

Perspective About Current Roadblocks to Implementation of ICC Workflow

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What is an “ICC Workflow”?

- **There is no workflow specification.**
- **Most color workflows are hybrid workflows.**
 - Why aren't they completely ICC?
- **Who uses only ICC profiles, in their workflow, from capture, display to print?**
 - A small percentage of professionals in print/prepress and photography.



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The ICC doesn't publish prescribed workflow, nor is there proscribed workflow. So that's not helpful in determining what an ICC workflow is, or is not.

Most workflows use proprietary color matching technologies at image capture time, use ICC based workflow for display and editing such as in Lightroom, Photoshop, InDesign, Aperture, and other applications, and then use proprietary color matching at print time for local printers.

Video seems to be a mess when it comes to color management with or without the ICC's involvement so I'm going to keep quiet about video.

Workflow stages and ICC usage

- **Capture stage**
 - Most captures are JPEG, color management is proprietary
 - Most professionals use DNG Profiles, not proprietary but not ICC.
 - The rest use ICC input class profiles.
- **Display**
 - Entirely ICC.
 - And entirely too complicated, apparently, because there are so many malformed ones in the wild.
- **Output (Proofing & Printing)**
 - Mixed, but most of it's proprietary.
 - Desktop printers all default to proprietary options.
 - ICC contained to output via files, works well.
 - ICC & printing on Mac OS is a disaster, however.



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Most captures on the planet are now JPEG and the color management is entirely proprietary. Why? Probably the lack of transparency to protect IP, but the ICC profile format isn't exactly transparent, but it is much less capable than what proprietary algorithms are doing with cameras today.

Most professionals are using dual illuminant DNG profiles and an CAT algorithm that interpolates between those two illuminants. Cannot be done with ICC? Well at least it's not being done. 50+ profiles for a single camera in a list of camera profiles is daunting and very cluttered. One profile and a slider? Elegant in comparison? Can we do better? Probably but the innovation isn't occurring in the ICC realm where we've had a scanner class profile and no camera class profile. I know I'm not the only one who has asked for a camera class profile to deal with limitations in the scanner class profile, but it's probably too late, the DNG profile is where it's at. To the degree that X-Rite's latest software for camera profiling builds DNG profiles but not ICC profiles. And it works better than any of the camera profiling stuff they've made has ever worked.

There's effectively no proprietary color management at the display workflow stage. All systems produce ICC display class profiles, even those that have very proprietary means of calibrating the display. However, it baffles me how many display profiles have problems of one sort or another. Why are we asking developers to constantly re-invent the wheel by inserting something other than raw measurement data into their display profiles? When working with Mozilla on Firefox color management, huge problems with Dell, LG, Phillips, Samsung, but mostly Dell and LG, with sabateur class display profiles. Why aren't we expecting CMMs to do Bradford or some other CAT of choice rather than it being baked into the display profile? I don't get any of the interoperability arguments here at all.

For prepress and printing to printing presses, it is primarily ICC because that market depends mostly on Photoshop to make conversions from RGB to CMYK. For everyone else, including proofing systems, it's mostly proprietary. And for desktop printing, by default it's entirely proprietary. ColorSync and ICM are not used by default at all on their respective platforms. In fact it is like pulling teeth to get them to use anything other than the default proprietary path. When applications do all of the color management internally and export a file such as TIFF, JPEG or PDF, things work out well.

ICC based printing

Who is the ICC relevant to?

- **The proprietary workflows have and continue to reject ICC (profiles and/or implied workflow).**
- **Hybrid workflows find value in some aspects of ICC workflow, and not others.**
 - Maybe implies room for improvement.
 - Maybe implies merely an incompatibility of interests.
- **Professionals**



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The ICC originated in a world trying to make itself relevant for all user types. In my opinion, this has clearly not turned out to be the case. There is no use case for ICC workflows, in practice, for business graphics, for example. The vast majority of photographers use proprietary capture and printing capabilities because it's easy, in many cases works better than ICC+OS+application monolithic workflows, and in many cases has fewer pain points such as bugs. Most photographers want to print pretty pictures.

