PDF/X
Frequently Asked Questions

(Last updated Nov 2005)

Over the last few years many people have talked a lot about PDF/X, and the sources of information on the subject have multiplied significantly. Unfortunately it can still be rather difficult to obtain clear and complete answers to some of the questions that you might expect to be asked by print buyers, advertisers, publishers and print service providers. There is also a certain amount of misinformation being passed on, often based on things that may have been true in the past. In other cases a mistaken understanding of the perceived 'dangers' of some aspects of PDF/X lead people to reject it in favor of specifications and workflows that are far more risky and less reliable than PDF/X could provide.

This document is therefore an attempt to ensure that accurate information is freely and widely available to all.

Please note that this is not an official CGATS or ISO publication, it is developed and maintained by me, and sponsored by my employer, Global Graphics Software. Any recommendations are mine, although I have made every attempt to ensure that they align as well as possible as any single opinion can do with industry consensus. Any mistakes are also mine; comments and corrections are always welcome, as are suggestions for additional information that could usefully be included. More specifically, this cannot be treated as a formal interpretation of any aspects of the PDF/X standards. Both CGATS and ISO have procedures to request official clarifications and interpretations of their standards which should be followed if you have a need to do so.

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Thanks, and I hope this proves useful to you.

Martin Bailey
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> Vice Chair, CGATS
> Chair, CGATS SC6/TF1 (PDF/X)
> Chair, ISO/TC130/WG2/TF2 (PDF/X)

1. Why do we need another format? Isn't PDF enough?

PDF/X is not an alternative to PDF, it's a focused subset of PDF designed specifically for reliable prepress data interchange.

It's an application standard, as well as a file format standard. In other words, it defines how applications creating *and* reading PDF/X files should behave.

2. What's the aim?

The aim for designers is to provide a digital content file that they can be confident will be printed predictably and correctly by the service provider. That requirement applies equally to a commercial print job printed on one site, and to a magazine ad placed in many publications and printed across the world.

The aim for service providers and publishers is to receive robust digital content files. In this context 'robust' means that they can be confident that the files will run through prepress without requiring rework or causing errors, and will allow them to meet (or exceed) customer expectations on press.

In both cases the key term is "process control". Reliable content file delivery is every bit as important as waste management and press automation; in fact it's a key pre-requisite for automation.

Bad files, errors in prepress and untrustworthy proofs lead to material waste and human intervention, which in turn increases costs, errors and delay both within and between the parties involved in a print job.

The immediately measurable goals of PDF/X are:

- To improve color and content matches from proof to proof, proof to press, and press to press

- To reduce processing errors in proofing and prepress

- To enable rapid, effective and automatable pre-flight of files at the time of receipt from the customer.

- To reduce the complexity and cost of customer education

All of these apply both on a single site, and when the files are handled on multiple sites, using different equipment, from many vendors

You'll notice that having a customer-supplied job print well is not on that list. All of the bullet items above can significantly increase the probability that a job will print well. On the other hand, it's just not possible that a single standard can enable jobs to print well on a wide variety of substrates and printing technologies. See "What's PDF/X Plus?" below for more on this.

3. What can I do in PDF/X that I can't do in PDF?

Strictly speaking, nothing.

The important point is that you can do a lot of things in PDF that are not appropriate for graphic arts use, and that can cause problems when outputting for high quality reproduction.

"PDF/X" can be thought of as a shorthand way of specifying most of what you need to tell somebody in order for them to create a file that's as likely as possible to print correctly when they send it to you, even if they don't understand the details of what it's doing for them.

Phrased slightly differently, think of all file formats used for file transfers as being compromises between flexibility and reliability (where reliability is defined as the final printed piece looking like your own proof).

At one end of the scale are application files like Adobe InDesign or QuarkXPress documents. You can change those in whatever way you like if you have the application. Unfortunately the receiver of a file can also change them accidentally rather too easily. The results you get when printing are also dependent on many factors in the environment in which that copy of the design tool is running, such as operating system, fonts, PPDs and printer drivers, not to mention exactly which version of the design tool you have.

At the other end of the scale are copydot scans. Those will print absolutely as you expect, given the necessary provisos about having been prepared for the correct resolution and calibration. It's because of those cautions that I describe them as inflexible.

In between, in order of decreasing flexibility and increasing reliability, other options at other positions on the scale include PostScript, EPS, PDF, PDF/X and TIFF/IT. When I use a name like 'PostScript' in that list I mean the format in an otherwise unspecified way. It's always possible to push such a format towards the reliable end of the scale by using appropriate software to create it. At one stage in northern Europe many people used a product called 'ProScript', for example, which limits the options used in EPS files. A 'ProScript EPS' file might be placed on the scale somewhere between PDF and PDF/X.

<div align="center">

Flexibility ⬆

Application documents
PostScript
EPS
PDF
PDF/X
TIFF/IT
Copydot

Reliability ⬇

</div>
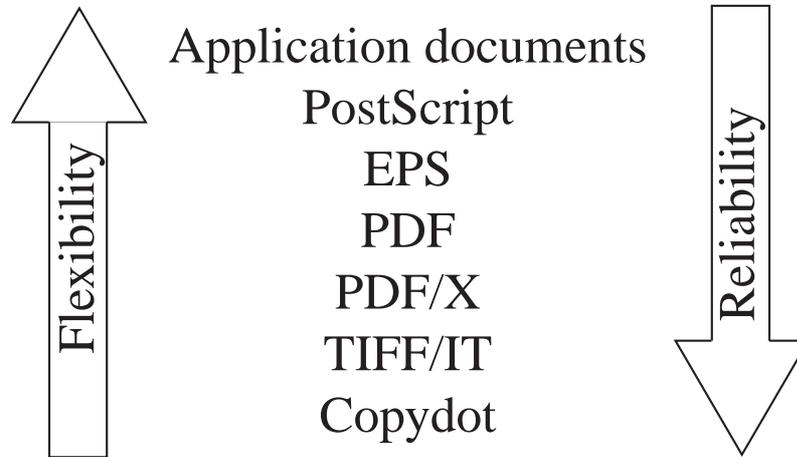
Appropriate use of pre-flight tools on PDF can give you a 'reliable PDF' much closer to where PDF/X is on that scale. The point of PDF/X is that it gives you a convenient and well specified label to use when asking for such a 'reliable PDF' file.

4. So when should PDF/X be used?

Every transfer of files from one place to another, whether it's between designers sitting at adjacent desks, or from an ad agency to a magazine publisher, has an optimal position on this compromise scale, and there's a file format and workflow appropriate to that optimal compromise. Those two designers at desks next to each other would be crazy to use anything but native application documents, for instance.

In some cases there will be additional selection pressure for a specific format, e.g. for compatibility with other processes, but as a general rule the optimal compromise for the supply of print-ready files *between* organizations will be to retain some flexibility, but not at the expense of compromising reliability.

Copydot files are simply too inflexible for most transfers of ads and other print-ready files, although there are some instances where it may be the right thing to do (such as between some publishers and print sites).

For most inter-company print-ready transfers where the sender and receiver do not have a strong relationship in place and where there's no intention of holding planning meetings for each job submission PDF/X is a very good choice. That's why it's recommended for digital delivery in the 10th edition of the SWOP specification (alongside TIFF/IT-P1 – see "Why is PDF/X better than TIFF/IT?").

5. Why is PDF/X better than a job options file?

Over the last few years a number of people who receive PDF files have developed an approach that sometimes works well. They save a set of job options in Acrobat Distiller, and send that to their clients. When files are created by relatively unsophisticated users it's far more likely that they will meet the receiver's quality requirements using such job options than they would otherwise.

The main drawback of this approach is that it requires all files to be created using Acrobat Distiller, and cannot help those people who want to use the increasing number of desktop applications that can export directly to PDF (Adobe Illustrator, PhotoShop and InDesign, QuarkXPress, MacroMedia FreeHand, etc.), or alternative PostScript to PDF conversion tools, such as Agfa Apogee Create, Apago Piktor or Jaws PDF Creator.

Adobe's Creative Suite 2 products all share nominally the same job option files, but each uses a different subset of the data that can be stored in such a file. That makes it even harder to construct a configuration that's suitable for all of them, because no tool on its own can create a fully portable file.

This approach also cannot be applied to the high-end graphic arts tools that can generate PDF directly, like Creo Brisque, Dalim TWiST, or OneVision Solvero. You might expect that the users of such equipment should understand the process well enough not to need such help, but everyone makes mistakes occasionally!

A rather minor further consideration is that a new job options file would probably need to be developed for every new version of Distiller.

The implications of some of the options available in Acrobat Distiller can be quite subtle, making it rather difficult for an individual company to develop the best possible configuration. On the other hand PDF/X has been developed over a period of several years by a broad-based team of users and vendors, ensuring that a consensus of expert opinion is embodied within the standards.

Recommended Distiller job options files are provided by a number of groups such as the Ghent PDF Workgroup, alongside their PDF/X Plus specifications (see "What's PDF/X Plus?").

