

The Lifecycle of Embedded Image Metadata within Digital Photographs: Challenges and Best Practices. (or The Secret Life of Photo Metadata)

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Abstract

The value of metadata embedded in digital images is recognized by communities at different stages in the lifecycle of an image. Photographers working for news media and publishers embed text information (metadata) into photographs to communicate what is happening in the image and to find those images later. Software developers build applications which expose the metadata in images to assist businesses with image management, search, discovery, and distribution. As more and more images arrive at museums, libraries and other archival institutions in digital form, it may be prudent to reevaluate how digital images and their supporting information are acquired in order to manage the potential glut of new arrivals. This may require, at minimum, exploring the idea of importing metadata that is already embedded when importing digital files into image and database management systems. How this data is extracted and moved into these other systems is important, and should be done in accordance with documented procedures using current industry standards and best practices.

Overview:

For archivists, one of the most heartbreaking jobs has to be dealing with the influx of new material that has been donated to their organization. On one hand this may represent a treasure trove of new material with some real gems for their collection. On the other hand it might take weeks or months of staff work, in order to sift, sort, filter and catalog that material so that others are able to find items of interest.

In the world of paper and analog “stuff,” archivists function as gatekeepers, working through these piles of material, determining what should be added, and organizing it in a way which enhances the collection. Part of this work requires gathering and entering information into long lists of fields creating a record for each object in the database.

This task is much the same whether the archivist is dealing with books, phonographic records, films, photographic prints, negatives or slides. The type of information gathered may vary somewhat depending on the material, but the work of cataloging still requires this same painstaking process. Once this task is completed, however, the information about what is available can be easily shared, and even accessed remotely.

With the emergence of digital photography, things have radically shifted. The most visible change is that we are now creating digital images at an exponential rate when compared to those on film. It is a reasonable assumption that this digital image tsunami is going to hit the archiving community at some point

soon, so having a strategy to deal with this change will be essential. The undercurrent of this tidal wave is the change in how many photographers are now recording information about their images.

In the past, it was simple to record basic information, like captions or “cutlines,” on the back of a photographic print or slide mount. With digital images, there is no “back” and thus no place to store this information. For most professional photographers the best place to store this data is directly inside the image file. However, there are risks to this approach, as what was visible is now out of sight. This is one secret which needs to be revealed, as then images can be safely “tagged” with information as soon as they are created, and this information will remain with them throughout their lifecycle and can be used to manage this same wave of images.

New tools for new times:

Applications such as Adobe Bridge, Adobe Photoshop, Lightroom, Photo Mechanic, Fotoware’s Foto Station, Breeze Browser, Microsoft Expression Media, Extensis Portfolio, and Canto Cumulus are all used to a varying degree by photographers to add descriptive and rights related information directly into their image files.

At this point, there are two widely adopted methods used to embed information into a number of standard digital photographic formats such as JPEG, TIFF, JPEG2000; as well as proprietary formats such as the Adobe Photoshop PSD and PSB formats, and Digital Negatives (DNG). This information is not visible to the viewer of an image unless they open the image with appropriate software, which is why the subtitle of this report is “*The Secret Life of Photo Metadata.*”

The Value of Metadata:

The value of metadata embedded in digital images is recognized by communities at different stages in the lifecycle of an image. Photographers working for news media and publishers embed metadata in photographs to communicate what is happening in the image and to find those images later. Software and web developers build applications which expose the metadata in images to assist businesses with image management, search, discovery, and distribution. At present, museums, libraries and other archival institutions use metadata, but it is typically stored in external databases, using different organizational structures.

Standards such as IPTC, and XMP have been adopted by professional photographers in the editorial and commercial photography sectors for embedding descriptive and rights based information into digital images. These are not necessarily the same

as those schemas used within the cultural heritage sector. At present, most image creators use these standards to annotate and embed this information within the digital image file itself; while most cultural heritage institutions use systems that “point” to the digital object, maintaining the information within a separate database. In order for these institutions to be able to import information from digital image collections they acquire, they either need to embrace the standards and tools used by photographers and their agents, or build options into their current systems that can expose information encoded using these photo metadata standards and transfer that information into their own systems. The various fields in these schemas used by photographers may or may not have semantic similarities to fields within the institutions databases, so the development of crosswalks that map the information between these various schemas is also needed.

Best practices, guidelines, & documentation:

Whether others will be able to leverage embedded metadata in a digital photograph depends on the schema used, and the practices of the creator. Photographers and others involved in the creating images need to follow best practices and add metadata to the image using tools that follow prescribed industry standards. If they do not, then that information may not still exist in the image when it reaches an image user, or archive.