Most proofing solutions are proprietary, but these companies are also media companies so they use the proprietary aspects of their proofing products to get their customers to use their media. So again, this is not what the ICC is about. The companies who don't push their own media, all support ICC profiles and all are suffering to some degree because of ancient software that hasn't been updated in years.

As I see it, there is one customer type that uses ICC fairly religiously from beginning to end and that's a small number of professional photographers, and prepress and printing. The ICC workflow is exactly what they want, but even they are feeling pain with existing ICC workflows today to the point of extreme frustration, expense, and even starting to dismember parts of their ICC workflow.

Quick overview of workflow types

- **In order of usage/volume:**
 - Proprietary color management still rules the day. This is the default for capture, and the default for printing on the two main platforms.
 - ICC based and proprietary, hybrid workflow, with the OS using ICC to normalize to some space, and then hands off to proprietary color management for printing.
 - ICC based and proprietary, hybrid workflow, with ICC based occurring exclusively at the application level.
 - ICC based exclusively, at the application level.
 - ICC based, exclusively, at the OS level (ICM and ColorSync).



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So the most common use case is proprietary color management, not ICC based. In other words, ICC workflows have not actually penetrated to the wider market. It does not cater to it at all, for various reasons mostly that there's simply an incompatibility in what ICC offers and what most users want which is pretty pictures, and everything completely automated with as little interaction as possible.

The next most common is really only on Mac OS where applications and users are forced into using color management, without an easy way to opt out. So this workflow is common because it's forced upon us, and generally is OK because it normalizes color to something like Generic RGB or presently sRGB, and then depends on proprietary color management in the print driver to produce the end product. That's the default scenario.

Next is application color management, with proprietary proofing or proprietary printing.

Next is the full ICC workflow from beginning to end, which is at the application only level.

Dead last is when ICM and ColorSync are used. It's practically unheard of. I've never seen it work correctly on Mac OS. And I don't know why Windows users would be compelled to use it, because most of them overwhelmingly want pretty pictures too, not accurate pictures.

Pro user's problems

- **These are the users that use the entire workflow, as it presently exists.**
- **Existing tools are old, falling apart**
- **Some old tools, will not be replaced.**
 - e.g. profile editing is on life support, with no hope at this point
- **The ICC profile format is incompatible with making any meaningful use of its optional metadata tags.**
- **Actual lighting conditions routinely do not correlate to 500lux and D50, and the ICC profile format is presently ill equipped to help, let alone ICC workflows.**
- **Bugs with ICC v4 profiles.**



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A small to moderate segment of professional users are the ones who use the entire ICC based workflow, such as it exists today. The professionals use ICC because it's what we have, and does what we want, although with increasing amounts of pain points. And the ICC needs to be aware that these are the people that it needs to keep happy because the other users ultimately don't matter unless the ICC undergoes a massive re-invention. And seeing as it can't keep the users it's got happy, I don't see how it makes sense to re-invent and go after a whole new user base.

The existing professional tools are very long in the tooth. Most of them are not being replaced because of conglomeration or developers who have abandoned the market.

While users tend to infrequently interact with ICC profiles, occasionally they need to add or change all of these metadata tags that the format supports, or search or sort based on them. And now, apparently, no profile editing from the one company that made profile editing software means we can't do very basic and routine edits such as paper white point adjustments or tweaking curves. This is really a major net loss in the functionality of the ICC profile format to lose such tools. But we've been losing tools and developers and we are now at an all time low when it comes to ICC profile and workflow innovation that users need and actually depend on.

I do not use or recommend v4 profiles in most instances because now I've just found too many bugs. We've had a couple of years of difficulty with Mozilla supporting v4 profiles. We've had problems with Lightroom. And universally with RGB and CMYK profiles for photographers and proofing, I have higher delta E's with Monaco and ProfileMaker profiles

Depending on context, and who you ask, these problems are very concerning, but not major problems. However they are the 2nd most commonly mentioned problem areas I come across.