6. Why is PDF/X better than pre-flighting?

PDF/X and pre-flighting are not mutually exclusive. Indeed, PDF/X files should be checked to ensure that they conform to the standard before transmission. Ideally they should also be checked for all of those issues that cannot be addressed in a standard, such as the trim area and image resolutions (see also "What's PDF/X Plus?").

Before the introduction of PDF/X some companies receiving PDF files encouraged their customers to apply appropriate pre-flight checks before sending files. When the sender and receiver both use the same pre-flight tool it is sometimes possible for the receiver to supply a configuration file (e.g. a ground control for Markzware FlightCheck or a profile for Enfocus PitStop). With care this can eliminate a large proportion of problem files.

If the two parties involved are using different pre-flight tools, however, an explanation of the checks that should be made by the sender can be very complex. As more and more pre-flight tools are released with pre-built PDF/X configurations already available these explanations can be significantly simplified.

7. Why is PDF/X better than TIFF/IT?

TITT/IT-P1 has been held up as an example of a bullet-proof delivery format for some time, but results from at least one large prepress company show that PDF/X and TIFF/IT-P1 have very similar failure rates, both significantly better than those for generic PDF files.

PDF/X has a number of advantages over TIFF/IT-P1, such as:

- Better compression, including ZIP and JPEG for CTs, leading to much smaller files.

- Mechanisms for marking trim and bleed areas allowing automatic placement when compositing or imposing pages (at least in theory).

- Support for spot colors.

- A free and widely used file viewer.

- A mechanism for identifying the printing condition that the file was prepared for (e.g. SWOP or ISO coated).

- A flag to state whether the file has been trapped already.

- The opportunity to make small last minute corrections when absolutely necessary (without it being so easy to make changes that they can be made accidentally).

- Generally cheaper tool sets with wider availability.

A new revision of TIFF/IT was published in 2004, introducing a new conformance level – TIFF/IT-P2. While this addresses several of the issues above, adopting it will require upgrades or replacement of existing TIFF/IT-P1 tools. If you're going to switch format for that, why not go the whole way and switch to PDF/X?

Unfortunately, encoding CT/LW data into a PDF or PDF/X file is likely to produce a file that RIPs and traps extremely slowly, and can show unwanted imaging artifacts if output at the wrong resolution. That makes it hard to convert files from TIFF/IT to PDF/X. Such files are sometimes referred to as "raster/raster" files, as opposed to the "raster/vector" files created by other workflows. The most recent position papers from the

DDAP therefore recommend that ads created in tools that create a CT/LW format be transmitted as TIFF/IT-P1 rather than converted to PDF/X if possible. The same advice is probably appropriate for non-advertising workflows too. Where a job does not start off as CT/LW, PDF/X is recommended instead.

8. Is PDF/X better than electronic delivery software?

Several vendors have brought out software that can create PDF files and transmit them to a print service provider in one step, with all creation parameters under the control of the file recipient.

In many ways such products are an attempt to address the same issues that PDF/X does, and in many ways they are just as successful in doing so. The main difference is that electronic delivery software requires the file submitter to obtain specific software matching that used by the recipient (often achieved by the print service provider supplying the appropriate software to the print buyer). Where the required client software is expensive that's likely to occur only where there's an expectation of a long-term relationship between the two parties, while PDF/X is designed to be applicable even in one-off exchanges.

Where such software scores over PDF/X, however, is that at least some such products require even less investment of money, and education by the file creator than a PDF/X workflow would. PDF/X is designed to be easy and cheap to create, but most products creating it still require the user to set several configuration items, often on several different screens. When the client software is inexpensive and a print service provider's customer base is unsophisticated, electronic delivery software may be a better choice.

Remember, however, that PDF/X and electronic delivery software are not necessarily mutually exclusive; the print service provider configuring the client software to supply to his customers may well choose to build his settings on PDF/X rather than to develop his own from scratch.

9. Is there just one PDF/X?

The PDF/X standards are designed to be very broadly applicable across as many sectors and geographical areas of the print industry as possible. They therefore form a very strong foundation for the development of specifications tailored more exactly for a particular sector (see "What's PDF/X Plus?" below).

Even so, in the development of the standard it was found that there were two issues that divided requirements so deeply that a single PDF/X standard could not address the needs.

CMYK vs. device independent

In some print sectors it is expected that the supplier of digital content files to a publisher or print service provider will retain absolute control over the final appearance of the piece on the printed sheet; the printer will simply follow instructions. Over the years this expectation has led to the exchange of data in CMYK (and/or spot color data).

In other print sectors responsibility for the printed piece looking right is taken by the print service provider. Many working in these sectors are creating files in device independent color spaces (usually CIELab or RGB tagged with an ICC (International Color Consortium) profile). Several advantages accrue from this approach, including reduced file size and more flexibility for re-purposing of jobs. These advantages, especially the ease of cross publication of jobs between multiple print formats (newsprint, magazine, commercial print and digital print) and also to the web, are encouraging a number of people who currently transfer files entirely in CMYK to investigate the use of device independent data as well.

Those who work in the CMYK world felt that they required an absolute assurance that they would not be accidentally provided with device independent color data. It was therefore decided to produce PDF/X standards for both use cases.

Throughout this document the phrase "CMYK-only" is intended to exclude data in RGB, Lab, ICC-based and "calibrated" color spaces. It does not exclude spot colors, either singly, or in combination (in, for example, a duotone).

Blind vs. open exchange

Some print jobs are ideally submitted to a print service provider with little or no technical discussion – all negotiations being restricted to business matters. In the PDF/X standards this is referred to as "blind exchange". It's an important model when a single print buyer is sending work to many service providers, and where a single service provider is accepting files from very large numbers of buyers. The archetypal example is

the transmission of publication ads, where the same ad may be placed in many magazines, and every magazine obviously includes ads from many sources. A need for detailed, individual discussions around every placement would be a significant barrier to increasing efficiency on both sides of the submission.

There are, however, situations where it's necessary for the sender and receiver of a file (or file set) to have more discussion about how data should be prepared and exchanged, and in many of these cases there can be a requirement that the content of a single job is contained within multiple content files, possibly residing at different sites.

The combination of these two divisions led to a decision to create several PDF/X standards:

- PDF/X-1a for CMYK-only blind exchange.

- PDF/X-3 for color-managed blind exchange

- PDF/X-2 for open exchange

Each of these is a superset of the preceding one, removing restrictions in a staged manner.

No standard for CMYK-only open exchange was needed because the two parties are in technical discussion anyway, and may therefore add their own further restrictions as to the construction of the files.

Note that this section is a summary of the rational behind the split into three standards. Unfortunately the groups involved were not in a position to set out that rationale in advance of PDF/X standards development work, and achieving worldwide consensus was not, initially, an easy task. This is also one reason why the numerical sequence of the standards does not appear to be as logical as it might be.

10. PDF/X-1a

The PDF/X-1a standard addresses blind exchanges where all files should be delivered in CMYK (and/or spot colors), with no RGB or device independent (color-managed) data.

This is a common requirement in many areas around the world and in many print sectors. It's often tied to an environment where the file supplier wants to retain maximum control of the print job; it's very hard to transmit data as RGB or Lab and still to include your own trap definitions, for instance.

Alternatively, it's requested by many print service providers and publishers who have had bad experiences with color managed data in the past, leading to inconsistent and unacceptable print quality. With the tools in current widespread use it tends to be easier to produce consistently reasonable color reproduction when files are supplied in CMYK.

Pre-conversion to CMYK works best where there is a clearly defined CMYK color space to convert into. Remember that a set of CMYK values do not specify a particular color until you also define what device it's being printed on; the same CMYK values printed on gravure, flexo, or offset litho presses, or on a laser or ink jet printer are likely to look quite different. For an excellent discussion of this see http://na.i1color.com/html/toast.htm.

In the US publication market most printers are attempting to standardize on the SWOP specifications, and much of the European newsprint market is converging on IFRA26. Thus an ad prepared for SWOP or IFRA26 is likely to produce the expected colors in most magazines or newspapers in those areas. Specifications like SWOP or IFRA26 are described as "characterized printing conditions".

Other sectors of the print market are more difficult to characterize; many commercial printers, for instance, claim to squeeze a larger gamut or better print contrast out of their presses than their local competitors. A wide range of paper stocks, in different colors, textures and coatings, obviously adds to the kind of color variation you'd see from the same CMYK values.

Several groups such as GRACoL, CGATS SC3, FOGRA, ECI and Printing Across Borders are working on characterizations and associated ICC profiles for commercial print but these are not yet in universal use, especially outside of continental Europe. In the meantime it's a little difficult to provide a file in CMYK to many commercial printers and have your proof exactly match the final printed piece off their press without significant discussion or on-press adjustments. In the absence of such discussion it's becoming commonplace for designers to separate to a form of "generic CMYK", often either SWOP or the default settings in Adobe PhotoShop. They must then simply hope that it will fall near enough to the press behavior to be acceptable, or that the print service provider will supply them with a proof that will match the press (see "Which characterized printing condition should I label files as using?").

