

Managing digital records: 5.2

5.2 Managing 'born' digital images – still photographs

Note: This guidance focuses on 'born' digital images. For advice on digitisation projects, see Recordkeeping in Brief 11 - *Digital Imaging and Recordkeeping* and General Retention and Disposal Authority - *Imaged records* (GDA24).

Your organisation may need to manage 'born' digital images such as still digital photographs for a number of reasons. You may have an important business need to document a particular event or issue and the image will provide essential evidence that can supplement other business records.

Example:

Inspectors at WorkCover take digital photographs of the scene of an accident which can be important to supplement records of the investigation and may be required in legal proceedings.

The Roads and Traffic Authority is required to manage the digital image taken by speed cameras and Councils need to manage digital images of parking infringements taken by rangers in order to retain evidence required to successfully impose fines.

The National Parks and Wildlife Service take digital images of parks as part of their asset management.

Alternatively, you may just need to take digital photographs of business events and activities to illustrate annual reports or websites.

Advances in technology have ensured that it is now easy to create, replicate and share digital images. However, these images generally take up a lot of storage space are more susceptible to abuse or human error. Therefore it is important to carefully address issues regarding the capture, management and disposal of digital images, particularly if they are to be used for evidentiary purposes.

Considerations include:

- preparations for the capture of images
- equipment and file formats for creating images
- Primary, Original and Working image creation
- optimisation
- retention or disposal of images
- file formats for storing images
- media/systems for storing images
- compression
- file formats for delivery
- titling
- version control
- useability and accessibility
- system and application integration
- maintaining context

- enforcing standards
- digital rights management.

The following table lists these issues and provides some ideas on how to manage them.

Note: Many of the footnote references are from TASI fact sheets. TASI is a Joint Information Systems Committee (JISC) advisory service providing advice, guidance and training to the United Kingdom's Further and Higher Education community. While these fact sheets are an excellent source of further guidance, the advice given is in the context of managing collections of digital media resources for teaching, learning and research and is not always relevant to smaller collections held by NSW public offices.

Note: Law enforcement and forensic organisations should also refer to the SMANZFL *Australasian Guidelines for Digital Imaging Processes* Version 2 produced by the Electronic Evidence Specialist Advisory Group, 10 March 2004.

<i>Issue:</i>	<i>Resolution:</i>
Preparations for the capture of images	<p>Some preparations are required even before digital images are captured. You will need to ensure that you have the appropriate equipment, expertise and controls for required to produce images fit for the intended purpose. Naturally, a photograph for an annual report will require much less rigorous preparation than forensic images captured by NSW Police.</p> <p>Images and imaging processes should be governed by documented policies and procedures. These can specify requirements including:</p> <ul style="list-style-type: none"> • the purpose of the project or program • business priorities and resources • the equipment required and how to ensure this equipment is operated with accuracy and precision and maintained appropriately • the image quality, colour settings, resolution and size appropriate for all subsequent uses • criteria regarding what to capture • capture formats • naming conventions • saving instructions and formats • recording or availability of metadata • quality checking and validation processes • rights management • retention and disposal requirements. <p>If there is an important evidential need to capture the images you will need to consider the appropriateness of implementing even stricter measures to ensure that their integrity will be safeguarded. This may include:</p> <ul style="list-style-type: none"> • training and assessing staff for competency with

	<p>regard to the organisation's standard operating procedures and relevant imaging technologies</p> <ul style="list-style-type: none"> • authorizing particular staff members to capture images, with roles written into their job descriptions • establishing a quality management program • conducting validation tests¹ on the system to ensure its suitability for the intended purpose, including determining accuracy and precision requirements for imaging equipment, and a calibration/verification program • ensuring equipment is checked for accuracy before every use • ensuring staff involved in imaging are aware of, and conform to, imaging standards • adding levels of protection or verification to images such as hash verification or encryption² • ensuring that appropriate levels of documentation will be captured in audit trails.³ <p>These measures should also be documented.</p>
<p>Equipment and file formats for creating images</p>	<p>A file format for creation should be one that retains all of the information captured by the camera. The format should be able to store the image in at least the same colour depth (or tones of grey) as it was created and retain the capture device colour management information. TIFF is an example of a suitable format.⁴</p> <p>The choice of file format is not relevant to admission as evidence, only to the quality. However, it is advisable to avoid proprietary file formats to ensure the accessibility of the images over time. If a proprietary format is used (eg for some level of additional functionality) it should be converted to an open standard format before being stored.⁵</p> <p>If images are being captured for evidential purposes, the image capture device chosen should be capable of</p>

¹ Validation is the developmental process used to acquire the necessary information to assess the ability of the imaging system to obtain a result reliably, to determine the conditions under which such results can be obtained and to determine the limitations of the imaging system. The validation process identifies critical aspects of the system that must be carefully controlled and monitored. SMANZFL, Electronic Evidence Specialist Advisory Group, *Australasian guidelines for digital imaging processes* Version 2, 10 March 2004, p.16.

