THE USE OF OPTICAL DISC FOR ARCHIVAL IMAGE STORAGE

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This paper examines the existing and potential use of optical disc as a medium for storing images of archival picture material especially photographs, and as a finding aid for archivists, researchers and the general public. Aspects include its suitability in an archives context, and the role it may have in promoting picture contents over words about pictures themselves. The advantages and disadvantages of the technology for this application are then considered, with both analogue and digital methods being examined. Problems of implementation are presented and some costing attempted, with the importance of clear goals and proper management being stressed. Finally some predictions on the medium's future are given and three short case studies provided.

Introduction

Archivists are charged with upholding the principles of provenance and original order. Their roles are to preserve, protect, control and reveal those records committed to their care. This may include the archival management of large collections of picture material, especially photographs, and the creation of control systems and finding aids. Traditionally this has meant establishing registers, guides, card index systems and subject files, in the form of picture files, of various types and complexities.

A technology being implemented in recent years is optical video disc, where access to video images of photographs on optical discs enables users to browse the archive's images, providing access to the collection, reducing both search time and most importantly the risk to the original photograph. If such collections of video images are controlled by an associated computer and software program, searching by structured means is possible and images can be gathered together and presented in a variety of ways and with the addition of various degrees of textual information.

The technology is a changing one and other image storage methods are available—from traditional microfilm through to new challenges to optical video disc itself. This makes selection decisions difficult. What are the advantages and disadvantages of optical disc in the management of picture collections? What are the complexities and costs of image transfer? Is it a transitory technology which will just add to future archivists' problems? Does it enhance or reduce the preservation and integrity of historical picture material? How widely has it been implemented in overseas and Australian archives and museums?

Attempts are made in this article to answer these and other questions. As well, three short case studies are included—on organisation in the U.S.A. and two in Australia that use optical video disc.

2 Optical media—why it should be considered

2.1 Provenance and Users

In 1965 T. R. Schellenberg in *The Management of Archives* stated the obvious: that the archivist "cannot arrange records by both their source and their subject."[1] He indicated that archivists, when they adhered to the principles of provenance, seem to run counter to what researchers want them to do—arrange and describe records in relation to subject. Many users wish for subject description, but this may obscure the reasons the records came into existence. In the 1980s the computer does enable indexes to be created which describe by subject, dates, places and other qualifying terms chosen by the archivist, while still retaining the records in their original order. Archivists however will be constantly expected to provide more, although many would cringe from Richard Kesner's call on them, along with librarians, to become "Vendors of information."[2] But at a time when many archivists are experiencing declining allocations of funds coupled with increases in the expectations and sophistication of records users, patience with traditional finding aids is declining. Whether users like it or not archival records cannot and do not come preassembled for them, because no-one can foretell what use or what intellectual arrangement will be required.

2.2 Problems of description

With this in mind, when images are sought their very nature makes description difficult. There is potentially an impossible diversity of user needs. Art Historian Professor Joan Kerr is of the opinion that no single cataloguing system will satisfy everyone and "nobody can possibly list every detail of every image and anticipate every possible need or interest and we keep on wanting more!"[3] She cites a wedding group scene as an example. Botanists might be interested in the plants in the foreground or interior decorations in the wallpaper. Architects might want more about the building. The central reason for the picture being taken may not be important at all. She is of the opinion that there are lots of words in catalogues about photographs but very few images, a large amount of "visual dismissiveness", which requires rethinking so that the image is put first and then the words, the reverse not being good enough.

The reasons this has occurred may be many:

- the traditional library heritage of archival development,
- the preservation of original material and protection of the collection from wear and tear, or
- the lack of expertise and resources to provide copies of originals for "browsing" or subject files.

2.3 Evidential and informational values

This is not to see the image in the photograph—the evidential value—as the "be all and end all". It may be meaningless without accompanying textual information. Whatever method of finding aid is used to locate an image, its informational value relies on words—location, date, format, artist/photographer, provenance etc. and terms have to be used as descriptors. This will be taken up further in Section 4. There is however a growing interest in the "image" not "words about the image".

2.4 Micrographics

Before proceeding to discuss optical disc storage as an optical solution to the above, some observations about the role of micrographics should be made. Comparisons between microfilm/fiche and optical disc are often made and just as often different conclusions reached. Colin Fairweather in a recent unpublished paper[4] was quite supportive of microfilm's role in the record management area. Pennix[5] has argued that if recent technological advances in microfilm and computer assisted retrieval were fully exploited the medium would still be attractive. It has proven archival permanence and wide acceptance in large organisations. One only has to visit the State Bank of Victoria Record Centre to be reassured that microfilm will be around for many years yet. In addition it is currently possible under some circumstances to use microfilm as evidence.[6]

In justifying the role of micrographics Pennix[7] is timely when pointing out that "the archival quality of storage media is not of course a glamorous topic. It is far more impressive to be able to say how many million pages of data can be stored on a particular medium, and how quickly they can be accessed than to say how long the data will actually remain on the media". Others predict a great demise in micrographics and a large shift to optical disc technologies. Kesner[8] while giving some support to computer output microfilm argues that micrographics programs are not always cost effective, and computer assisted retrieval in his opinion is expensive and cumbersome. In his view optical disc promises to be the archival storage medium of the future and that both archival and records management systems will one day tie into computer controlled optical disc.[9] This he says will virtually wipe out the commercial viability of micrographic alternatives.

2.5 Optical disc as an aid not a substitute

There are of course differences in the applications of the technologies here. Most use of micrographics is to provide a permanent compact storage medium of textual paper records, enabling easier retrieval and the saving of space. While the potential for using optical disc in this area is enormous, the application under discussion here is a finding aid for valuable records, enabling their continued preservation and their accessibility. It is not seen as a replacement for them, but simply as a means of access, a way of establishing physical and intellectual control over picture material in an archive, and providing for searching and retrieval of both image and information about the records. For this purpose therefore the permanence of the information storage medium is important but not vital.