The rise of non-impact digital presses, based on either ink jet or laser technology, also makes it difficult to send CMYK data without knowing exactly what press it will be run on, because presses from the different manufacturers may print the same CMYK values as very different colors. CGATS is investigating the possibility of standardized characterizations in this area too (CGATS SC6 TF2). Attacking the same problem from the other end, many digital press front ends can color manage incoming CMYK data, producing output that is a reasonable emulation of a SWOP press, for instance.

The first PDF/X-1a standard, better referred to as PDF/X-1a:2001 was published as ISO standard 15930-1:2001. See below for details of how to obtain a copy ("Where can I get more information?"), and for new revisions ("2003 revisions" and "Should I start using the 2003 revisions?").

11. PDF/X-3

While some market sectors require exchanges with all color data already converted to CMYK, others are better served by transferring data in other spaces, such as CIELab or RGB with a profile attached.

The PDF/X-3 standard is a superset of PDF/X-1a; a PDF/X-1a file meets all of the technical requirements of PDF/X-3 except for the label that actually says "I'm a PDF/X-3 file". The primary difference between the two is that a PDF/X-3 file can also contain color managed data.

The same PDF/X-3 file may contain data in color-managed color spaces (such as Lab, CalRGB or using an embedded ICC profile), and other data in grayscale, CMYK and spot colors. The combination means that images can be included in a defined RGB space (for instance), while solid black text can be guaranteed to print in solid black without unexpected color fringing caused by color management spreading the black data to all the process separations.

Different prepress software may handle embedded ICC color profiles, etc, in color-managed jobs, which means that some care must be taken to ensure that a proof of device independent colors will accurately predict the final presswork. This is not to say that consistent color cannot be achieved in non-CMYK workflows, only that you must invest more effort to learn the behavior and capabilities of all equipment involved in your workflow.

Both of the PDF/X-3 and PDF/X-2 standards are clear as to how a compliant proofing or plate-setter device should act on the colors in a file. In many situations, however, a print service provider may need to use a mixture of PDF/X-compliant and non-compliant tools. This gets more complicated when a customer expects a print company to match their proof; the print company needs to be aware that the customer's proofing device may not be PDF/X-compliant. They also need to watch that other steps in their workflow, such as stand-alone imposition or OPI tools, don't lose the PDF/X data or construct inconsistent files.

ISO has recommended that all tools designed to read PDF/X-3 should also be able to read PDF/X-1a files. Indeed, in the 2003 revision of PDF/X-3 (see "2003 revisions"), a compliant PDF/X-3 reader *must* be able to read PDF/X-1a files as well. A PDF/X-3 file may also be made explicitly for monochrome and RGB characterized print conditions, although RGB is likely to be very rare in practice. A PDF/X-1a file may only be made for CMYK characterizations.

The first PDF/X-3 standard, better referred to as PDF/X-3:2002 was published as ISO standard 15930-3:2002. See below for details of how to obtain a copy ("Where can I get more information?"), and for new revisions ("2003 revisions" and "Should I start using the 2003 revisions?").

12. PDF/X-2

Both PDF/X-1a and PDF/X-3 define file formats for blind exchange. In some workflows that's not required, or a single file per job is not appropriate, but some additional restrictions on file formatting rather than just saying "PDF" would be desirable to increase reliability.

PDF/X-2 is designed to address exchanges where there is more discussion between the supplier and receiver of the file. It enables an "OPI-like" workflow. The OPI specification is not actually used, instead the "reference XObject" mechanism defined in PDF version 1.4 has been extended slightly to provide greater confidence that the correct subsidiary files have been located. One of the consequences of this is that all of the external files must also be in PDF/X.

There are a number of situations where it is envisaged that PDF/X-2 may prove useful. The only common theme between these is the use of a single 'master' file referring to others that will be rendered in the final output – the business reasons that provide the value in that separation vary from case to case. Maybe the

receiver already holds high resolution images to replace proxy images (low resolution previews) in the supplied file.

There are many occasions where an "OPI-like" workflow can provide value (e.g. to increase the response speed of design workstations), but which do not automatically lead to a requirement for PDF/X-2. If an OPI workflow is resolved entirely within a single company (or a division within a larger company) then PDF/X-2 is not necessary.

PDF/X-2 adds value where a set of several files should be exchanged between companies or divisions. It can also add value where the company running a purely internal OPI workflow has little control over the names of files used in that workflow, and where the ability to resolve conclusively between files from different sources but with the same name can help to avoid the use of the wrong image.

It is a superset of PDF/X-3, and will therefore allow device independent color spaces, like Lab and those base on ICC profiles, to be used, just like PDF/X-3. The rather confusing hierarchy running from PDF/X-1a through PDF/X-3 to PDF/X-2 is a historical accident caused by the development process in CGATS and ISO.

The first PDF/X-2 standard, better referred to as PDF/X-2:2003 was published as ISO standard 15930-2:2003. See below for details of how to obtain a copy ("Where can I get more information?").

13. Who's accepting PDF/X-1a files?

The first known complete test-run of a PDF/X-1a ad was in early August 2001, and by the end of August an ad delivered as PDF/X-1a had been printed in a national American magazine (both handled by LTC/Vertis). In September 2001 the SWOP calibration test kit was issued in PDF/X-1a. In December 2001 the first known case of PDF/X-1a being used for the whole of a magazine transmission from publisher to printer was recorded (Wizards of the Coast – Dragon issue 292). The latest SWOP version recommends that all digital ads are supplied in either TIFF/IT-P1 or PDF/X-1a.

PDF/X-1a is now a very common approach to solving problems of production file reliability and customer education.

Amongst the foremost PDF/X-1a evangelists are Time, Inc, who provide a comprehensive guide to creation of good files at direct2.time.com.

Many of the member organizations of the Ghent PDF Working Group (see "What's PDF/X Plus?") also indirectly recommend that jobs be submitted as PDF/X, because the 2004 and earlier Ghent specifications are all based on PDF/X-1a.

Many PDF/X-1a compliant tools are now available – mainly initially addressed at converting PDF files into PDF/X, and in pre-flighting such files. The DDAP constructed a list of available PDF/X applications at www.pdf-x.com, although applications are now so common that it is no longer being maintained.

14. Who's taking PDF/X-3?

There is a general, but very slow, move towards accepting device-independent color data in files for print. To date this is most advanced in northern Europe, although many large magazine publishers across North America are actively investigating how to move in that direction for submitted advertising. Work intended for output on digital presses can also benefit from the color-managed workflows implied by submission of device-independent color. Obviously PDF/X-3 is the PDF/X standard of choice for all of these cases.

There is, however, an unfortunate tendency for some companies to require that jobs be submitted as PDF/X-3, while simultaneously demanding that all data in them be supplied in CMYK. This approach is driven by politics rather than by technical issues. In terms of the standards, very nearly the only reason that a PDF/X-1a file is not PDF/X-3 compliant is that it is labeled as PDF/X-1a rather than as PDF/X-3. The PDF/X-3:2003 standard makes that very clear, and requires that a PDF/X-3-compliant application that reads files *must* also be able to read and process PDF/X-1a files. It is to be hoped that CMYK-only PDF/X-3 file requirements will be dropped in the future, and that the companies involved will accept PDF/X-1a as well, or instead.

A free PDF/X-3 verifier is available from www.pdfx.info.

Several tools for creation and verification of PDF/X-3 files are also available – see the list at the same web site.

15. And who's taking PDF/X-2?

At the time of writing there are no known products that can construct or validate files against the PDF/X-2 standard. Some products will act on reference XObjects in PDF files, and can therefore consume PDF/X-2 file sets, but the additional robustness that the standard was written to enable will not be achieved using these tools.

16. What's PDF/X Plus?

The PDF/X standards are each designed to be applicable to broad ranges of the print industry world wide, across many geographical regions, print technologies and sectors. That means it's not possible for them to define all the appropriate limitations for any particular usage of PDF, such as minimum image resolution, minimum type size, bleeds, etc. The values appropriate for high quality magazine production would be completely wrong for newsprint, for instance.

It's therefore entirely appropriate that additional specifications be built by industry associations on top of the PDF/X standards, each constructed for a particular niche. Because these specifications use PDF/X as a foundation they are often called "PDF/X Plus".