² *ibid.*, p.29

³ *ibid.*, p.16-20

⁴ TASI Fact Sheet: *Choosing a file format*, viewed June 2008, <<http://www.tasi.ac.uk/advice/creating/format.html>>.

⁵ *loc.cit.*

	producing an accurate representation of the evidence being recorded. ⁶
Primary, Original and Working image creation	<p>A Primary image is the first instance in which data is recorded onto any media that is a separate, identifiable object or objects. An example is an image captured on a memory card in a digital camera.</p> <p>An Original image is an exact binary copy of the Primary Image. A number of Original images may be created. However, if an Original image is to be used for evidential purposes your organisation would need to demonstrate it is identical to the Primary image. For example, an Original image is created by copying an image from a memory card onto a hard drive.</p> <p>A Working image is a copy of the Original or Primary image. This may involve applying processes that change the file format or Original Image data in any way (including compression, enhancement, filtering, cropping etc).⁷</p> <p>Your organisation will need to consider whether it needs to retain an Original (master) image at the best resolution (eg colour or spatial resolution) possible, considering current and future needs. High resolution digital photographs require more storage space and can cause network congestion so they are not suitable for all uses. High quality Original images should be retained for certain types of images such as those:</p> <ul style="list-style-type: none"> • which will, or may be, used as evidence in court • with long term retention requirements or • required as State archives. <p>The integrity of Original images must be maintained.</p> <p>Working copies may be made from the Original image at lower resolution for the purposes of delivery or display (eg on websites).</p>
Optimisation	<p>If you wish to optimise (touch up) the image (eg crop, adjust shadow and tones, change the colour balance, rectify faults, restore etc) you should make a Working image from the Original image. The integrity of the Original image should always be maintained.</p> <p>Any optimising of images will affect the quality of the image file. If the image is being used as evidence in court, it is important that changes are recorded, eg optimisation procedures may be documented as part of organisational procedures with any variations recorded in the metadata for the digital image.</p> <p>You may need to do an initial generic optimisation and a further specific optimisation that creates specific Working</p>

⁶ SMANZFL, *op.cit*, p.21.

⁷ *ibid.*, p.7 and 12

	<p>images for targeted uses such as 'web delivery' or 'print use'. Any copies that have been optimised should be named in a way that connects them to the Original and shows that they are new working copies of the Original image.⁸</p>								
<p>Retention or disposal of images</p>	<p>The following table gives advice on the retention and disposal of images:</p> <table border="1" data-bbox="563 468 1353 1749"> <thead> <tr> <th data-bbox="563 468 715 533"><i>Image:</i></th> <th data-bbox="715 468 1353 533"><i>Advice:</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="563 533 715 987">Primary</td> <td data-bbox="715 533 1353 987"> <p>Primary images are generally binary copied onto networks or other appropriate storage media, then destroyed as part of working processes. For example, Primary images may be created on a memory card, then copied to a network drive or other storage media, creating the 'Original' image. The memory card will then be reformatted to clear all digital data. This type of deletion of the Primary images can be covered under Normal Administrative Practice (NAP). The Original image then becomes the 'master' image in effect.</p> </td> </tr> <tr> <td data-bbox="563 987 715 1346">Original</td> <td data-bbox="715 987 1353 1346"> <p>An Original image used for business purposes should be captured into recordkeeping systems in accordance with the <i>Standard on Digital Recordkeeping</i>. The Original image is an official record of government business and should be treated as such. Your organisation's retention and disposal authority should indicate how long Original images for particular business processes need to be retained.</p> </td> </tr> <tr> <td data-bbox="563 1346 715 1749">Working</td> <td data-bbox="715 1346 1353 1749"> <p>Working images may become separate records. For example, you may optimise an image and use the optimised image as part of a business process rather than the Original. Your organisation's retention and disposal authority should also indicate how long these images need to be retained.</p> <p>Other Working images made from a Primary or Original image can be destroyed under Normal Administrative Practice (NAP) when their business use is complete.</p> </td> </tr> </tbody> </table> <p>It is common for multiple images to be captured and stored while only few of these are used as part of a business process. Images and duplicates that are not used for business purposes, and are not intended for</p>	<i>Image:</i>	<i>Advice:</i>	Primary	<p>Primary images are generally binary copied onto networks or other appropriate storage media, then destroyed as part of working processes. For example, Primary images may be created on a memory card, then copied to a network drive or other storage media, creating the 'Original' image. The memory card will then be reformatted to clear all digital data. This type of deletion of the Primary images can be covered under Normal Administrative Practice (NAP). The Original image then becomes the 'master' image in effect.</p>	Original	<p>An Original image used for business purposes should be captured into recordkeeping systems in accordance with the <i>Standard on Digital Recordkeeping</i>. The Original image is an official record of government business and should be treated as such. Your organisation's retention and disposal authority should indicate how long Original images for particular business processes need to be retained.</p>	Working	<p>Working images may become separate records. For example, you may optimise an image and use the optimised image as part of a business process rather than the Original. Your organisation's retention and disposal authority should also indicate how long these images need to be retained.</p> <p>Other Working images made from a Primary or Original image can be destroyed under Normal Administrative Practice (NAP) when their business use is complete.</p>
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⁸ TASI Fact Sheet: *Basic guidelines for image capture and optimisation*, viewed June 2008, <http://www.tasi.ac.uk/advice/creating/img_capt.html>.