3 Optical disc technology—what it can offer

3.1 Considering the new technology

A commitment to introducing a major new technology into an archival program requires most careful consideration especially in this era of financial constraint and fast technological change. It is difficult to disregard the potential of optical media such as video disc, optical digital disk and compact disk.[10] These media have been attracting the attention of archival organisations for three primary reasons:

- the vast quantities of text, sound and image information that can be stored on a single disc,
- the capacity to provide rapid random access to any item of information on them, and
- their potential for the dissemination of information previously stored on paper, photographic, magnetic and phonographic media.

3.2 Historical background

Optical storage technologies however are fairly new and the history of their development has been turbulent. They are totally dependent on playback devices, the standards for which are still evolving. Although they can withstand constant use and quite bad treatment, the archival life of the media is essentially unknown.

The development of the optical disc began with numerous U.S. companies attempting to develop new information media and equipment for the consumer market. Work proceeded in several directions but two main types of discs and playback equipment evolved. The first used technology similar to a phonograph record where physical contact was made between a playback head and the disc. The second involved non-contact techniques using laser light emittance and reflection from the disc surface. But in the consumer market the disc technology was unable to compete with the rapid rise in video cassette tape and recorders, which by 1981 had become an established consumer method of video recording and playback. This and a proliferation of disc formats creating confusion, brought about the demise of optical disc as a consumer product.

In the institutional market however the disc had different appeal. Here the prospect of an audio visual device that could retrieve a single image in seconds at the touch of a button interested educators, trainers and information specialists. Universities, corporations and government in the U.S.A. began attempting new sorts of instructional programs that would take advantage of the technology's unique features, the random access ability, the mixture of sound, motion and still frame and the possibility of linking this with a computer to create new methods of informational control. The more recent concept of storing textual and numeric data in digital form has brought about a wider acceptance of optical disc as an information storage medium.

3.3 Problems of standards

While some standardizing of the physical methods of enclosing information on the discs has occurred a variety of sizes, forms and resulting equipment remains. Formats differ in size, the underlying medium and the way light is used to write and read from the recording surface. Each of those media may have different playback equipment and serve distinctive information applications.

A brief outline of optical disc as it relates to use in archives and more specifically for picture collections in archives follows.

3.4 Names and more names

Many terms may be used to describe the physical aspects and capabilities of optical discs. Those of immediate interest for the purpose of this paper are large optical discs for recording either in an analogue (video) form—*optical video discs* or digital (binary code) form—*optical digital disks*, and the rising importance of the *compact disk* in digital form.

Those terms above will be used as standard descriptive titles in the remainder of this paper. Other titles used to describe these media are:

optical video disc
- video disc
- optical video disk
- laser vision
- laser video disc
- laser optical disc
- optical analogue disc
- high density optical storage

optical digital disk
- digital disk
- OD3 (optical digital data disk)
- high density optical storage
- digitally encoded optical video disc

compact disk
- high density optical storage
- CD-ROM (compact disk-read-only-memory)
- CD-I (compact disk-interactive)
- CD-V (compact disk-video)

Their capabilities may be expressed in various ways such as *read once discs, worm (write-once-read-many)* or *draw (direct-read-after-write).*

3.5 Physical Characteristics

Optical disc/disks of both forms are the rainbow-hued silvery reflective discs most often used in pictorial illustrations of video disc technology. The most established disc formats are the 30 cm (12 in) and the 12 cm (4.72 in) sizes. Others, including 7, 8 and 14 inch types are less common. The former two are likely to become the two standard industry sizes.

Information is mostly recorded on these discs, regardless of format, by making patterns of pits, bubbles or blisters on a metallic recording surface. Each side of a large disc is impressed with 54,000 concentric circles and these are protected by a mutilayered synthetic resin. The variations in the recording surface produce different indexes of reflectivity when exposed to a low powered laser reading head and these variations are interpreted and decoded to reconstruct the programming stored on the disc. When the laser shines on the reflective surface there is less reflection from the pits, bubbles or blisters than from the surface that has not been written upon. New methods create a similar effect using alternating alloys. The airtight transparent coating encasing the surface on which programming has been recorded, protects it from the air and enables it to be handled normally without damage.

Current reflective disc player design is such that a two sided disc can only be accessed on one side at a time. Very large storage systems involve a "juke-box" method of accessing information on up to fifty discs at a time.

3.6 Analogue and digital—an outline of the differences

Image storage of black and white photographs alone lies at the boundary between analogue and digital methods. To capture them for recognition retrieval, or to assist research for further study, either technology is adequate or could be preferred. Up to 54,000 colour or black and white images can be stored on a single side of an optical video disc. The quality and resolution of the images however is sufficient only for recognition or identification purposes.

Alternatively, digitizing a photograph at 300 pixels per inch, with one bit per pixel, provides an image of moderate quality, but uses large amounts of memory space—usually 1 M byte per black and white photograph. However new information compression techniques means it may be

FIGURE 1 Sample of video disc image printout and database information (Museum of Victoria)

FIGURE 2 Sample of digital disk image printout scanned at 300 pixels per inch (Courtesy of Delairco Publishing Solutions Pty. Ltd.)

possible to accommodate up to 10,000 such images on a single compact disk. Images in colour could be stored this way but require either much more storage space or accepting much less quality than black and white.

The two methods—analogue and digital, although they may use a common medium, require completely different image transfer methods, play-back equipment, control and display equipment. Access times and security of information varies.

3.7 Retrieval times

Access time of one to three seconds is standard for optical video discs. Digital methods are slower, 7 seconds up to 45 seconds if several terminals are in use at once. The placement of information on digital disks during original recording, affects retrieval time. Careful batching of related information at this early stage aids fast retrieval later. Magnetic tapes and disks may be faster but their storage capacity is not as great. In addition, physical contact between the tape and the read heads produces wear on the tape, and reasonably pessimistic figures for optical disc life exceed expected tape life.