One interesting observation made after the PDF/X standards were published was that the issues left to be addressed in PDF/X Plus specifications are the kind of things that people working in the graphic arts are already familiar with: image resolution, type size, bleed size and selection of a print characterization (usually guided by tone value increase (dot gain)). The standards themselves cover all the "propeller head" technical issues that deal more with the details of the PDF file format, and that most professionals in print could not be expected to know in great detail.
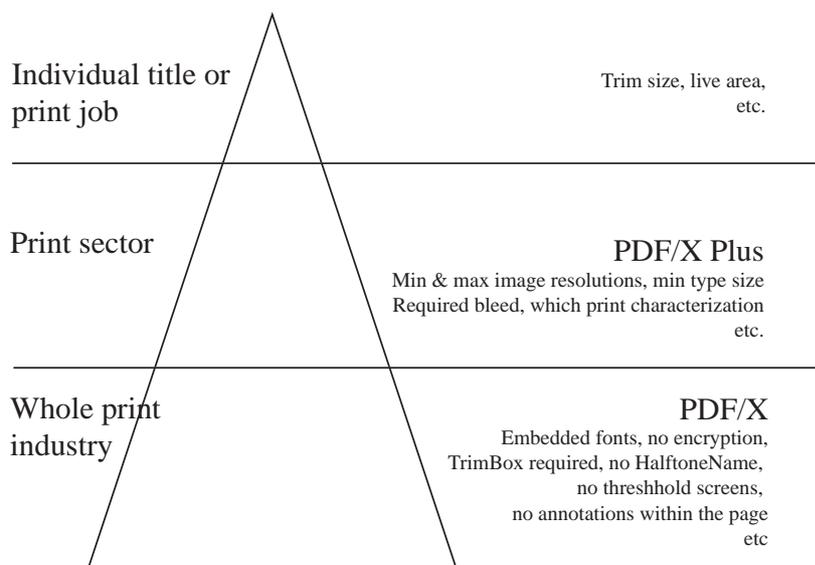
At the time of writing much of the development of PDF/X Plus specifications appears to be converging on the Ghent PDF Work Group (GWG, www.gwg.org). This association now comprises many industry associations from across northern Europe, plus others from North America, including the IPA and FTA. In addition, a number of vendors provide support and assistance. They have published several specifications intended for use in advertising delivery to magazines and newspapers and for commercial print.

In the UK the Periodical Publishers Association (PPA, www.ppa.co.uk) have also published the Pass4Press and Proof4Press specifications, which address some of the same issues as the GWG specifications, but with more concentration on the behavior of prepress equipment. This work is converging with the GWG (PPA is a GWG member).

17. Which PDF/X should I use?

That's obviously quite a few different PDF/X standards, but it's expected that any particular market will settle on one, or two at the most, of these.

If you're a print buyer or advertiser, or anyone else who is generating files to send to a print service provider, ask your service providers what they can work with reliably. If they don't suggest PDF/X but you think it would be advantageous to both of you then raise the idea. There's no point in supplying files that you know

your business partners can't work with, though. The only possible exception to that rule is if they just say that they accept "PDF" – PDF/X files are perfectly compatible with the PDF specification, so if they take PDF they should also take PDF/X. Creating PDF/X files can be a useful self-discipline on the creation side in helping you construct workflows with appropriate pre-transmission validation steps.

If you're a receiver of files then you should be listening to your customers, but ultimately it's your choice what you accept. You need to be confident that you can handle any new file format correctly before adding it to your list of acceptable inputs.

On both sides, your local industry associations may have published recommendations, some of which may incorporate PDF/X Plus specifications (see "What's PDF/X Plus?"). Each such specification will probably include clear guidance as to which of the PDF/X standards is likely to be best, and your association may also be able to provide assistance with implementation, or at least a forum to discuss issues that arise.

In the absence of this kind of advice, you should send a PDF/X-1a file if you specifically wish to send a file that contains only CMYK and/or spot color data (but see "Who's taking PDF/X-3?"). Examples where that would be necessary include a requirement to trap all data before submission, or a perceived need for a specific black generation in all images in a job.

Otherwise:

- For ad delivery and catalog work in North America PDF/X-1a:2001 is the obvious choice.

- The same ads or catalog entries in Europe might be sent as either PDF/X-1a:2001 or PDF/X-3:2002 – check with your publisher. Unless a publisher specifically requests PDF/X-3 it's probably safer to supply PDF/X-1a.

- Commercial print jobs intended for offset lithography, especially for quick print, will use the same selections as ad delivery – PDF/X-1a:2001 in North America, and either PDF/X-1a:2001 or PDF/X-3:2002 in Europe.

- Commercial print jobs intended for digital print tend to benefit more from submission as PDF/X-3 than those for offset presses. This is partly because of the lack of widely accepted print characterizations designed specifically for digital presses. More importantly digital press front ends very commonly include relatively sophisticated color management capabilities when compared with plate-setter RIPs for conventional print work.

Other print technologies and industry sectors are less clear-cut at this time. A number of groups around packaging etc are developing their requirements and solutions, such as the packaging committee in the Ghent PDF Work Group.

The preceding recommendations do not include comments for areas outside of Western Europe and North America because I don't have the data necessary to make such recommendations. Input for other areas would be welcome.

If you already have a workflow that's working reliably and efficiently then there is probably no immediately compelling reason to switch to using PDF/X. You may find, however, that it is easier to standardize on an appropriate conformance level of PDF/X as new versions of your tool set are released, and especially when you find yourself needing to work with and educate new partners: clients or service providers.

18. 2003 revisions

New versions of PDF/X-1a and PDF/X-3, based on PDF 1.4 were published as ISO standards in 2003. At this point it should become clear why I've been recommending that the existing PDF/X standards be referred to as "PDF/X-1a:2001" and "PDF/X-3:2002" instead of just "PDF/X-1a" and "PDF/X-3". It gives a clear way to differentiate between those versions and the new ones, which are "PDF/X-1a:2003" and "PDF/X-3:2003" (published as ISO 15930-4:2003 and 15930-6:2003 respectively).

After much debate the decision was taken to prohibit the use of one of the most obvious new features in PDF 1.4, PDF transparency, in the 2003 revisions of PDF/X. That was mainly because of very significant differences between the results from different transparency flattening engines in different products. You can flatten a file in different design programs and RIPs and get very different results; all of them apparently correct according to the PDF specification. In that situation, how on earth can you expect a proof that the creator of a PDF/X file makes before transmitting it to be a reasonable prediction of the final printed piece?

This doesn't stop designers using the transparency functions in their design applications – it just means that the transparency must be flattened before making the PDF/X file for transmission. That also means the flattening must be done before making the final pre-transmission proof, because that should always be printed from the PDF/X file you're about to send.

The PDF/X task forces have no intention that the prohibition of live transparency in PDF/X will continue forever; see "Future plans" for more on this.

The other big issue in PDF 1.4 was JBIG2 compression, which can be quite effective for copydot scans. JBIG2 is also prohibited in PDF/X – not for philosophical reasons, but because of ongoing difficulties with access to intellectual property.

PDF 1.4 also added some new security options, but the PDF/X standards all prohibit encryption, so those new security options are also prohibited.

For historical reasons there's a PDF/X-1:2001 (without an 'a') conformance level as well as PDF/X-1a:2001 in the existing standards. In the 2003 revision that conformance level has been removed. It is strongly recommended that PDF/X-1:2001 should *not* be used (see "Obsolete PDF/X standards").

19. Should I start using the 2003 revisions?

It was extremely useful for the standards community to develop the 2003 versions of the PDF/X-1a and PDF/X-3 standards. In many ways the new versions are improvements over their predecessors as they encapsulate a lot of clarifications in response to developer and user queries. On the other hand, widespread use of the 2003 versions complicates the marketplace at a time when many users are still learning their way through constructing PDF/X workflows.

The 2003 versions of the standards require a conforming reader to read all files that comply with either the 2003 or the previous version. Thus a PDF/X-1a:2003 reader must be able to read both PDF/X-1a:2003 and PDF/X-1a:2001 files. On the creation side it's unlikely that you'll see any tools that only make 2003 files and not the 2001/2002 ones for some time to come.

If you're receiving files:

- Clarify your guidelines that describe what files you accept to state exactly which revisions of PDF/X you mean. If all you say is that you take "PDF/X-1a" don't be too surprised if some enterprising person sends you a PDF/X-1a:2003 file before you're ready for it. Make sure your sales people know this information too.

- It's safe for you to upgrade your tools as new versions become available to support the 2003 revisions, because they'll still be able to read the older files. You'll then be able to handle whatever your clients send to you. You can start planning those upgrades as soon as suitable and trusted products are shipping.

- Don't forget to review your whole workflow before you say you accept 2003 files. Remember, you're opening the door to PDF 1.4 files (although most PDF/X files will continue to be PDF 1.3 compatible because of the prohibition of transparency and JBIG2 compression).

If you're sending the files:

- Don't start sending 2003 files until the printers and publishers that you work with explicitly say they can accept them. Do not assume that "PDF/X-1a" implies both the 2001 and 2003 versions, for instance.

- Keep an eye on new versions of the tools you use to create PDF/X files, and consider upgrading when you're happy with them. You don't need to rush into upgrading, though. Your printer or publisher will also be able to read the older files too, even after they've started to accept 2003 files.

As a general rule, the benefits to a user of creating or receiving files using the 2003 standards are outweighed by the disadvantage of the extra confusion that supporting them may cause. For both senders and receivers of files the default selection should therefore be PDF/X-1a:2001 or PDF/X-3:2002, rather than the 2003 variants. This matches the decision made by the Ghent PDF Work Group for their 2005 specifications.

20. Future plans

Developing and maintaining standards like PDF/X is always a bit of a balancing act. If the standard is based on too old a version of the PDF specification there will be complaints from users at the creation end of a PDF/X exchange that they can't include use the wonderful new features of the latest tools.

On the other hand, if it's kept right up with the leading edge of new PDF versions there will quite rightly be complaints from prepress companies at the receiving end of a PDF/X exchange that they can't handle the files without constantly upgrading to the most recent versions of their tools … or even that the tools they need are simply not available.