The promotion of best practices is happening in a number of image creation communities. For example, photographer trade associations, such as the Stock Artists Alliance (SAA), American Society of Media Photographers (ASMP), Advertising Photographers of America (APA), Editorial Photographers (EP), National Press Photographers Association (NPPA) and others have worked together to promote the Universal Photographic Digital Imaging Guidelines[1]. Starting in 2005, this coalition has published a series of guideline documents for both photographers and image users that stress specifics regarding image quality and the importance of embedding metadata. The four main principles promoted in the UPDIG quick guide are that:

- Digital images should look the same as they transfer between devices, platforms and vendors.
- Digital images should be prepared in the correct resolution, size and sharpness for the device(s) on which they will be viewed or printed.
- Digital images should have embedded metadata that conform to the IPTC and PLUS standards, making them searchable while providing relevant rights and usage information — including creator's name, contact information and a description of licensed uses.
- Digital images should be protected from accidental erasure or corruption and stored carefully to ensure their availability to future generations.

Standards bodies like the Japan Electronics and Information Technologies Industries Association (JEITA), which governs the Exif Standard; the International Press Telecommunications Council (which governs the IPTC and IPTC Core schemas); and the Picture Licensing Universal System (PLUS) have worked with constituents to revise and expand their standards/schemas and promote their use to others — including the other standards bodies.

As one example, the latest version of the IPTC Core/IPTC Extension schema includes five fields that map to and use the

Dublin Core namespace as well as nine fields that use the PLUS namespace. In addition, the full PLUS schema provides a way to convert most of the rights-based metadata needed to describe a license transaction into machine-readable formats, that can then be automatically processed.

As mentioned above, the UPDIG group recommends the addition of descriptive and rights-based metadata to image files using the IPTC Core and PLUS metadata schemas as a best practice. There is currently one guide written for the general public which describes the use of the various fields within the IPTC Core. It is referred to as the User guide to the “IPTC Core” schema for XMP [2]. This guide covers the semantics of what and how the various fields should be used, in language that is accessible to photographers.

While it is freely available, there are many photographers that are not aware of this guide, and thus not using the fields as they were intended. Prior to the publication of this guide the only documents that explained the IPTC fields were specification documents written for engineers — which few if any photographers took the time to read. Getting photographers and other metadata users to read the user guide is something that needs to be encouraged. Making the information available in more visual forms is something that the Stock Artists Alliance plans as part of the Photo Metadata project website[3].

Working on Metadata behind the scenes:

Commercial alliances, such as the Metadata Working Group [4] include companies in the digital media industry, such as Apple, Adobe, Microsoft, Canon, and Nokia. They have worked together to develop guidelines on how best to coordinate specific field properties that are shared between the Exif, IPTC and XMP metadata containers.

The primary thrust of the Metadata Working group is to reveal issues regarding how metadata is exchanged and preserved as it moves between applications and processes (devices, platforms and services), file formats and metadata standards. Their whitepaper, titled, *Guidelines for Handling Metadata* discusses the use of a small number of current metadata fields which are part of existing standards; and which deal with what they feel are the key questions that most consumers have about images:

- Who is involved with this image (who took it, who owns it, who is in it)?
- What is interesting about this image?
- Where is this image from?
- When was this image created or modified?

Their goal is to provide best practices on how these nine critical data fields (Keywords, Description, Date/Time, Orientation, Rating, Copyright, Creator, Location [created], and Location [shown]), should be synchronized so consumers don't face the kinds of metadata interoperability issues professionals have been dealing with for a number of years.

These issues include things such as how, when and where metadata should be changed in popular consumer still image file formats using existing industry metadata standards. A wide scale adoption of these best practices should solve many current problems that plague the photo community.

While this initial effort targets consumer still-imaging metadata — rather than those of the professional — they have expressed plans to expand their efforts. Josh Weisberg, chairman

and founder of the Metadata Working Group and director of Microsoft's Rich Media Group said that, "We've chosen to address the most common issues photographers face as we feel this will make the biggest impact for the average photographer," noting that "Down the road, we will expand our work to include other metadata issues relevant to photographers."

The preservation community has taken steps to assist in this effort of metadata education as well, evidenced by projects funded through the Library of Congress's digital preservation program. The Stock Artists Alliance, ASMP (via UPDIG), and ArtSTOR organizations are all working now on initiatives to educate their constituents about the importance of metadata. The SAA is launching their Photo Metadata project which will include a ten city tour and a website that will provide photographers with tutorials to help visualize best practices for generating metadata as well as showing how popular professional tools can be used for this purpose.

An Ecosystem of Metadata

The emphasis of each group is different and image creators and image users are constrained by the capabilities of available tools for embedding and updating metadata, as well as extracting information for use by other image and database management systems.

To be effective, the application of metadata to images needs to be a bottom-up initiative — not one solely dictated from the top-down. The person who knows the most about the specifics of a particular digital image is the same person that made it. With that in mind, creators need to be encouraged to add rich descriptive metadata such as those which answer who, what, when, where and why questions regarding the image.

The primary incentive may be so they can protect their intellectual property and register the copyright, but this information will also serve to help them and others find the image later. Once this information becomes a part of the image, it also means that future generations will have a way to know about the particulars of that image as well. If this addition of information is required by clients as a necessary requirement in order to complete the assignment — and be paid — then that may be an additional enticement, but it should not be the only reason.