3.8 Remote access

Both types can be linked to telephone systems providing access and transfer of images to remote locations. Access is possible this way to optical video discs at the International Museum of Photography in New York. Using an IBM PC, video disc player and modem it is possible to search images at moderate cost by photographer, place, photographic process, generic or proper subject categories.[11]

3.9 CAV and CLV

A further complicating point is that optical video discs may be recorded analogue in two ways. Only one is suitable for image storage or interactive use and it is important that the correct method of information storage is selected.

In the *constant angular velocity* method (CAV) each frame occupies one of the 54,000 concentric tracks with each track commencing in the same position on the disc whether it is near the inside or outside of the disc. When the laser comes to the end of a track it can "hop" over to the beginning of that same track. Therefore it can freeze frame and as the starting location of each frame is known CAV frames can be randomly accessed.

The second method *constant linear velocity* (CLV) the frames are stored immediately following each other and greater storage capacity is achieved. However it is not possible to freeze frame images or to easily random access with this method.

3.10 Acceptance of optical video disc

The large optical disc, recorded analogue by the CAV method and used in association with a controlling microcomputer and data base, has gained modest acceptance as a de facto standard. This has been in three main areas:

Storage of film and television images for conservation of the originals enabling them to be replayed many times from the disc without incurring any damage. Preservation of original copies is assisted.

An education and training aid. A single disc can combine motion pictures, slides, text stills, graphics and stereo sound. Its potential for creative use when computer controlled is therefore considerable. Sophisticated programs can be made where the user can seek information, obtain answers to decisions made, choose various paths and expand into particular topics, thus interacting with the program. Many programs have been developed in the areas of education and training. The "Domesday Project"[12] and "Aussie Barbie"[13] are two examples of the former while commercial, military and industrial staff instruction and skilling programs are used, especially in the USA. Production costs of sophisticated interactive video disc programs are high and to be cost effective they need to have a long useful life.

An image storage bank for archives, libraries and museums as is being discussed in this paper. Its use for this purpose has appeal for both the user/researcher and institution staff. Working systems where researchers, without the need for staff assistance, can access photographic collections to browse or scroll through hundreds of images. Alternatively searching can be carried out by using controlled terms. In the Museum of Victoria's project "Australia as Australians saw it"[14] one can, for example, specify images of females milking cows in Wycheproof in the 1890s. The quantity and file numbers of images fitting those terms is quickly revealed. One can then view them, recalling any at will. For a small charge a printout of the microprocessor display and a low quality thermal print of the image with its control number can be obtained within a few seconds. If a high quality photograph is required later for publication the negative is accessed via the control number and a print made by traditional photographic means. Multiple terminals can allow several users at once similar to modern library catalogue access methods. Various levels of textual information control are possible to restrict details of provenance, donor etc. from the user.

In this era of raising funds to offset costs the possibilities of generating income from printouts, print sales, search time, copyright and reproduction fees, and sale of discs has appeal. However regardless of the magnificence of the system or how cheap the equipment and image transfer becomes, or how easy it is to use, the cost in time and effort to prepare and input the textual information is a major factor and should not be underestimated. Intellectual control over the record is still necessary and like the preparation of information access and control systems, still has to be carried out. However less descriptive information "about" the images is necessary because the images themselves are available.

Table 1 lists organisations known to be using optical video disc for image storage.

Table 1
Some known creators and users of optical disc for image storage
(not including sole interactive or point of sale users)

Australian War Memorial, Canberra, Australia. Embarking on a large image storage program using digital disks.

Boston Museum of Fine Arts, Boston, USA. Small collection of artworks on disc.

Canadian Film and Video Centre, Ottawa, Canada. 100,000 images being transferred to disc in 1987.

City of Boston, USA. All properties in the city have been photographed and stored on discs.

Domesday Project—BBC Enterprises London, England. A large two disc interactive project that also included 50,000 still photographs.

Footscray Institute of Technology, Victoria, Australia. CD-ROM being used for experimental image storage.

Giovanni Agnelli Foundation, Turin, Italy. Image discs of a "Visual Encyclopaedia of Italian Civilization".

Government Printing Office, N.S.W., Australia. All images from 1870s stored on 4 discs.

Graves Medical Library, Chelmsford, England. Large medical slide collection stored on discs.

National Air and Space Museum, Washington, USA. Four discs of photographs about the history of aviation.

National Archives of Canada, Ottawa, Canada. Pilot program similar to Library of Congress.

National Library of Canada, Ottawa, Canada. "O Canada" mixed disc of photographs, manuscripts, newspapers etc.

National Library of Medicine, Maryland, USA. Mainly interactive discs but examined various access methods and provided technical evaluation.

Patent and Trademark Office, USA. Large disc project involving text, drawings and photographs.

Science Museum, London, England. In 1986 the museum had developed 47 interactive discs.

Spanda Gallery, Rome, Italy. Image data banks on disc including works of Leonardo Da Vinci.

Strong Museum, New York, USA. Collection of paper ephemera on disc.

University of Iowa, USA. Visual databases on disc established in several faculties, including 40,000 slides in School of Arts.

University of Leeds, England. Large collection of Medical slides stored on discs.

Harvard University, Massachusetts, USA. "Aga Khan" project involving 30,000 images of Islamic architecture.

Horner Museum—Oregon State University, USA. One disc of textile collection.

International Museum of Photography, New York, USA. Archival collection of 52,000 images on disc. On-line access available.

J. Paul Getty Museum, California, USA. Large databank of images of Greek Vases. Rotation and zooming possible on individual vases.

Library of Congress, Washington, USA. Optical Disk Pilot Program. Analogue and digital. Analogue discs include World Transportation Commission collection, Detroit Publishing Co. Collection, Farm Security Administration collection and the Yankee Poster Collection.

Massachusetts Institute of Technology, Cambridge, USA. One disc of 7,000 images of Boston architecture.

Metropolitan Museum of Art, New York USA. Interactive and image storage on disc.

Museum of Victoria, Australia. Pilot project collecting historical images. Two discs completed.