The most common roadblock to implementing working ICC workflows?

Apple's Mac OS X

- **Presently, no reliable way to make a custom profile on Mac OS X**
 - No intuitive or obvious mechanism to print profile targets.
 - Only non-obvious, and heretical.
- **For the past 6+ years, an intermittent ability to print reliably using any ICC profile (manufacturer supplied, or custom).**
 - Color management for professionals on Mac OS X is somewhere between a mild inconsistent nuisance, to an unmitigated disaster.
- **Constant blame game.**
 - Epson, Apple, Adobe constantly blame each other, and have invariably done so publicly.

I do not think it is possible to have a diplomatic conversation about the complete mess that is printing with custom ICC profiles on Mac OS X. It's really exceptionally appalling.

This is a problem that predates CUPS, so it is not a problem with Apple's integration of CUPS. This is an ideological problem whereby Apple demands no simple off switch for ColorSync. They require a convoluted and undocumented means of null transform as the only way to tell ColorSync to piss off.

Apple's color management ideology

- **Untagged color is evil, and must be disallowed.**
 - Requires profile targets to be tagged, improperly, as Generic RGB, sRGB, Adobe RGB, or some bogus printer profile space.
 - Requires actual jobs to be tagged in bogus form, antithetical to working, testing PDF/X-3 workflows.
- **Off switch for color management not to be found.**
 - Requires a convoluted scheme to achieve null transform.
- **It has been proven to be a complete failure.**
 - These problems do not occur at all on Windows.
 - They were warned six years ago.
 - They've heard complaints for those six years by developers and users alike.
 - We continue to get hacks, not enduring solutions.



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A sincere attempt to contain my extreme irritation with Apple's bullshit will be made. But given the facts and reality of what they've done, and how their system DOES NOT achieve its design goals, has cost their professional users thousands of dollars in paper and ink as they iterate trying to figure out how the system actually does work (or not), I'd say it's a complete failure.

So at the very top of the list of actual, literal roadblocks to implementing viable color management workflows, I put Apple at the top of the list. It is so bad, that I and a number of color management consultants now recommend to users that if they need reliable printing to an inkjet printer, that is color accurate, using ICC profiles, they need to use Windows or a 3rd party RIP.

By all means let's blame Apple's three major print driver vendors for not reading nearly non-existent documentation. Especially Seiko Epson who couldn't write decent software if their life depended on it. But then, knowing what the world knows about SEC software engineering, which is not a secret, why would Apple create an overly complicated color management behavior in their printing system in the first place, let alone also inadequately document it. It's almost like printing color accurately is not an Apple priority, at all.

Conclusion

- **What does the ICC want to be when it grows up?**
 - Lack of innovation
 - Dwindling developers and products
 - Lack of focus on their target market
 - What is the target market?
 - Complicated profile format that developers have difficulty producing valid ICC profiles.
 - CMMs can and should do more.
 - Profiles are fragile and should describe device behavior.
 - Opaque profile format for users to add/modify/remove the myriad optional metadata tags the ICC has added recently.
 - Take a cue from the Open ICC and XML
 - ICC v4 bugs and lack of benefit = low adoption rate.



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So the ICC needs to figure out its target market, it clearly isn't everyone who captures, displays and prints things. That idea has been rejected. The ICC is relevant primarily to a small number of professionals and it desperately needs to modernize the file format (more transparent, not so fragile when edited, and either make it easier to edit directly, or get into the software business).

Make it easier for developers to build products

ICC v4 bugs are developer problems, but they are a huge part of why ICC v4 adoption is next to nowhere. At this point, the spec needs to be cleaned up, move to XML or JSON, and change the version number to v5. Or witness the ICC becoming really irrelevant to users and developers.

- **Apple, please fix your OS and stop blaming your developers**