Digital images for LTO conservation

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Abstract: *Digital photography has a number of advantages over traditional film photography for use in recording large technology. However digital photography is a fast changing world and there are some big pitfalls to avoid. This paper outlines some key points to remember to ensure that your digital photographs remain useful and accessible in the long term future.*

Why Use Digital Photography for Large Technology Objects?

Conservation images of objects are often unique and irreplaceable - the only record of an object in a particular state. Conservation images are used to communicate information about an object through presentations, displays and copies to work from. Conservation images should be kept at least as long as the object is retained in the collection.

Digital photography is taking over from film photography in many areas, including conservation photography. Digital photographs are particularly useful for large technology conservation work, for the following reasons:

- you can see that you have got the shot you want before you move on to more photos or treatments (this is important because large technology items are very difficult to light well and you may find half your shot is in darkness);
- automation can be used to speed up the process of adding metadata to and archiving large numbers of images;
- images are very easily incorporated into presentations, publicity, displays and web pages through electronic publishing, word processing, photo editing and presentation software packages. They can also be easily moved around via email, CDs etc, to facilitate sharing information and requesting advice on problems;
- if you do it right better colour accuracy is achievable than was possible with film.

Downsides of digital images:

- digital images are vulnerable to corruption, and unlike film, once corrupted they can often not be read, even in part.
- digital images (unless you take HUGE files) have a much lower resolution than film images. For example colour film transparencies have a resolution that is equivalent to about 100MB of digital information, whereas large digital files may only contain 10MB of information. If you want to blow an image up for a display or to examine a small area in detail, this is a disadvantage, as the lower resolution will mean blow ups will become grainy and fuzzy.
- digital images need colour and file management. You can’t just put then in a box on the shelf and hope to retrieve them easily in the future.

This paper looks at ways in which you can make the most of digital photography for your large technology work, while avoiding common problems.

Implementing digital photography

Key point: Regard everything in this paper as potentially wrong – by the time you come to set up a system the digital world will have changed again. Use the concepts here as pointers to things you might consider, not as absolute recommendations.

1. It is very important to think through the system you will use before implementation. One of the first things to do is get all the potential users together to discuss what they need. If you don't, additional user needs will gradually emerge after you have done the main scoping, and trying to add these needs into the system will break the bits of the system which already work. The user group needs to discuss the following things:
   - How to "future proof" the system. Work out your likely aims and needs in the future in ways which are not based on current technology and standards. For example, don't ask what resolution you want, but rather whether you will want to access high quality images on screen or print them out (this will guide decisions about whether you buy good monitors or printers) and what physical size you want the viewed image to be - full screen? thumbnail? 10x8 print? exhibition graphic? Do you want to be able to zoom in on details? A list of useful questions is provided in Appendix A.
   - What needs do your users have in common and what needs are different. For example, curators may want a single view of an object for the catalogue, but conservators want all views for a condition record. Curators may want the background "tidy", while conservators prefer the image unaltered. One photography session may be able to do all this (this is called "use neutrality"), but only if you plan for it.
   - What compromises will you make between resolution and cost of storage? As technology improves, so do people's expectations – the high resolution file you take today will be tomorrow's low resolution file.
   - How will you adapt as technology and expectations change, without requiring lots of money and time to redo everything? Changes you may have to cope with in the future might include new data management systems, new printers, demand from the public and the web for online access, etc.
   - How you will manage migration of data when (not if) it becomes necessary? You will have to provide for a lot of preparatory data cleanup, development of protocols for matching the old to the new, and cleanup of things that don't transfer quite right. Try to choose formats that are easy to migrate to new data bases and which can be accessed even if you have lost the original hardware and software on which they ran.
   - Who will manage your system? This will involve doing backups, providing support for users and system, providing virus protection and a firewall, evaluating new hardware and software and devising ways to reconfigure existing systems to do new things.

2. Do a pilot project.

3. Review the results of your pilot project at a scheduled point, involving all your potential users and developers. Base your full implementation of digital photography on this review.

4. Go for it! But review your system and procedures yearly and expect to change both as new technology and opportunities come up.

Storage

Key point: If a film based negative or photo is damaged, you can often still get information out of it. If a digital file is damaged it is a meaningless string of 0s and 1s. ACTIVE storage and management procedures are critical – you cannot just leave a digital file in a box like you can film.

"The preservation of digital images requires active management of the system, environment, risks and all forms of obsolescence" (Frey 2004).

1. Only use CDs, floppies, memory sticks or any other portable storage media for TEMPORARY transport of files. Even the best of these have lives of only a few years. When you retrieve them from your box on the shelf you will be unable to open the files. We come back to that meaningless string of 0s and 1s…

2. Back up, backup, backup, and then migrate information before your system becomes so old it is no longer supported. Devise a backup regime and STICK TO IT. A good basis is daily, weekly and monthly backups, with (if possible) two copies being made of the weekly and monthly and one copy being stored in a different building or suburb. If digital images are backed up, and a current backup kept off site, they are far less vulnerable to site disasters than film based images. Making a digital copy – a backup - is cheap, quick and easy. If you don't do it regularly, we get back to that meaningless string of 0s and 1s…

3. Decide what medium you are going to use for your backups
    - Long term ones need to be magnetic tape, but this still needs to be rotated and old tapes disposed of.
    - Short term ones could be optical discs (eg. CD-Rs, CD-RW and DVD-RW).
    - Whatever you choose, store it in appropriate environment (find this out from manufacturers or literature, a good starting point is National Archives of Australia, 2004 'Archives advice 5 and 6') and remember that magnetic tapes should not be stored near sources of electrical interference, eg power points, cables, electrical equipment or fluorescent lighting.