Most vendors will support PDF/X in products that also support 'baseline' PDF. If the standard is based on too old a version of PDF it becomes hard for those vendors to maintain a code base that can simultaneously support the most recent versions of PDF and the one required for PDF/X.

If it isn't reasonably easy for vendors to support the standard there won't be any tools available. If the standard falls into the kind of pitfalls described above for people creating and receiving files then it wouldn't get used anyway, especially as the details of the file format you're working with tend to affect the whole of your prepress workflow.

The PDF/X task forces have consistently worked on the premise that the standards should be placed ahead of the "comfort zone" but within the capabilities of the average prepress shop, in order to help the industry to move forward. On the other hand, they must be behind the cutting edge of technology, so that they can actually be implemented in practical workflows. Over time both the comfort zone and the cutting edge move forward; what was viewed as difficult or impossible a few years ago is commonplace today. Something that seems too complex today is likely to become relatively easy by the end of this decade.
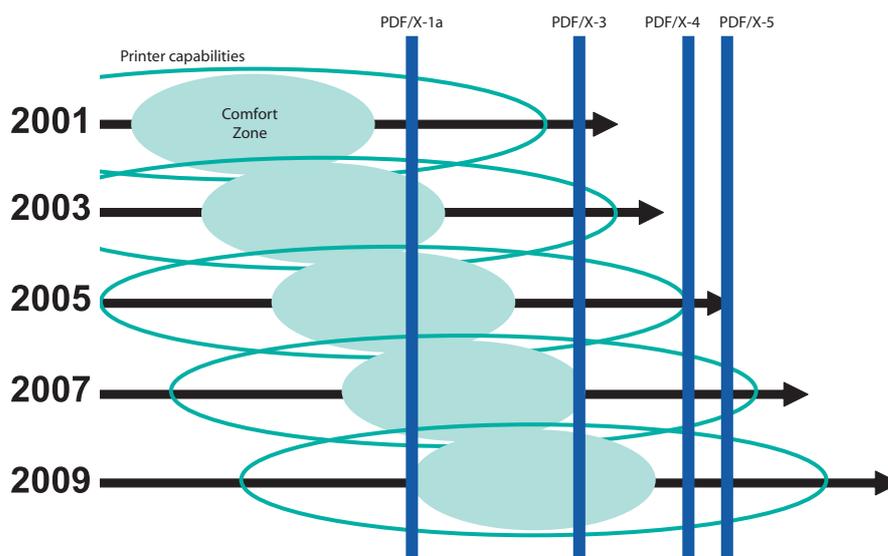
A second difficult question is how often the standard should be revised. If that's too often, so that the standards become moving targets, it really doesn't help anyone. On the other hand, standards that fall behind common usage have also failed.

PDF itself doesn't stand still; the full specification for version 1.6 has been released, but the PDF/X-1a:2001 and PDF/X-3:2002 standards in widespread use are based on PDF 1.3, published way back in 1999. If the industry can survive the PDF specification being updated roughly every two years, then the interval between revisions of PDF/X should not be too long.

At the moment, the most pressing piece of new functionality that is not supported in PDF/X is live transparency. It's slowly becoming common for designers and print buyers to complain that they "can't use PDF/X" because they need to use transparency. While it is possible to use PDF/X after flattening transparency, that raises the possibility of unwanted artifacts and color conversions. On the other hand, it's also common for printers and publishers to demand that transparency be kept out of PDF/X because they can't print it reliably.

Those points of view obviously reflect the current state of the industry. The rather slow speed of development of ISO standards, plus the time required to bring out applications supporting the standard once it has been finished, means that the standards committees need to be looking several years into the future. Prepress

equipment has developed significantly since the decision was taken to prohibit the use of live transparency in the 2003 PDF/X standards. Amongst other things, RIPs capable of processing PDF files containing transparency on-the-fly are now much more widespread in the market. That trend is expected to continue over the next year or so. In addition, the transparency rendering engines in modern RIPs from different vendors (and the flattening engines in design tools) are now producing output that is much more similar to each other than was the case a few years ago.

The decision has therefore been taken to develop a new PDF/X standard that allows live transparency, with appropriate restrictions to minimize variation between different rendering engines. It will be based on PDF 1.6.

At the same time, the committees have recognized that the existing PDF/X-1a and PDF/X-3 standards have significant value which will not decrease for a considerable time. In order to avoid confusion, therefore, the new PDF/X standard will not be a revision of PDF/X-1a and/or PDF/X-3, but will be known as PDF/X-4. It will be a superset of PDF/X-3, in that it will allow the same kinds of usage of device independent color spaces.

There will also be a new PDF/X standard based on the idea of OPI-like workflows, in a similar way to PDF/X-2. It's likely that this standard will go further than PDF/X-2 in that it will also allow the metadata describing the characterized printing condition for which the job was created to reference an ICC color profile that is not embedded in the PDF/X file. This standard will be known as PDF/X-5.

Both PDF/X-4 and PDF/X-5 are likely to be published in 2007.

21. Obsolete PDF/X standards

The first PDF/X standard published was PDF/X-1:1999, approved by ANSI as an American National standard in October 1999 (ANSI/CGATS.12). It was intended for blind exchange and, like PDF/X-1a, PDF/X-1:1999 was restricted to CMYK and spot color data.

The developers of the PDF/X-1 (without an 'a') standard were persuaded at the time that there was a need to provide a mechanism to integrate 'legacy' file formats such as DCS and TIFF/IT into a PDF/X workflow. The standard therefore provides a kind of "internal OPI" mechanism, by which such files could be embedded within the body of the PDF file.

Very few implementations of PDF/X-1:1999 were ever released by vendors, the only known complete reading application being the Harlequin RIP. This standard should now be regarded as obsolete and is not recommended for use in any production workflows; even current versions of the Harlequin RIP do not support it.

PDF/X-1:1999 was based on PDF version 1.2. When the PDF/X work transitioned from the American national standards bodies to the International Standards Organization (ISO) a new version, based on PDF 1.3, was developed. This was published as PDF/X-1:2001 in April 2001 in 2001 (ISO 15930-1:2001). As you can see, PDF/X-1 followed the same path as TIFF/IT which was released first as an American standard and then further developed and released as an international one.

ISO 15930-1:2001 defines two specifications, or conformance levels, PDF/X-1:2001 and PDF/X-1a:2001. PDF/X-1:2001 (without an 'a') retained the "internal OPI" mechanism first defined in PDF/X-1:1999. PDF/X-1a:2001 differs in being based purely on PDF objects, and does not allow the use of embedded DCS, TIFF/IT files, etc.

While PDF/X-1a:2001 has been widely adopted, there are no known implementations of PDF/X-1:2001. Vendors are strongly recommended *not* to implement this conformance level.

22. Which characterized printing condition should I label files as using?

A PDF/X file is always labeled with the name of the characterized printing condition that was assumed when the file was created. It's intended to provide early warning for the print service provider if a customer sends a file that is not suitable for his presses. It also ensures that the supplier and the receiver can set up their proofing environments in a compatible way so that they see the same results.

While the label is just a flag that describes how the file has been created, you must be careful to ensure that the label you apply matches how the file was made. If it includes CMYK images separated from RGB or Lab, the label in the resulting PDF/X file must match the profile that you used to do the separation. It would be extremely difficult for preflight software to validate your selection of a label after the event (most don't even try) so you must use care in assigning the correct value.

The best choice of PDF/X-1a vs PDF/X-3 is made as a result of discussions with the print service provider or publisher that you plan to send the job to, and exactly the same is true of selecting a characterized print condition. Unfortunately, it's rather common to find that printers and publishers are not (yet?) in a position to supply the appropriate data. In these cases, you could do worse than to select an entry from the following table, based on the geographical location of the printer, the print technology and the paper that will be used:

	Europe	North America
Magazine ads	FOGRA28	CGATS TR 001 (SWOP)
Newsprint ads	IFRA26	IFRA30
Sheet-fed offset	Dependent on paper stock: Types 1 & 2 (coated): FOGRA27 Type 3 (LWC): FOGRA28 Type 4 (uncoated): FOGRA29	Dependent on paper stock: Grades 1 and 2 (premium coated): FOGRA27 Grade 5: CGATS TR 001 (SWOP) Uncoated: FOGRA29
Web-fed offset	Dependent on paper stock: Type 1 & 2 (coated): FOGRA28 Type 4 (uncoated, white): FOGRA29 Type 5 (uncoated, yellowish): FOGRA30	Dependent on paper stock: Grade 5: CGATS TR 001 (SWOP) Uncoated (white): FOGRA29 Uncoated (yellowish): FOGRA30

The designations in this table ("FOGRA27", "IFRA30", "CGATS TR 001" etc) are all taken from the registry of characterized printing conditions maintained by the ICC at www.color.org/drsection1.html. The descriptions available at that web site provide more detail on the conditions under which the characterization data was measured, and the standards and printing conditions that it is intended to represent. That registry is subject to change as improved characterization measurements are made, the recommendations above are based on the characterizations registered at the time of writing.

All of the FOGRA characterizations are based on the ISO 12647 standards. The full text of those standards is available from the same sources as the ISO standards for PDF/X (see "Where can I get more information?").