	<p>future use, could potentially be destroyed as part of Normal Administrative Practice (NAP).</p> <p>In some cases a digital image may be used for a number of different business purposes. For example, a digital image may be taken to document a community relations event, then used in a number of different business contexts, including in your organisation's annual report. In this case, your organisation may need to consider which of a number of different retention periods is suitable to apply.</p> <p>Your organisation should clearly state in its procedures which Original or Working images should be retained and what is considered to be Normal Administrative Practice in relation to the disposal of images. Procedures should include specific guidance regarding who has the authority to delete images of any kind.</p> <p>It is important to ensure that images that are no longer required for business purposes, and can be legally destroyed under NAP or retention and disposal authorities, are disposed of regularly in accordance with organisational procedures. This is a requirement in the <i>Standard on appraisal and disposal of State records</i>. If such images are not regularly disposed of, network congestion inevitably results.</p>
File formats for storing images	<p>It is best practice to store all images, regardless of their purpose, in a format that is non-proprietary and is an established industry standard. The most common of these are:</p> <ul style="list-style-type: none"> • Tagged Image File Format (TIFF) • Portable Network Graphics (PNG) • Joint Photographic Experts Group File Interchange Format (JPEG or JFIF) • Graphic Interchange Format (GIF). <p>If it is an Original image that needs to be retained long term or as archives according to retention and disposal authorities, lossless compression can be used. TIFF or PNG are good format options for masters. The JPEG2000 format can be suitable where lossless compression is used.</p> <p>A note about RAW format: Some compact digital cameras and all digital SLR cameras offer a native or RAW format. RAW format is not a single file type, but the name given to any image file containing unprocessed data as captured by the digital sensor. Most camera manufacturers have created their own unique RAW formats. Native RAW files are encrypted and the formats are largely undocumented.⁹ State Records does not recommend you retain images in RAW format as there is not a non-proprietary standard format.</p>

⁹ TASI Fact Sheet: *The camera raw file format*, viewed June 2008, <<http://www.tasi.ac.uk/advice/creating/raw-format.html>>

