history. It is unfortunately somewhat clumsy in practice if trying to trace any history more complicated than a single sender/receiver pair and only a few rounds of proofs. It is also somewhat ephemeral, as email tends not to be kept for more than a short period. Workflow systems such as Synapse InSite® deal with this problem by maintaining a database which logs all activities which take place with the soft proofs, including approval of the proof which can only take place if the user has viewed the proof. This database in turn can be backed up and archived offline.

In hard proofing, comments will be drawn or written onto sticky notes attached to the proof or directly on the proof itself. As with the viewing of the proofs, the hard proofs themselves serve as the evidence of whom has requested what change to the files. In soft proofing, a similar system is required, as there, not only are the proofs themselves in electronic form, but the annotations as well. For example, in Synapse InSite®, a PDF text report can be generated from the database for each job listing all of the annotation activities for each page in a job.

The other assurance users have when using hard proofs is that, by circulating a single physical hard proof to a number of different people, they will all be able to see the same proof, to receive the same information, as it were, with no worries about different versions being sent to different people, possibly with different content. Soft proofing systems solve this problem by using a simple monitor calibration utility in concert with easy-to-run on-screen monitor color checks, the idea being that if all monitors networked together in the soft proofing system are tightly calibrated together, then it is assured that users viewing proofs on all of these monitors will be receiving the same color and content information. RemoteDirector®, Matchprint Virtual®, and Synapse InSite® all include this type of vital functionality.

Beyond this type of checking, for forensic audit reasons, it is important to log the calibration state of the monitor into the audit database, to provide some

indication that, when a user approved the color for a particular proof, that their monitor was calibrated properly and simulating the correct color target. This type of audit tracking goes one step beyond what is possible with hard proofing.

Conclusions

Previously, soft proofs were used for content only, as the level of color match between a soft proof and a printed piece was either nonexistent or difficult to maintain in an industrial setting. The recent SWOP® certifications of a number of soft proofing systems indicates that the industry is willing to accept the level of color match which is now achievable with a soft proofing system. Color quality alone is no longer a significant problem for soft proofing.

The barrier to acceptance of soft proofing throughout more of the graphic arts workflow is workflow-related. Proofing users need to be reassured that the viewing, annotation, and acceptance of soft proofs is every bit as traceable as with hard proofs. For example, it is possible to circulate a single instance of a hard proof around to different people in different geographic locations and ensure that each person has the substantially the same viewing experience. With a soft proof, only data gets circulated, so the workflow software infrastructure needs to ensure that each viewer receives the same experience and that this experience is traceable. For content-only soft proofs, fairly little needs to be tracked other than file versions and read receipts. For color contract soft proofs, the workflow needs to also track the color condition of the viewing monitors, among other things. The ability to perform these additional workflow steps is what will separate the successful soft proofing systems from the unsuccessful ones, much more so than even the relative color quality.

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