There are efforts currently underway to generate characterizations for printing to GRACoL recommendations. Once that work is published the new characterizations should probably become the recommended selection for sheet-fed work to be printed in North America. They are expected to become available as "CGATS TR 004".

This section does not include comments for areas outside of Western Europe and North America because I don't have the data necessary to make such recommendations. Input for other areas would be welcome.

Once you've selected the characterization for which you will prepare a file, you may also be asked to fill in a couple of fields in the PDF/X file itself. Some creation applications, such as Adobe Acrobat 7 and Jaws PDF Creator, handle this semi-automatically for you; you select a characterization, or a profile based on that characterization, and the tool will fill in the fields for you.

Other applications, such as Adobe Acrobat 6, require that you manually enter the data yourself. In order to enable automated pre-flight checking at the publisher or print service provider the "OutputConditionIdentifier" field *must* be filled in exactly correctly:

- If you're following the recommendations in the table above enter the designations used in the table above (note that SWOP should be entered as "CGATS TR 001").

- If you're using another characterization from the ICC registry, enter the "Reference name" from the registry.

- If you're using a non-standard characterization, enter the name supplied by your print service provider (if there is one). If not, use a very short description of the characterization.

- Some software will default to using "Custom" for this field. Some print service providers and publishers now treat any file set to "Custom" as suspect; it means that the file creator didn't really know how they should create the file, and that the CMYK data may need adjustment. If that's truly what you mean, then

by all means leave it as "Custom"; if you don't want your data re-separated you would do better to change the value to something more meaningful.

The second field that you may be asked to fill in will normally be referred to either as "OutputCondition" or "Info". The value you use here should be a more complete description of the print condition, if you feel that the recipient of the file will benefit from the additional information. It may be useful to include anything special about the embedded profile (if there is one), such as the maximum total ink coverage, or the fact that it's intended especially for high- or low-key images. If there's nothing specific that you want to convey, you don't need to fill in this field at all. Note that the prepress workflow used by the recipient of the file may not display this data to the operator, so if it's vital that they know the information you should also include it as a comment on your order.

23. How do I get an ICC profile for use with PDF/X?

In order to use the characterizations recommended above, you'll have to obtain an ICC color profile. In some cases that must be embedded within the PDF/X file itself, but even when that's not necessary you'll probably need a suitable profile for separation to CMYK, or for hard- or soft-proofing. (See "What do the PDF/X standards restrict?" for notes on when the profile must be embedded).

The registry at color.org includes measurement data for print characterizations (or a description of how the measurement data may be obtained). It does *not* currently include any downloadable ICC profiles for use in setting up proofing devices, or for embedding within PDF/X files. At the time of writing there is no centralized repository for ICC profiles, although discussions are under way to try to pull that together.

In the mean-time, profiles are available from the following locations:

FOGRA up to 37:	www.eci.org
FOGRA 33-38	www.fogra.de
IFRA characterizations:	www.ifra.com
CGATS TR 001 (SWOP)	Neither CGATS nor SWOP have made an official ICC profile for this characterization. A number of applications come bundled with a suitable profile, usually labeled as "SWOP" or something along the lines of "US web-printing". The quality of these profiles varies somewhat, but almost all are good enough at least for less demanding work. Be careful to read the license agreement for these profiles before using them with applications other than the ones with which they were supplied.

Wherever you obtain a profile from, you should make your own evaluation of the results it provides with your own equipment before using it in production. Profiles from ECI, FOGRA and IFRA are generally regarded as being of high quality.

24. Isn't PDF/X raster only? It's just a wrapper for TIFF/IT isn't it?

It was possible to use PDF/X-1 (without an 'a', see "Obsolete PDF/X standards") as a wrapper for TIFF/IT files, although that was not the intent of the design. PDF/X-1a and PDF/X-3 cannot be used in that way, and it is strongly recommended that you do not use PDF/X-1 (without an 'a') any more.

25. Can PDF/X do duotones?

The original ANSI PDF/X-1:1999 standard (see "Obsolete PDF/X standards") could not comfortably encode duotones in a way that would display correctly in the Acrobat Reader, or proof properly on a CMYK printer because it was based on a very old PDF version (1.2).

All of the PDF/X-1a, PDF/X-3 and PDF/X-2 standards are based on PDF 1.3 and later, which includes support for the DeviceN color space. Thus duotones and other multi-tones and bump plates can now be encoded, viewed and proofed reliably.

26. Constructing pre-press workflows with PDF/X

As mentioned before, PDF/X is an application standard as well as a file format – it defines the correct behavior for applications that read and write the files as well as specifying how the files themselves must be constructed.

In simplistic terms a creation tool is compliant if the files it makes match the specification, but testing the compliance of a receiving workflow is somewhat more complex.

If you're a publisher, printer or pre-press department and considering accepting PDF/X files, you must ensure that your whole workflow (including trapping, compositing partial-page submissions, imposition and RIPing) is PDF/X compliant, for both proofing and final output. That doesn't necessarily mean that every tool you use must be explicitly PDF/X compatible, although, if they are, it can obviously simplify matters.

That makes it sound rather difficult to set up to receive PDF/X files, but there are only a few key issues that you need to keep close tabs on. The purpose of all of these is to ensure that PDF/X files process reliably and predictably, and that the final printed piece can match the proof generated by the customer before submission. You would therefore need to examine your workflow in a very similar way in order to handle baseline PDF files. The major difference between PDF and PDF/X in this respect is that some of the most difficult PDF issues to resolve in a prepress workflow are circumvented by the restrictions of the PDF/X standards.

In other words, it looks like hard work to set up a prepress workflow to handle PDF/X files properly, but that's only because it's very rare to see all of these steps set out fully for PDF files in general.

When files are initially delivered you should pre-flight them to ensure:

• they are compliant with the appropriate version of PDF/X;

• they were created for the correct characterized printing condition, or one that you are comfortable transforming into your printing condition (if you asked for SWOP files because you're printing magazines in the US then you don't want files created for newsprint, for instance);

• the trim and bleed are appropriate for the job. Unfortunately this is one area where it is very easy for files to be badly constructed. The PDF/X standards require that all files have the trim box marked in the file, but it's virtually impossible for an automated pre-flight tool to verify that the trim box is marked in the right position relative to the graphical elements that should appear on the printed piece. Manual/visual inspection is therefore advised. Some products can mark the position of the PDF TrimBox on hard- or soft-copy proofs, allowing relatively rapid assessments to be made;

• the resolution of images is appropriate.

You may want to apply your own extra tests as well, or to use a PDF/X Plus specification designed for the purpose.

For the rest of the workflow:

• If the file is noted as already being trapped you should not re-trap it. If it's marked as requiring trapping you should apply whatever traps are necessary, or contact the sender if you're not set up to perform trapping.

• When rendering the file, the fonts embedded within the file must be used rather than any that happen to be installed in your RIP, on your print server, etc.

• When rendering the file overprinting should be applied as defined in the PDF specification. Note that many RIPs have switches that allow you to adjust overprinting behavior and the default settings may not produce the required output.

• When you proof files you should do so using a proofing system set up to match the characterized printing condition for which the file was created. In many cases that could be a standard configuration on your site, because all jobs are printed to the same condition. If you're proofing PDF/X-3 files, however, it is advisable to use the ICC profile embedded within the supplied file as an emulation profile in order to ensure that the gamut and tone-scale compression, and black generation, match what was intended by the designer.

• When creating plates from individual PDF/X-3 files that contain device independent color data, the ICC profile embedded within the file should be used, again to ensure that the output matches the designer's intent.

• In many cases, it will not be the PDF/X file as supplied by the buyer that is submitted to the proofing or plate-setter RIP; it will have been re-constructed as it passes through stand-alone trapping or imposition tools, or aggregated with other files in an advertising or catalog workflow. When processing PDF/X-3 files, these steps must be able to maintain the information about the intended printing condition and any embedded ICC profiles so that the data is acted on appropriately. It may be necessary to apply the

embedded color management to individual files, effectively converting them all to CMYK, early in your workflow.

There may be application data sheets available for the components of your prepress workflow, which can make configuration for reliable PDF/X handling much simpler (see "What tools should I use for creating and processing PDF/X?").

A number of free tools are available to assist in evaluation and tuning of your workflow:

• The Altona suite for PDF/X-3 workflows is available from www.eci.org (note that this suite goes beyond testing PDF/X-3 compliance).

• The Global Graphics PDF/X overprint test strip is available from www.globalgraphics.com.

The first of these is a fairly complete physical for your implementation and may take some time and expertise to evaluate completely. The second is a simple patch intended for inclusion on all jobs to allow the overprinting applied on proofs and prepress work to be easily evaluated.

In addition, a suite is being developed by the Ghent PDF Work Group under the code name "Kensington Suite". This is designed specifically for testing complete workflows, rather than RIPs, which are targeted by Altona. This suite was originally started by an ad-hoc group associated with CGATS SC6, but has now been formally transferred to the Ghent PDF Work Group. Beta patches developed for the suite have already been used in an IPA workflow shootout in 2005, and the whole suite should become available at www.gwg.org at some stage.