4. Develop a virus protection strategy and MAINTAIN it. Your strategy will depend on your resources (do you have dedicated IT people to do it for you?) and your activities (do your want your images to be available on the web?). A cheap way of doing this may be to have an "air wall" – house your database on a computer or server which is not connected to the web and use virus protection software to keep your system clean. What happens if you get a sleeper virus which infects your system several months before activating? This is where you need backups from a year or more ago – yes you will lose a lot of work, but you can at least restore everything from before the infection.

5. Use archival file formats.
    - Archived images should be colour managed, but otherwise preferably unaltered. To reduce their vulnerability to corruption and obsolescence they should be stored in a standardised uncompressed, open file format, such as TIFF (see below).

- Any alterations to the original file increase the risk of degrading the information and reducing potential uses for the image (alterations are generally directed at a specific purpose and may make the image unsuitable for other purposes). Alterations to the file (cropping etc) should be done using a copy of the file.
- The JPEG format is lossy – EACH TIME the file is saved it makes the file smaller by cutting out 10-90% of the data in the file (it cuts out details it thinks the human eye will not miss). This produces images which become gradually more pixellated and less able to be blown up to reveal critical conservation details. A lossy file format should therefore not be used as a 'master' or 'archival' format.
- The TIFF format on the other hand is lossless, which means it can be saved repeatedly without loss of information. TIFF files are also 'open' (non proprietary) so they can be read by any image editing application and accessed even if the original soft ware is no longer available. TIFF format is therefore good for archival purposes.

Metadata

Key point: An image cannot be considered high quality unless there is high quality metadata associated with the file (Frey 2004).

To make images accessible you need some way of organising and retrieving the files – you need metadata. Metadata is data about the photograph – both the content of the image and how it was taken. Traditional film slides or photographs generally have their metadata written around the edge of the slide or the back of the photograph; for digital images similar information must be stored digitally. You should decide what metadata you are going to keep and ensure that it is kept consistently (eg always entered, correct spelling etc.). Good metadata should be appropriate to the type of collection, the users of the collection and the intended and likely use of the digital photograph. Metadata could include, but need not be limited to:

- Accession/registration number
- Date photograph was taken
- Photographer/conservator's name or both.
- Phase when the photograph was taken - before, during or after treatment (BT, DT, AT).
- A title for the photograph (eg. inside left wing).
- Caption – what the photograph was taken to illustrate, (eg disassembly process)
- The camera and lighting set up used to take the photograph (some of this metadata will be saved automatically by the camera, such as the camera type, lens type etc).

Using metadata schemes that are similar to those used by other collections, or international standards such as the Dublin Core (Dublin Core Metadata Element Set, 2003) or the AGLS Metadata Element Set (National Archives of Australia 2004), will mean the information is more easily shared between applications and institutions. For instance multi-institutional Web Portals are one way in which records from many different collections are already being combined into a single database for searching.

Colour management

Key point: Traditional film photography with colour bars did not achieve accurate colour control. Digital photography does have the ability to manage colour more accurately - but <u>not</u> by using colour bars!

Colour bars are no use for accurate colour rendition and monitoring. Colour bars are not produced to a standard, cannot be matched from batch to batch and are affected by the colour and angle of light under which they are photographed. In film photography their appearance in the photograph is also affected by the development and printing processes used.

If you want to record and monitor colour really accurately you need to do spot readings with a colourimeter. If however you just want to ensure the green engine in your digital photo stays green instead of becoming a buttercup yellow, you need to do some Colour Management. This ensures that your photo will look correct through different monitors and printers both now and in the future.

To manage colour in digital photographs you need to:

- Take photos under a known light source (eg daylight, camera flash, incandescent lights etc) and record the light source information through software such as Photoshop using a type of metadata known as an ICC profile. The ICC profile is effectively a "colour recipe" that tells calibrated monitors or printers how to display the photograph with the correct colours. Each different light source or mix needs a different ICC profile (a range is available in Photoshop).
- Use cameras, monitors, printers and software that can be calibrated for good colour rendering and that can read the ICC profiles.
- Use the international standard for the best colour rendition for on-screen viewing conditions: ISO 3664:2000 Viewing conditions - Graphic technology and photography.

Colour management **need not be complicated**, there are now companies on the Web that can set up colour management for you remotely.

Conclusion

Digital photography of large technology objects during conservation procedures is quick and easy. However losing your images is also easy (and usually awfully quick…) So if you want the images to be accessible for as long as you keep your object, you need to put in place systems for storing, retrieving and backing them up. These systems don't need to be expensive or hugely complicated - much of the software and advice is open source (ie - it can be downloaded free from the web). They do however need to be thought about carefully before you start and they need regular attention. The world of digital photography is changing every month and your requirements and opportunities will change with it. Be prepared!

References

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Appendix A

Questions to ask all users before implementation of a digital photography system:

- What is your job/role?
- What do you want to do with your photographs?
- How accurate do you want your colour reproduction to be?
- Do you need to manipulate copies of the image (eg crop them, add annotations etc)?
- Do you need the image corrected for public presentation?
- Do you need to meet any external standards (if so, list them)?
- What view(s) of the object do you need?
- Do you need to export the image (list any programs/devices you export to)?
- List any reasons you might need to change or add to the metadata in the future
- List any reasons why you might want to delete the image in the future
- Do you need to keep any features of the original file (eg uncorrected, full size)?
- List the uses for which you need non-pixelated resolution (eg. on screen, printout, projection, web, print publication)?