Preserving & Conserving Embedded Metadata:

While many desktop software applications do a good job of preserving existing metadata, this is not the case with all internet based systems. Information technology staff, service providers and image users need to honor this embedded information and ensure that it is preserved at each step in the imaging chain. It is not difficult to periodically perform tests to verify that computer systems are configured properly to preserve this information; and not inadvertently removing it from the digital files that are being processed.

There are a number of popular internet based photo sharing websites that have not been good stewards when it comes to preserving the metadata of the images members upload. A small number of members have become aware of this issue and have brought it to the attention of these photo sharing site developers, but so far the image processing procedures they use have not changed. This may need to be addressed by a larger constituency

in order to move this issue forward, or hundreds of millions of images will be affected.

In most cases, this removal of embedded metadata is an issue with server-based tools used for resizing or watermarking images, and which have no knowledge of anything that is not pixel based. As a result, any other information within the file — such as color profiles, and descriptive and rights based information — is left behind after the image is uploaded, or resized. Some server based image processing tools may have the option to preserve metadata, but their IT staff made the decision that it is more important for image files to be processed so they download more rapidly, or can be processed more speedily; and tell the software to ignore or remove this information. Last year, Laura Cotterman developed a set of free PHP functions that can be installed by web programmers or IT staff. These will modify server processes so you can resize jpeg images with the open source GD software, and keep the photo metadata intact. You can download these functions from the ImageMetadata website.[5]

When members of the archiving community receive digital images, they should verify if there is embedded information. If it is still intact, they should do whatever is necessary to conserve the original information, even though they may place the image or it's metadata into a larger system. As you can see, the creation and use of metadata needs to be viewed not just as an activity for a particular community, but as an ecosystem to be supported by all communities involved in the image lifecycle.

Outstanding issues:

As you can see, what I have described is a utopian vision, rather than the current environment. At present, there is a bit of a clash between the various communities, which could create a short-circuit at any number of points in the lifecycle of an image.

The various fields in the IPTC and XMP schemas used by photographers may or may not have semantic similarities to fields within the institutions databases. The development of published and accepted crosswalks that map the information between these various schemas could be very useful for all communities.

A Metadata Manifesto:

Though three years have passed since it was first published, the three guiding principles of the Metadata Manifesto [6] still make an excellent case for the widespread adoption of embedded metadata, namely that:

- Metadata is essential to identify and track digital images.
- Ownership metadata must never be removed.
- Metadata must be written in formats that are understood by all.

While it sounds deceptively simple, putting those principles into practice requires the metadata ecosystem described above, in order to be successful.

In order for cultural heritage institutions to be able to import information from digital image collections they acquire, the photographers first had to add embedded metadata. That information must remain with the file during its lifetime, to the point where it comes into the hands of the archivist.

Cultural heritage institutions either need to embrace the standards and tools used by photographers and their agents, or build options into their current systems that can expose information encoded using these photo metadata standards and

transfer that information into their own systems using documented field mappings or metadata crosswalks.

In effect, this would take the ideas put forward by the Metadata Working group and the metadata crosswalks that already exist between Exif, IPTC and XMP, and extend it to reveal the linkages between Dublin Core, PLUS and those metadata schema that are used within the archive and cultural heritage communities. It is also important to note that if the last system in the chain creates new metadata which is based on the content of existing metadata — using Extensible Stylesheet Language Transformations (XSLT) or other automated transformations — then the process of the transformation should be documented; as well as the metadata crosswalks that are being used.

Though the use of well documented schemas and metadata crosswalks, it should be possible to develop a set of best practices for sharable and interoperable metadata that works for all of the communities involved in the imaging chain.

References

- [1] Universal Photographic Digital Imaging Guidelines (<http://www.updig.org/>).
- [2] User guide to the “IPTC Core” schema for XMP, http://www.iptc.org/std/Iptc4xmpCore/1.0/documentation/Iptc4xmpCore_1.0-doc-CpanelsUserGuide_13.pdf (<http://tinyurl.com/qw25p>).
- [3] Photo Metadata Project website (<http://www.photometadata.org/>).
- [4] Metadata Working Group (<http://metadatabworkinggroup.org/>).
- [5] ImageMetadata website (<http://www.imagemetadata.com/>).
- [6] Metadata Manifesto (<http://www.stockartistsalliance.org/metadata-manifesto-1>)

Author Biography

Photographer David Riecks chairs the Stock Artists Alliance Imaging Technology Standards committee and their PhotoMetadata Project (a partnership with the Library of Congress). Riecks' involvement in standards initiatives includes service in the IPTC Photo Metadata working group; and IPTC4XMP working group (including authoring the IPTC Core User's Guide). He also serves as an UPDIG.org board member, Chief Technical Advisor to PLUS (usePLUS.org), and created ControlledVocabulary.com to assist others with keywording and metadata issues.