27. What tools should I use for creating and processing PDF/X?

This FAQ does not include lists of commercial software for creating and processing PDF/X files. There are two reasons for that:

• It's not updated continually, and would therefore always be incomplete and out of date

• It's written by somebody working for a software vendor, who might therefore be open to accusations of bias in selection of products to include

Lists of appropriate software are maintained on web sites such as www.pdf-x.com and www.pdfx.info.

It is hoped that application vendors will develop and publish application data sheets (ADSs) describing how their products can be configured to be PDF/X-compliant. As an example, the ADS for the Harlequin RIP is available at www.globalgraphics.com.

28. Compatibility between validation tools

When a number of parties agree to exchange files in any particular format it's obviously important that each file can be independently validated as conforming to that format.

Over the last few years a large number of validation and preflight tools have become available from several vendors. Many of those vendors have worked hard to ensure not only that their products correctly validate conformance with the PDF/X standards, but also that they show the same kind of error messages when files are not valid, and similar warnings for additional checks. Software being software, however, it's inevitable that some of these products will very occasionally deliver incorrect results – either accepting a file as correct when it's not, or reporting a file as invalid when it's OK. It's important to use a variety of such tools if any disputes arise over the validity of an individual file.

Perhaps the most likely area to trigger such reports is over the use of standardized print characterizations in the "Output Intent" structures in the file. Without diving into too much technical detail, the standards allow a file that contains only CMYK and spot color data, and which is intended for output matching a print characterization recorded in the registry on the ICC web site, to be created without an ICC profile in the output intent. Many validation tools therefore include an explicit check against a list of characterizations from that registry and will mark a file as non-compliant if no profile is included and if the characterization identifier in the file doesn't match a name in their list.

The ICC registry is not static, however; new characterizations are added from time to time. In addition, it has recently been re-structured to make it much clearer which name should be used in PDF/X files for each

characterization. If a validation tool is shipped with a single list of characterizations it may report files using the new characterization names as invalid, even though they are not.

If you're creating or receiving PDF/X files you'll know what characterization you should be using, so when a validation tool fails a file purely on the characterization name, and you know that the value in the file is right, you should accept the file anyway.

Note also that many PDF/X validation tools can test for additional issues that are not set out in the PDF/X standards. These checks are obviously very useful at times, but should be disabled if all you care about is whether a file complies with the standard.

29. How and when should I proof my files?

As a submitter

If you're creating files for submission as PDF/X, you probably output several proofs for various purposes as the job is designed and prepared. Once you have the job ready to go, and you've converted to PDF/X you should always proof that PDF/X file, rather than relying on proofs output direct from your design application. That means that any unexpected alterations that occur during the conversion to PDF/X will show up in the proof. It doesn't matter if the final proof is on hard copy or a soft-proof on a monitor, as long as it meets your internal requirements.

If your PDF/X file contains an embedded ICC color profile, you should proof using that profile as the emulation target. If it does not, then proof using a suitable non-embedded profile for the intended print characterization as the emulation target. If you proof without an emulation target you will not be able to make any valid assessment of the quality of the color data in the file.

If your job includes any spot colors it's usually worth proofing color breaks (separations) at this stage as well, to ensure that spot areas have not be converted to CMYK. This isn't specific to PDF/X, of course; it's just good practice for any file format.

As a receiver

Print service providers and publishers follow a variety of policies for proofing files received from customers. Some proof all files received, and retain those as file copies in case of a later dispute. This can be particularly useful if it is tied into a preflight process in such a way that the preflight report can be filed with the proof. On the other hand, producing hard-copy of all customer-supplied files can be too expensive or too slow for some receivers.

Whether a job is proofed on receipt, or only in retrospect in the event of a customer complaint, there are two ways in which the proof can be performed. Both can be useful in different ways:

A. If the PDF/X file contains an embedded ICC color profile, a proof may be generated using that profile as the emulation target. This should give you a representation of what the customer produced in any proof that they created immediately before sending the job to you.

    First compare that with any hard-copy proof sent by the customer, any significant differences will show that at least one of the two proofing systems is not correctly configured; you'd then have to determine whether it's the customer's or yours that's wrong.

    Next compare the appearance of any device-independent color data on this proof with what appeared on your press. If that does not match, but the appearance of page elements in CMYK does match, then it's probable that your prepress workflow did not honor the embedded profile within the PDF/X file.

B. Create a proof using your usual profile for the print characterization that your press is running to as the emulation target, ignoring any embedded profile within the PDF/X file.

    The color of any CMYK data in the file should match what appeared on your press; if it does not, then either your press is not running to the characterization intended, or your proofing system is not configured correctly. Don't worry about page elements defined in device-independent color spaces here, they should be checked on proof A, above.

30. How can I persuade my customers to send me PDF/X files?

At first glance it may appear that all the benefits of PDF/X accrue to the publisher or print service provider, while all of the work and expense involved in preparing them falls on the designer or print buyer. This leads to some receivers finding it difficult to persuade their customers to make the effort to create PDF/X.

This is not, of course, the whole story. As a general rule, regardless of whether you submit PDF/X or not, the old adage that an ounce of prevention is worth a pound of cure applies; a little time double-checking a job immediately before transmission can save many panicked phone calls and considerable expense.

It's not uncommon to find people who prepare all of their PDF files that will be submitted for print as PDF/X, even when the print service provider or publisher does not require that (and even occasionally when the recipient explicitly says that they "can only accept PDF and not PDF/X"). The reason behind this is that creation as PDF/X is an easy way to enforce the self-discipline required to ensure that your jobs are sent as high-quality, print-ready files, at least in those areas that are covered by the standards. The mind-set that validates and proofs a job before transmission is also likely to pick up other quality issues, such as low-resolution images.

On the receiver's side, if PDF/X fulfils its promise, then having clients who submit jobs as PDF/X should reduce your customer education, prepress and CSR (customer service representative) costs. You might want to consider sharing some of that saving with them to encourage such submissions. It's common at the moment for print companies to swallow the costs for correcting bad files from customers for fear of losing sales to competitors. For that reason it's unlikely that you'll want to add a penalty fee for non-PDF/X files. On the other hand, if your regular pricing review happens to lead to higher prices than before for non-PDF/X files but slightly lower for good PDF/X …

There will probably always be customers that you won't trust to create print-ready files and you know you'll have to do a lot of corrective work on them before printing, so much that you can do it more easily if the files are supplied as native application files. In these cases the best approach is not to push for PDF/X. You can continue as you are and just ensure that your pricing structure allows you to continue to make a profit, or you could investigate supplying those clients with improved submission tools (see "Is PDF/X better than electronic delivery software?").

In any event, as you work with customers transitioning from submission of application documents to sending PDF/X, it's worthwhile to have them send both formats in parallel for a few jobs. That will give you immediate access to a known fall-back position in case anything goes wrong.

31. I'm an application developer – what should I develop for?

If you're developing tools for page design, pre-flight, file conversion or pre-press you should take the time to investigate PDF/X fully. Depending on your target market sector you should seriously consider developing support for PDF/X-1a:2001 or PDF/X-3:2002.

If you're already supporting one or more of those, keep an eye on market acceptance of the new revisions – PDF/X-1a:2003 and PDF/X-3:2003 (see "2003 revisions"). If you're starting from scratch you might consider adding both the current and the new revisions together. Given the level of market penetration and understanding of the PDF/X standards as a whole it would be unwise to develop only for the new revisions at this time.

On the other hand, if you're developing for PDF/X-1a:2001 or PDF/X-3:2002, you may find it useful to read the 2003 version as well. Several important clarifications are included in the later releases that could help you in development of products for the earlier standards.

Developing to PDF/X-1:1999 or PDF/X-1:2001 (without an "a") is extremely unlikely to be useful (see "Obsolete PDF/X standards").

Please also consider developing an application data sheet for your products, showing how they can be configured to process PDF/X files correctly (see "What tools should I use for creating and processing PDF/X?"). Writing this kind of document in parallel with product definition can also be useful in helping to identify any oversights or awkward user interfaces at an early stage of development.

One important aspect of the user interface for PDF/X creation tools is that it should be enable the operator to enter accurate details about the print characterization for which the file was prepared as easily as possible; see "Which characterized printing condition should I label files as using?" for more detail.

Developers should also read the PDF/X application notes available at www.npes.org (see "Where can I get more information?").

32. Who's developing these standards?

With apologies for the alphabet soup - the PDF/X standards are being worked on by a number of organizations:

PDF/X-1a and PDF/X-2 were initially developed by Subcommittee 6, Task Force 1 of the Committee for Graphic Arts Technical Standards (CGATS SC6 TF1) at the request of the DDAP Association (Digital Distribution of Advertising for Publications) and NAA (Newspaper Association of America). CGATS is accredited by ANSI (the American National Standards Institute) to generate national standards for the graphic arts in the USA.

The initial development of PDF/X-3 was driven largely by the Swiss and German representatives to Technical Committee 130 of the International Standards Organization (ISO TC130), with additional funding from BvDM (the German printers' association), UGRA/EMPA (the Swiss standards and research institute) and IFRA (the international newspaper organization), and with active support from the ECI (European Color Initiative) and FOGRA (the German printing research institute).