National Gallery of Art, Washington, USA. One disc of collection, which as at early 1987 was the only Museum disc known to have paid back its initial cost through sales.

3.11 The challenge by optical digital disk

Substantial adoption of optical video disc has already taken place, however the rapid growth in the acceptance of optical digital disk as a large capacity computer information storage medium, may eventually restrict the market opportunities of optical video disc to its existing applications.

There is no generally accepted standard for recording on large digital disks and all methods for reading the data are proprietory. The Sony Corporation however has a strong presence in the market place and the digital method is becoming appealing to organisations holding massive files requiring random access. They can become a storage medium for down loading of information to secondary level status and to free computer memory space. Banks, large corporations and government departments are adopting this information technology as an alternative to magnetic forms. The current generation of write once optical digital disks could have archivally useful properties because they cannot be erased. CD-ROM is a fast growing and portable storage medium gaining wide acceptance.

Traditionally the large amount of memory space needed ruled out optical digital disks of both sizes for image storage, but in recent times new information compression methods have raised image storage capacity. This may result in two different de facto optical disc systems using similar or identical discs for the storage of pictures: video discs, having only a small range of alternative applications, while digital disk technology becomes widely adopted.

3.12 Capturing the image on the disc

Basic differences in the way information is stored in analogue and digital forms also means there are differences in the way the images of pictures, be they artworks, prints or slides, are transferred onto the discs.

Analogue methods. The "traditional" method is by copying black and white photographs onto high quality archivally processed negative film. These negatives are then brought together in long rolls and transferred optically onto one inch video tape, allocating usually a single sequential number which appears in the picture area. Vertical images are either cropped top and bottom, or appear whole, but smaller, to fit the format. Careful checking and final editing is necessary at this stage as no changes can be made later. Colour slides are transferred by projection direct to video tape. The final tape is then sent for transferring to optical disc. Associated textual information is separately inputted into a computer using the allocated number as the access to the disc image.

While the preparation of the long rolls of film is usually undertaken "inhouse" the transfer to tape and disc production are usually commercially done[15], the latter step being generally carried out overseas. However some organisations e.g. Search Tech Pty Ltd[16] offer a range of image transfer services.

This picture to disc transfer method is cumbersome and expensive.

However, once one master disc is made copies are relatively cheap offering image information marketing opportunities for cost recovery. One large advantage of the negative, or a second made at the same time, becomes the source of copy prints that may be ordered by users. The original, once copied for the disc, requires no further handling. An additional advantage is that should a better quality high resolution playback system become cost effective, the negatives can again be used for creating new discs of high definition pictures.

A new analogue direct-to-disc system now only requires using a video camera to copy directly from the picture onto the optical video disc. This can be done on location on write-once discs so the information cannot be erased. It is similar in end result to the first method but omits the roundabout intermediate steps, though careful planning is necessary as no editing is possible. Additionally no good quality intermediate image source remains for later use.

Digital Methods. Two basic systems may be used to transfer pictures in digitized form to the disk. The first involves scanning the original and converting it into pixels of information. A variety of scanning resolutions is possible—the greater the resolution the more "space" is used up on the disk. The standard method is similar to photocopying with the picture instead moving across the scanner. Transfer time is about 7 seconds per image and originals in some cases could be batched and fed automatically.

Originals that are unsuitable for this method are recorded using a video camera, the taped analogue information then being transferred to digitized form on the disk. A further option is to make the high quality negative or slide discussed earlier and then digitally transfer this to the disk.

A concern that may arise for archivists, if optical digital disk technology becomes adopted, is the potential for image manipulation by electronic means. In the optical video form only contrast grading and some colour enhancement can be achieved. The digital method allows for a wide range of image "massaging", even to the point of removing portions of the image (e.g. people) as required, or adding colour to black and white images. This is a concern, especially if this disk technology is used as a primary information storage.

3.13 Disc life

The life of optical discs is not known and claims range from a minimum of 10 years[17] to 100 years.[18] A variety of accelerated ageing tests is being carried out including one by the US National Bureau of Standards. It is expected these will reveal that the medium is quite stable and a life of 30-50 years, given reasonable storage conditions, can be expected. These times compare extremely well with magnetic media and high use microfilm. Tests carried out also claim that no visual impairment occurs after 100 successive copy generations of single video images.[19]

Two points should be considered however when using optical disc as a permanent archival medium:

1. Unfortunately the more reliable a device or medium is, the more difficult and costly it becomes to determine long-term reliability. The use of accelerated tests and the response to these may not be a valid guide to performance under normal stress.

2. The test conclusions will probably be irrelevant in another way. The information stored in this generation of optical media, even if it resists physical degradation, will probably be inaccessible in a decade or so simply due to changes in technology. Media which can be decoded only through machine intervention raise conservation issues when the machines that read them are no longer available, or are difficult to maintain.

The question of archival life therefore comes down to whether the information can be read, and how difficult or easy it might be to transfer disc contents onto future media without loss of the essential features of interactivity, random access and vast data storage capacity.

Any use of optical disc as a primary information storage is likely to create archival risks as the hardware will cease to exist before archivists inherit the medium and probably long before disc failure. This of course is a problem in existing non-paper records systems, but with only proprietory standards existing in the optical disc area, the loss of information in the future could be serious. As discussed earlier (2.5) this is not such a serious problem in its application as a tool for controlling, accessing and preserving pictorial records.

4. Electronic images versus the real thing

4.1 Loss of context

There is no doubt that searching and revealing images on a video monitor is vastly different from browsing through original pictorial sources. A low quality electronic image, possibly cropped to fit the TV format and with a large file number in the picture area, could be said to have little association with the original.

The contextual problems are especially so when considering albums of photographs. How does one relate scrolling through images on a monitor to handling the pages of a leather-bound, gilt-edged, chronologically arranged and beautifully captioned album of photographs, with its unique feel and smell? This should be of concern to archivists implementing optical disc access systems however very little documented discussion seems to be available.