	This could threaten the longevity and continued readability of images stored in RAW format.
Media/systems for storing images	<p>Where possible, it is preferably that image files that are vital to business processes, or required to be retained for long periods of time or as archives are stored in active systems or in a RAID hard drive array rather than on removable media (eg CDs, DVDs, magnetic tape). That way they can be maintained and controlled as an integral part of the organisation's recordkeeping system, checked for integrity and backed up or migrated regularly and remain readily accessible to users. Removable storage media tend to be more easily compromised, are easier to lose or overwrite and can be overlooked in back up and migration exercises.</p> <p>Removable storage media are only suitable for storing relatively low-value digital records not required to be kept long term.¹⁰ If removable storage media are used, strict controls must be employed to ensure the security and preservation of both the storage media and the records they contain and to ensure they remain readable.¹¹</p>
Compression	<p>Compression is a way of encoding a file's data more concisely or efficiently by squeezing or squashing the file.</p> <p>Image files tend to be very large and sometimes compression is required to save space or assist delivery. However, compressed images can take time to open while decompression takes place. Some forms of compression will also compromise the quality of the image.</p> <p>Compression is generally in two categories: lossless or lossy compression.</p> <ul style="list-style-type: none"> • Lossless compression uses redundancy reduction techniques which find patterns and repetitions in the image data and express these more efficiently. For example, if there are 25 black pixels in a row, during lossless compression information would be recorded for one pixel, with directions that the next 24 are all the same, rather than recording each pixel separately. • Lossy compression uses some redundancy reduction techniques combined with irrelevancy reduction techniques which aim to remove or alter information that makes little or no difference to the

¹⁰ National Archives of Australia, *Digital recordkeeping: Guidelines for creating, managing and preserving digital records*, May 2004, pp.40-41. viewed June 2008, <http://www.naa.gov.au/Images/Digital-recordkeeping-guidelines_tcm2-920.pdf>

For further information, see TASI Fact Sheet: *Choosing a file format*, viewed June 2008, <<http://www.tasi.ac.uk/advice/creating/format.html>> and *Digital preservation and storage*, viewed June 2008, <<http://www.tasi.ac.uk/advice/delivering/digital.html>>. Note: TASI recommends offline storage for masters but this is not recommended by State Records NSW.

¹¹ See SMANZFL, *op.cit.*, for more information regarding strict requirements for forensic and law enforcement images.

	<p>user's perception of the image. For example, some of an image's colour information can be simplified without perceptible changes. In extreme cases lossy compression can compromise the quality of the image.</p> <p>Lossy compressions transform and simplify the image information in a way that gives much larger reductions in file size than lossless compressions but the information, once disposed of, is irretrievable.</p> <p>State Records recommends lossless compression for images required to be retained according to requirements expressed in retention and disposal authorities as no information is irretrievably lost in the compression process. Once decompressed, a lossless image will always appear exactly the same as the original, uncompressed, image. Lossy compression can be used for some Working images eg for delivery.¹² Compression algorithms used should be open (ie not patented) and they should be captured in a non proprietary format.</p>
File formats for delivery	<p>In some cases you may need to 'deliver' images to users eg via email or downloaded from websites, via display on websites, through PowerPoint presentations etc. You will need to consider what formats are most appropriate for the task at hand. For example, if you require commercial printing of images, the printer will usually specify the format. Delivering images through a web browser means you will need to select formats supported by browsers, such as JPEG, GIF and PNG.</p> <p>TASI recommend you consider the following issues when deciding the format to use:</p> <ul style="list-style-type: none"> • What is the intended use of the image after delivery? • How much image resolution is needed to convey the intellectual content to the user? • On what output device is the image going to be used - monitor, printer, projector? • What are the capabilities of the output device? What bit depth can it handle? What is the required resolution? • What bandwidth is available for delivery? • Is the image for photo-realistic or presentation use? • How is the image going to be delivered? CD-ROM, tape, WAP, Internet (dialup, broadband, LAN or WAN connection)?

¹² TASI Fact Sheet: *File formats and compression*, viewed June 2008, <<http://www.tasi.ac.uk/advice/creating/fformat.html>>.

	<ul style="list-style-type: none"> Is there a requirement to add any watermarking or deal with any other digital rights management issue?¹³
Titling	<p>It is important to establish naming conventions for images captured and maintained as part of business processes. If the organization captures a large quantity of images, the naming system for individual images and the files they are contained in should be outlined in the organisation's procedures. A well devised naming structure can ensure consistency and be integral to efficient retrieval. File naming should be in line with titling conventions adopted for other digital records.</p> <p>Some images will be required to be stored and retrieved now and well into the future - the naming conventions therefore should be able to be understood through time. Image Management Systems (IMS) can be used for very large collections and can generate unique non-descriptive names (eg unique numbers) automatically for images, but it is important that the IMS is preserved over time to allow continued access to the images.¹⁴</p> <p>Several standard thesauri for pictorial images are available, including the Australian Pictorial Thesaurus (APT) at <http://www.picturethesaurus.gov.au/>.</p> <p>Note: It is good practice to not only name images but to record other important metadata within the image properties on creation so that the metadata is bound to the image itself over time.</p>
Version control	<p>Your organisation will need to consider conventions for various forms of the same image. You may have, for example, a Primary image, an Original image and an optimised Working image. You may also have a number of different versions of the Working image used for delivery eg thumbnail, reference image, full screen image etc derived from the Original.¹⁵</p>