At the international level PDF/X work is done by the ISO TC130 Working Group 2, Task Force 2 (ISO TC130/WG2/TF2). Technical development of all PDF/X standards is now shared between CGATS SC6 TF1 and ISO/TC130/WG2/TF1, with the ISO task force as the senior partner.

NPES The Association for Suppliers of Printing, Publishing and Converting Technologies provides secretariat services to CGATS and administrative and technical support services to ISO TC130/WG2. Without their assistance and support it's unlikely that these standards could ever be completed.

33. Why don't these standards come out faster?

The latest version of PDF available is 1.6 (Acrobat 7), and both PDF/X-1a:2001 and PDF/X-3:2002 are based on PDF 1.3 (Acrobat 4). Even the 'new' revisions published in 2003 are only based on PDF 1.4. Why the mismatch?

Two important issues that come into play here are results of the fact that CGATS and ISO are open consensus organizations - i.e. they operate by allowing everyone with expertise in the relevant area to make contributions.

One consequence of that is that they cannot work under a non-disclosure agreement from a third party, so it's not possible to see, for instance, the specification for a new version of PDF before it's officially published by Adobe. Thus the work to determine which pieces of functionality offered by a new version should be supported cannot start until the PDF specification is made public.

A second consideration is that it's very difficult to determine the real-world implications of a new version of PDF on professional print production without real experience. It took some significant time, for instance, to evaluate the impact of PDF transparency in PDF 1.4 on processes such as trapping or color management for proofing, and to understand the effects of different implementations of rendering workflows for those objects.

The third is that both ISO and CGATS have very formal balloting processes to ensure that all interested parties are given the chance to express opinions. From submission of a new revision of PDF/X for the final voting process to publication usually takes of the order of twelve months.

Finally, and most importantly, it's inappropriate to require all users to keep on the cutting edge of technology for all stages in their workflows in order to accept a standardized file format. It usually takes some time after the release of a new version of PDF to generate the tool sets that can handle them, often even longer before those tool sets become stable enough to rely on in a production environment, and longer still before it's reasonable to assume that they are in common use in prepress and print service providers.

The standards groups involved are still attempting to determine what the most appropriate release cycle for PDF/X updates should be. (See also "Future plans").

34. How can I get involved?

Both the CGATS and the ISO PDF/X task forces welcome representatives from interested parties such as vendors, user organizations and users themselves. They both cover market segments from ad agencies through

pre-press and repro companies as far as printing companies. If you think you can help to build better standards please contact NPES or me (standards@npes.org, martin.bailey@globalgraphics.com).

More informal discussions aimed at PDF/X development take place on an email listserve. Anyone can join this group by filling in the form at groups.yahoo.com/group/pdfx_revision.

35. Where can I get more information?

Published and final draft (DIS & FDIS) ISO standards may be purchased directly from ISO or from national standards bodies around the world (NPES in the USA – www.npes.org, BSI in the UK, DIN in Germany, etc).

More information on …	is available at …
PDF/X-1a	www.pdf-x.com, www.ipa.org and www.ddap.org.
PDF/X-3	www.eci.org, www.pdfx3.org and www.pdfx.info.
Future PDF/X developments	groups.yahoo.com/group/pdfx_revision.
Ghent PDF Work Group	www.gwg.org
Printing across borders	www.printingacrossborders.org
ICC color profiles & printing characterizations	www.color.org
ISO, including purchasing standards	www.iso.org
CGATS, including SC6/TF1	www.npes.org/standards/cgats.html

CGATS SC6/TF1 has also created application notes covering some issues which were not appropriate for inclusion within the standards themselves, but which are designed to assist developers and systems integrators. These are available from www.npes.org/standards/workroom.html. Note that this document is revised periodically to keep abreast of new revisions of the standard or simply to convey additional information as it is discovered to be important to the target audience. Copies of several supporting documents required for developers to implement PDF/X in their products may be downloaded from the CGATS pages on the NPES web site.

36. What are PDF/A, PDF/E and PDF/UA?

The PDF/X standards were developed as a focused subset of PDF for the graphic arts industry, but PDF is flexible and powerful enough to provide great value in other markets too. An initiative started by AIIM International (the Association for Information and Image Management, International) and NPES in the USA, was moved into ISO (under TC171/SC2) and has developed a format called PDF/A which is an equivalent subset for long-term archival of documentation. It's likely to also become a format of choice for internal use in enterprise, legal and government document exchange. At the time of writing, the standard is approved and publication is expected very soon. It will be published as ISO 19005-1:2005.

Slightly after work on PDF/A started, two more initiatives were formed, also under the auspices of AIIM. One aims to develop a PDF subset format for the exchange of engineering documents to be called PDF/E. This has now also moved to TC171/SC2 in ISO. The other is developing a standard for the creation of PDF files accessible by physically impaired users, especially by the blind and partially sighted, to be called PDF/UA (universal access).

More information on all three programs is available from www.aiim.org.

37. What do the PDF/X standards restrict?

This section provides a very brief overview of the main points of the PDF/X-1a:2001 and PDF/X-3:2002 standards. The 2003 versions differ slightly in some respects, but those are nothing like as commonly used, so I've not included the full details here.

This information is intended to give a feel for the requirements of the standards, but is definitely not complete enough to implement a product that creates or verifies PDF/X, or a PDF/X-compliant reader. Anyone intending to produce a PDF/X-compliant product really needs to buy the full standards.

Technical terminology used in this section is taken from the PDF 1.3 and PDF 1.4 reference manuals.

PDF version

Both these standards are based on PDF 1.3, although the version number in the header and in the catalog should not be used to determine the conformance of a file to that version of the PDF reference.

A PDF/X-compliant rendering of the file must follow all the requirements and stipulations of the PDF reference.

Fonts

All fonts used in the file must be embedded in the file, including their associated widths and encoding data. Only fonts that may legally be embedded should be used.

All font formats supported in PDF 1.3 may be used, including TrueType, multiple master and CID fonts (OpenType may not be used, that's not supported before PDF 1.6).

Color

All data in the file must be prepared for a single characterized printing condition. For a PDF/X-1a file, that printing condition must be defined in CMYK; for PDF/X-3 it may be gray, RGB or CMYK, although the vast majority of PDF/X-3 files are created for CMYK conditions.

The printing condition is identified using an output intent, much as described in the PDF 1.4 reference manual. The output intent must contain an embedded ICC profile if the characterized printing condition is not in the registry of CMYK characterizations on the ICC web site, or (in the case of PDF/X-3) if any device independent color data is used in the file.

In a PDF/X-1a file all color data must be defined in DeviceGray, DeviceCMYK, Separation or DeviceN color spaces, or in Indexed or Pattern color spaces based on one of those.

In a PDF/X-3 file any of the PDF 1.3 color spaces may be used, but with restrictions that ensure that all colors are defined colorimetrically.

Pre-separated files, where each PDF 'page' represents a single separation of a final page, are prohibited.

Encryption

PDF/X files may not be encrypted, which means that they may not have either a user or an owner password.

File references

In PDF/X-1a file references are allowed, but cannot be accessed through OPI or reference XObjects. In PDF/X-3 (and in PDF/X-1a:2003) file references are prohibited completely.

Metadata

The files must be marked as PDF/X using extra keys in the Info dictionary: GTS_PDFXVersion in the case of PDF/X-3:2002 and both GTS_PDFXVersion and GTS_PDFXConformance in the case of PDF/X-1a.

The files must include creation and modification dates, a title, and a file ID in the Info dictionary. It is recommended that they also contain the creator and producer fields. Use with PDF/X-2 introduces requirements for more metadata, this time in XMP.

Page boxes

Each page must include one (but not both) of ArtBox and TrimBox. It's recommended that BleedBox should also be included if the job is intended to bleed off the page.

PostScript

Embedded PostScript is prohibited, both as a PS XObject and using the PS operator in a contents stream.

Alternate images

The default image for print must be the same as the default image used for display.

Graphics state

PDF/X files may not set halftone phase, and may not use threshold screens. A PDF/X-compliant reader is free to ignore all halftone information within the file.

Transfer functions are prohibited within the graphics state, and are allowed in halftones only to the extent that they are required by the PDF reference.

Annotations and interactive features

Annotations are allowed, but all except TrapNet annotations must lie entirely outside the ArtBox/TrimBox/BleedBox of the page. This includes the Widget annotations used to represent AcroForms.

A PDF/X-compliant reader is not required to print any annotations other than TrapNets, even if their Print flags are set.

Actions and JavaScript are prohibited.

Compression

Any or all of JPEG, Flate, RunLength, and CCITT fax compression are allowed. LZW, JPEG2k, JBIG2 are all prohibited, the last two because they were added to the PDF specification after PDF 1.3.

Trapping

The trapping requirements of the file must be recorded using the Trapped key in the Info dictionary. A value of False means that the file has not been trapped (trapping is required); True means that the file has been adequately trapped (trapping is not required); the value Unknown is not allowed.

Files marked as having been trapped should not be re-trapped

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