4.2 Safeguarding the original

Perhaps this is because archivists take seriously their responsibilities of preservation first and access second. Sir Hiliary Jenkinson reminds us the duties of the archivist are "In the first place . . . to take all possible precautions for the safeguarding of his Archives and for their custody which is the safeguarding of their essential qualities. *Subject to the discharge of these duties* he has in second place to provide to the best of his abilities for the needs of historians and other research workers. But *the position of primary and secondary must not be reversed.*"[20]

So the preservation and provenance of the original should be paramount and this certainly is a reality for many pictorial archivists. According to some it is a pleasant romantic notion to believe that continued access to the original material, and its ultimate preservation in its context, are both possible.

4.3 Serendipity

Sadly, lack of access also reduces the role of serendipity—that faculty of making happy chance finds with minimal judicious input. How often would browsing original material mean finding that very special unexpected image that is so important. P. D. Jordan, the U.S. historian writing before the days of computers, reminds us that "the wise archivist knows, as does the sagacious scholar, that the researcher does not define his research topic but that the documents dictate the subjects to be researched."[21]

4.4 Less access to the original

In discussing these problems with those charged with managing archival picture collections it becomes clear that unfortunately direct handling of original photographs, especially 19th Century material, will be less and less possible. While they express concern about this loss of relationship the hard facts are that it just cannot continue to happen. This loss of access to the original and the role of serendipity create difficulties for the serious researcher.

4.5 Searchers and context

An alternative romantic notion is to think that all wanting access to images in picture collections are serious about contextual relationship. In reality many want to find an image that suits a preconceived set of conditions—searchers rather than researcher. An image may be needed for a television commercial; a background for a trade display; as artwork for a wine label or as a "filler" in a new publication. The use of such images from picture collections while quite legitimate (assuming copyright and contractual obligations have been fulfilled) means little thought is given to their original context.

4.6 Optical disc as an alternative

Thus protection of the original and demands from increasingly skilled researchers means the concept of electronic image storage is more enthusiastically accepted by archivists in recent times. The prospects of having all images on optical disc with associated textual information on a computer has increasing appeal to both researchers and archivists as a way of providing control and access. Serendipity in some form is still possible, not by browsing originals, but by conveniently scrolling through tens, hundreds or thousands of electronic images from a disc.

A well operating optical disc system is seen by some as a way of freeing up archivists' time for other responsibilities by placing the searching for the records increasingly back on the user. This may prove illusionary as demand increases.

4.7 Potential loss of archivists' knowledge

Like a good reference librarian, an archivist contributes experience and knowledge, is the human resource who suggests other options, choices and variations and knows their collection sufficiently to offer more than a computer might. There are fears that this sort of expertise may be lost as electronic and computer methods are increasingly used in archives. P. D. Jordan, again writing from an historian's perspective, says "I have learned that, in the last analysis, the finest research source is not the documents themselves, but is the degree of interest and of cooperation manifested by archivists."[22]

4.8 Optical disc as evidence

One unknown fact about optical disc is its acceptance as evidence in a court of law. In Victoria the value of evidence, other than that given directly by persons in the court, is included in Sections 51 and 55 of the Evidence Act 1958. However different acts of course apply in different States. As an example, in Section 51 of the Victorian Act emphasis is placed on the document itself, and if the original is not available, copies including microfilm copies may be accepted instead. While microfilm is specifically mentioned in this Section the current Act does not include any interpretation of optical disc images. The emphasis is on the contents of the document in Section 55 and the Act includes acceptance of information generated by a computer as being admissible.

The current situation in Victoria is therefore one where microfilm images can be admissible as evidence but optical disc images are not. While it seems that Section 55 implies acceptance, it could conceivably be argued that optical disc and especially optical video disc images, are not computer stored images in themselves. Presumably computer information which has been downloaded onto optical digital disk would be considered suitable under the Act, however the status of video or digitized images of documents and pictures at this time is unknown. There may not be any problem evidentially, but it has yet to be tested.

Implementation considerations—cost

5.1 Difficulties in cost assessment

Even though primary questions about the costs of making optical video or digital discs usually revolve around the medium and the hardware, the expense of database construction and image transfer to disc are likely to far outweigh the physical aspects. Time consuming descriptive work and inputting are normally major costs, as with most projects introducing computer technologies, and these seem often to be the ones that are poorly estimated and exceed budgets.

Additionally system costs such as hardware, discs, and image transfer, seem likely to fall in time, while programming and inputting costs such as data preparation, keyboarding and consultancy are likely to rise.

The rather radical nature of the technology especially in the digital area, makes it difficult to compare costs of achieving similar objectives with more traditional methods as now exist, except perhaps for computer output microfilm. It is also difficult to compare costs between optical disc methods themselves. The current most used process of analogue transfer via quality negatives, video tape and then to disc, is cumbersome and therefore costly. Direct to disc analogue methods seem currently the cheapest. Digitizing images onto disks either 30 cm (12 inch) or CD-ROM seems cheap to actually carry out, but complex steps have to be implemented to compress, index and format images to maximise disk space and minimize retrieval times.

5.2 Primary goals and good management

Regardless of which path is taken to achieving image storage and associated data bases, the importance of proper planning—establishing clear goals and thorough costing of indexing and inputting—seems paramount. Basic questions need to be asked such as what is the final aim? Do we want a pictorial management system? Is preservation only required or is it to promote user access? Is a major aim the supply of quality reproductions? What complexity of associated textual information is required and how is its preparation being achieved? What cost recovery is planned? Can the organisation and staff retain commitment to the project over the estimated "capture" period?

A commercial organisation, which undertakes analogue image transfer to large discs, has the view that a project manager is necessary during image gathering and disc production, and proper budget control is essential even to the point of having a separate computer management system just for financial control.

5.3 Some current optical disc imaging costs

Optical video disc production occurs in three basic phases:

1. Program objectives planning and production, including preparation of aims, budgets and staffing; selection of hardware and software for indexing systems; selection of pictures and preparation of textual information.