Useability and accessibility	<p>A key to ensuring that your images are usable and accessible is ensuring that sufficient metadata is associated with the images. Minimum metadata requirements for digital records are outlined in the <i>Standard on digital recordkeeping</i>.</p> <p>Organisational procedures for managing digital images should include the metadata schema. This may include descriptive metadata such as:</p>
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¹³ TASI Fact Sheet: *Choosing a file format* viewed June 2008, <<http://www.tasi.ac.uk/advice/creating/format.html>>.

¹⁴ TASI Fact Sheet: *File naming*, viewed June 2008, <<http://www.tasi.ac.uk/advice/creating/filenaming.html>>.

¹⁵ *loc.cit.*

	<ul style="list-style-type: none"> • the title and creator of the image • workflow metadata regarding its capture, processing and quality assurance • source metadata regarding the Original and information relating to Working images, and • digital rights management metadata such as copyright, sales and usage information. <p>Implicit metadata may be deduced from the file itself, such as file size, type and date created. Where possible, metadata should be based on an established schema, using standardised vocabulary and syntax and should be entered at the time of creation.</p> <p>Most image collections seek to comply with Dublin Core or the Australian Government Locator Service (AGLS) as basic metadata for retrieval and use of the images. For more information about Dublin Core see <http://dublincore.org/> and AGLS see <http://www.agls.gov.au/>.</p> <p>Other strategies to improve the useability and accessibility of your images include:</p> <ul style="list-style-type: none"> • using records management software to store and manage image files • using strong titling conventions that are rigorously enforced • deploying powerful search tools • encouraging rigorous version control <p>converting image files to standard formats.¹⁶</p>
System and application integration	<p>Saving images to records management systems or integrating your image management systems with records management software or other business systems can:</p> <ul style="list-style-type: none"> • improve workflows • enable better information access, and • facilitate comprehensive management of your image files. <p>However, if it is proprietary, it can be difficult to integrate image management software with other software or systems. If you do require system integration, ensure you allow an appropriate budget to enable this integration to be developed.</p>
Maintaining context	<p>Image files may be linked to other records in your organisation. For example, the Office of Public Works may</p>

¹⁶ TASI Fact Sheet: *Metadata: image description, indexing and cataloguing*, viewed June 2008, <<http://www.tasi.ac.uk/advice/delivering/meta.html>> and *Search and retrieval*, viewed June 2008, <<http://www.tasi.ac.uk/advice/using/search.html>>

	<p>create a range of project management records such as emails, project management reports, site surveys, CAD drawings etc to which the images relate.</p> <p>Building connections between related records can be achieved by:</p> <ul style="list-style-type: none"> • creating metadata fields in your image management software to list identifiers of related files • implementing records management software to connect and co-locate related files • establishing interfaces where appropriate between image management systems, records and CAD systems • implementing strict procedures that require the maintenance of all associated correspondence.
Digital rights management	<p>Your organisation should be aware of the laws governing intellectual property rights, such as privacy, copyright and data protection and consider and manage these proactively.</p> <p>If images include recognisable living people, you should seek permission before making these images publicly available – eg in annual reports or on websites - especially if the images are of a sensitive nature. Authorisations given by individuals to the organisation granting permission to take and use images of individuals in publications, on websites and intranets must be retained for a minimum of 15 years after use of the image for publication purposes or until disposal of image (General Retention and Disposal Authority – <i>Administrative records GA28, 17.2.1</i>).</p> <p>Metadata can be used to record information about intellectual property rights. Remember too, that you are likely to store personal information with some digital images, including:</p> <ul style="list-style-type: none"> • the image content, if it includes recognisable images of people • the 'descriptive metadata', if it names those depicted • the 'technical metadata', if it says who worked on the image • user data, if personal information is collected when people register to use images. <p>Personal data should be securely stored, kept up to date, and disposed of when no longer needed in accordance with privacy legislation.¹⁷</p>

¹⁷ TASI Fact Sheet: *Copyright, data protection and other IPR*, viewed June 2008, <<http://www.tasi.ac.uk/advice/managing/copyrights.html>>

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ISBN: 978-0-9805148-9-6