2. Post production and premastering, including inputting of indexing information, transfer of pictures to film and then videotape, colour and contrast correction, cue insertion, edition and preparing videotape to disc producer's specifications. Most of this work is carried out by a commercial agency.

3. Mastering and replication of the disc. At present this work is carried out overseas, eg. Germany or Singapore at the commercial disc producers facility. The tape is checked for specification standards and the master disc is produced and inspected. When all is correct the master is replicated and copies checked and packaged.

Costs for steps 1 and 2 above are difficult to determine, however the cheapest picture to film costs are 16 cents per image for materials only. While such negatives are suitable for image transfer, their quality is not satisfactory for later use as a master negative for quality print production. If the original is in slide form no internegative is necessary and the image is transferred straight from slide to tape. Costs of transferring film images either negative or slide are 80 cents to $1 per image. The complete production of the first disc from the tape is about $6,000 for the 54,000 images and, depending on quantities of copies ordered, disc prices vary from $300 down to $40 each.

5.4 New direct-to-videodisc costs

The newly marketed analogue direct-to-disc system offered by commercial production houses provides a cheaper way of capturing images. The company brings their own specialists and equipment into one's organisation to undertake the work. Current rough costs are $400 per day, plus 40 cents per image at the rate of 1,500 images per working day. A standard 36,000 capacity large disc would take 24 days, and the costs of the resulting single disc would be approximately $24,000 (24 days @ $400 plus 36,000 x 40 cents).

Regardless of the type of production system adopted, minimum hardware costs for accessing the completed disc are approximately $14,000. This is made up of a PC, hard disk, keypad and monitor plus the optical videodisc player and colour monitor. Printers for outputs from both the PC and disc player would be extra.

5.5 Digital imaging

Very little information is available about these costs. The relative newness of optical scanning technology for photographs, and its proprietary base makes costs even more difficult to provide than for video disc production. As digital disk information storage becomes widespread optical scanning costs should drop. The use of a commercial production house would seem the best way to proceed, however the Central Army Records Office has established its own large image capturing system as part of its CARO file management on optical digital disk. However no costs are available from this project. The Australian War Memorial is about to undertake an optical digital disk storage and access management system for its thousands of historic photographs. Commercial organisations have been invited to tender for this work.

5.6 Dollar value judgements

It seems very difficult to make quality judgements about the value of optical disc storage for picture collections as so many factors are involved. The claims of commercial organisations need to be weighed carefully against the unforeseen pitfalls of adopting new methods. What price can be put on the protection of a picture collection? What benefits accrue from greatly improved access by the public and serious researchers? What percentage of the costs have to be undertaken anyway just to establish proper intellectual control, regardless of any additional optical image system? As with most undertakings in archives, dreams or possibilities will be tempered by lack of money and staffing restraints.

Even if costs are difficult to ascertain, it is clear that good early planning and program management is essential to achieve disc production and successful implementation, whether it be a small or large scale project. The Domesday Project, the British multimillion pound interactive optical videodisc undertaking involving the BBC, Department of Trade and Industry and Philips Electronics was produced in 1986 to commemorate the completion in 1086 of the Domesday Book. It is considered a reasonably successful example of what can be achieved, but even with all the management resources available, the project cost at least twice its original allocation!

6. Other implementation considerations

6.1 Data elements

Every photograph in a repository could be assigned many content classifications such as subjects, names, place, photographer, technical process etc. In past years this has been attempted using manual systems, mainly card indexes. The amount of detailed work can be overwhelming and maintenance of systems very difficult. Valuable and achievable information for researchers may be given in analytical descriptions of groups of photographs and indexes at the collection, series folder or album level. Having individual images stored on optical disc has meant that, for proper management, individual description is needed. As stressed earlier, this may be the most time consuming and intellectually challenging task in constructing an image/database.

Description depends upon using language in a consistent fashion to represent meaning, and some standards have evolved that may be useful for consideration or adoption. These include the MARC-VM format and the *Descriptive Terms For Graphic Materials* published by the US Library of Congress.

6.2 APAN Draft Standards

An attempt has been made in recent years in Australia to develop standard descriptive terms for photographs by the Australian Photographic Access Network (APAN). This group was formed in 1985 by curators of photographic collections in NSW government institutions. Although APAN has at least temporarily disbanded, they developed a draft set of standards comprising 23 data elements to facilitate the transfer of information about individual photographs. These were designed for either

Table 2
Apan Group Data Elements for the Exchange of Information About Single Photographs

No.	Name of data category	Name of data element	Type of data element	Synonyms	Definition	Vocabulary
1	Institution Details	Institution	Mandatory	Owner Location Custodian	The name of the institution which has possession or custody of the image and is responsible for documenting it.	NAG Art Gallery of NSW NAM Australian Museum NAO Archives Office of NSW NGP NSW Government Printer NSL State Library of NSW NAS Museum of Applied Arts and Sciences NMM Macleay Museum NNM National Maritime Museum
2		Record Number	Mandatory		The number which uniquely identifies the institutional record relating to the image.	
3		Accession Number	Mandatory	Registration Number Negative Number	A number associated with the objects by the documenting institution for the purpose of identification.	
4	Image Details	Title	Mandatory if known	Original Title	A word, phrase, character, or group of characters naming the image or the work contained in it as attributed by creator.	
5		Assigned Title	Defined		A word, phrase, character, or group of characters naming the image or the work contained in it not assigned by creator.	
6		Subject	Mandatory	Key Words, Descriptors	The subject, people or place depicted by the image.	Key words by priority 1 2 3 4 5 6

No.	Name of data category	Name of data element	Type of data element	Synonyms	Definition	Vocabulary
7		Place of Creation	Defined	Place of Execution	Where button pressed to make original image.	
8	Date	Date of Creation	Recommended	Date of Execution	The date the button was pushed which created the image.	YYYY/mm/dd
9	Inscription	Inscription	Defined		A dedication, note, phrase, or number written or marked on the image.	
10	Photographer	Creator	Mandatory if known	Photo-grapher	The person, group or body chiefly responsible for the creation or artistic content of the image.	
11		Sex of Creator	Recommended			
12		Nationality of Creator	Recommended			
13		Birth Date/ Death Date of Creator	Recommended			YYYY/mm/dd
14		Manufacturer	Defined	Producer Workshop Printer	The person, group or body responsible for the fabrication or physical manufacture of the image if different from creator.	Given Name Surname Title Studio Street Year (YYYY/mm/dd) Other
15	Medium Details	Characteristics if first gener-ation photo-graphic recording	Recommended		What are the physical characteristics?	Negative Positive Transparency Daguerreotype Ambrotype Tintype Paper Wet Plate Dry Plate Film Polaroid B and W Handcoloured Colour Stereograph Other

No.	Name of data category	Name of data element	Type of data element	Synonyms	Definition	Vocabulary
16		Dimensions of 15	Recommended		Height followed by width in mms of image.	
17		Characteristics if second or later generation photographic recording.	Recommended		What are the physical characteristics?	Copy negative Glass plate Film Positive Transparency Original print Copy print Albumen print Gelatine print Plastic print B and W Handcoloured Colour Stereograph Other Opaltype Contact Enlargement Polaroid
18		Dimensions of 17	Recommended		Height followed by width in mms of image.	
19	Donor/ Restriction Details	Source	Defined	Donor	Provenance	Given Name; Surname; Title; Street; City; Telephone Number; Other
20		Restriction	Recommended		Any restriction on access.	
21	Condition Details	Condition	Recommended	Conservation Survey Elements	A description of the quality or state of preservation of the item.	Complete; Incomplete; Tarnished; Corroded; Scratched; Creased; Emulsion Lifting; Faded; Stained; Dirty; Cracked or Torn; Fire Damaged; Buckled; Solarized; Other
22	Association Details	Asociation Details	Defined		Details of people, places, events and dates associated with the object.	
23		Comments	Defined		Any information not provided for the above.	

manual or computer use, and adopted as a guide by indexers of the NSW Government Printing Office video disc project. They were used also in the HISTORA software program designed specifically for archives and adopted by the Macleay Museum at the University of Sydney.

The International Museum of Photography in New York used a modified MARC-VM format, with up to 47 possible data elements to provide description of its 400,000 photographs, when adopting optical video disc as an image database.

Searching a collection of images accessible by secondary subject description, however extensive the data elements might be, means that the user, is at the mercy of the indexer's interpretation and biases. In assigning titles or descriptors the picture is judged in some way. Few picture indexers would claim to pass judgement on the images they describe yet, when they choose headings, subjective decisions are made. These may involve moral, political and intellectual judgement and reveal to users what the indexer believes the picture is about. It is therefore important that qualified cataloguers or indexers carry out this work, hopefully maximising the accuracy and integrity of the description.

6.3 Copyright

Those undertaking the dissemination of optical disc images, either by sale of disc copies or image printouts, may need to take care not to break copyright law. Copyright procedures existing in archives and museums may not be adequate to allow for these distribution methods, and care may also be needed to avoid breaking donor agreements.

The US Library of Congress has established the principle that copyright materials should not be stored on their optical discs or disseminated from discs without the consent of the copyright owner in a license agreement.[23] This may or may not involve royalties. The Library of Congress has been a leader in managing copyright problems relating to document storage on optical digital disk. They established an advisory committee of publishers and librarians to address the issues raised by optical disc and by 1986 had negotiated permission to put more than 70 journals onto digital disk for public use.[24]

One way of avoiding potential problems is to put onto disc only those pictures without copyright restriction, or where copyright resides with the archive. This policy is adopted by the Museum of Victoria who, in their collecting program, only accept images free from donor restrictions. It would seem a pity if images were omitted from the database because of copyright or other restrictions. A better approach would be multiple level access to the image base with restricted access to these images.

Those planning to market discs of their archive's collection should be aware of their obligations under the Australian Copyright Act 1968.

Conclusions

Susan Sontag, the leading American critic on photography writes

> '. . . photographic images . . . now provide most of the knowledge people have about the look of the past and reach the present. Photographs furnish evidence. Something we hear about but doubt seems proven when we're shown a photograph of it."[25]

Until recently historians often looked upon photographs as an afterthought, illustrating existing conclusions, not as primary sources in themselves. The lack of documented evidence about photographs—subject, time, location or other identification—has not helped. Conversely, much description of photographs has taken place to aid their cataloguing, resulting in words getting in the way of the image—the visual dismissiveness discussed earlier.

Optical disc technology provides a way of accessing images, not only photographs, but two and three dimensional works of all kinds. In archives this assists preservation of the original and provides accessibility. It may be that one day optical disc or a similar technology will actually replace the original, but this paper's aim has been to focus on its use as a control for archivists and as a finding aid. Thus new possibilities, such as image manipulation and updateable disks, are not seen as major concerns.

The choice of optical disc type is certainly a difficult one. For black and white image storage, both video disc and digital disk methods are suitable, while at the present time only video disk has the storage capacity to handle colour. Approached from another perspective CD has appeal because at least there are some industry standards, whereas no proper standards exist for the other two formats.

There is no doubt that optical video disc is a viable image storage system and it is widely used especially in North America. This is why it has been the major method detailed in this paper. The cumbersome image transfer system can be greatly reduced by direct to disc methods, but at the cost of not having any intermediate negatives for future use.

Optical digital disks both large and in the CD format are however challenging "traditional" video discs. Even in the last year, compression techniques have enabled the image storage capacity of digital disks to be increased. Capacity figures of up to 14,000 black and white images are now discussed as possible on one 4.72 inch disk, unheard of two years ago. Technological change of this rapidity create nightmares for those wishing to implement new systems. No one wants to choose a tried system that is outdated before it is implemented, nor opt for a new technology only to find it remains a proprietary oddity.

If implementation of optical disc is planned in the near future, serious consideration should be given to delaying choice of the physical medium until the picture becomes clearer. This does not mean the primary descriptive work—the preparation of the textual information to accompany each image—could not be carried out. In the near future much could hinge on the acceptance of large digital disks as information stores, and agreements being concluded on format standards.

The future scenario for optical disc technology as an archive image storage medium may therefore include:

1. The wider acceptance of digital imaging.
2. The use of 12 inch (30cm) digital disks for either large collections of photographs or to provide very high quality fine detail image reproduction, especially useful for artworks. The Australian War Memorial has selected this path for its photographic management system.
3. The acceptance of CD in ROM form or WORM form as a storage medium for smaller collections, and as a cheaper solution. Even if 5000 images can be stored on a disk this would provide a convenient image database for some. A Melbourne company already offers a document storage system with a capacity to store this number of black and white images. They can be scanned at 300 pixels per inch onto a 4.72 inch WORM disk and controlled by an Apple Macintosh computer. Full text searching of the associated database is possible if required. However retrieval times are slower and scrolling more difficult than with a video disc system.
4. The use of DRAW (Direct-Read-After-Write) erasable and updateable compact disks. These can be considered similar to conventional hard or floppy disks, enabling updating of existing data and correction of mistakes. These are already marketed but are of limited storage capacity at this stage.
5. The possible decline in the use of optical video disc. Major acceptance of large digital disks by industry and government would be necessary for this to result. Video disc has two large advantages in the image storage field—capacity to handle large quantities of colour images and fast retrieval times. However its limited applications in the market place—as a storage/retrieval medium for images and in interactive form as an education and training aid—may not be solid or broad enough for it to maintain continued support.

It seems reasonable to assume that the move to optical disc will be easier in the future and less of a gigantic step. Instead of going from no imaging system to a disc of 54,000 in one step, albeit a complex one of film, video tape, master discs, etc., new ways will be possible. Disc sharing is one option, such as combining several regional picture collections onto one disc, thus spreading costs. As discussed earlier, CD WORM and widely used personal computers are available to smaller archives, museums and libraries. Better and friendly software is coming onto the market at reasonable prices. It should be easier to establish pilot programs, or small scale systems, which can be expanded later, spreading costs as well. The possibility now exists to have updateable disks of images as well as updateable text files.

This is not to gloss over the problems with digital disks, including the slow retrieval times, the lack of capacity to store many colour images, the problems of restricted scanning sizes and the necessity to convert all dissimilar forms of data into a common format.

Whichever path is taken no permanent loss of the data should occur. Both video discs and digital disks are quite stable mediums with a reasonable life. If technological change makes them redundant, it should be possible to electronically transfer the information to a new medium.

Like the technologies that have preceded them, optical media are not panaceas. Their successful implementation will demand changes in emphasis. It is exciting to be able to store thousands of images on a single, rapid, user friendly, on line retrieval system. However, as with any commitment to introducing a new technology into an archive program, it requires clearly set goals and careful planning, management and implementation.

APPENDIX

CASE STUDY—LIBRARY OF CONGRESS

In 1982 the US Library of Congress commenced the Optical Disk Pilot Project to explore the potential of optical storage media in library preservation, storage and service applications. The project, which concluded in late 1988, was in two parts: the Nonprint Project which aimed to store still and motion images on analogue video discs plus sound recordings on compact audio disks, and the Print Project which focussed on the storage of scanned images of print material—especially periodicals and government publications—on digital disks. The failure of an earlier project for the storage of catalogue cards on digital disk helped promote this long term evaluation.

The Nonprint Project was to make creative use of existing technology—optical video discs and compact audio digital disks—while the Print Project was to create and use new technology in a better way. Five facets of the Nonprint Project were to be evaluated:

1. Technical aspects—preparation of material and creation of discs.
2. Copyright and donor restrictions.
3. Preservation.
4. Research access and use—how well the discs and hardware performed from the user's point of view.
5. Dissemination—promotion of knowledge about the discs and their capabilities.

The Prints and Photographs Division of the Nonprint Project includes photographs, posters, cartoons and architectural drawings, and three still image discs have been produced. Originals were copied onto 35mm film then transferred to video tape and disc. This film size was chosen as its resolution offered a reasonable preservation copy of all of the images, and it may be transferred to future high definition optical formats without the need to rephotograph the originals.

Access to the database is via a micro-computer with the disc player. As no approved MARC format for visual images existed during development of the project, an abbreviated MARC system was used to provide information about the pictures. Browsing of images is also possible. The experimental nature of the project has meant that adequate descriptive fields are not possible as terms have to be related to the library's catalogue format.

In 1984 the first optical video disc station in the Prints and Photographs Division was opened to the public, with an additional station opened in 1986. The concept of machine readable textual records, linked with images instantly available on an adjacent monitor, was assessed as being beneficial to the interrelated problem of access, preservation and security encountered in all visual material collections.

As the Optical Disk Pilot Project has just recently concluded little formal published results are available. However it has been decided that optical disc technology will have a permanent future role in the Library of Congress, and expansion is planned in both analogue and digital areas. Because of the breadth and scope of this pilot study—only one aspect has been briefly described here—the conclusions, whatever they be, will have a major influence on the adoption of optical disc technologies in information management including archives.

CASE STUDY 2—NSW GOVERNMENT PRINTING OFFICE

For many years the NSW Government Printing Office provided photographic services to other government departments. The resulting collection of photographs, both prints and negatives, has built up from the 1860s and been augmented over time by other collections, especially the Star newspaper collection in 1910, and material from the Maritime Services Board.

The GPO has thus been acting as a repository for approximately 200,000 photographs on behalf of government departments, as well as accepting important archival material from others. The users of this collection have been mainly the creating government departments, no public access policy existed.

Access to these extensive files has previously been very time consuming. Indexing systems did exist, but location and identification often involved direct handling and inspection of glass plates, putting valuable originals at risk. However a new picture management system, involving optical video disc, has been established to assist protection of the collection, and provide public access to many thousands of historical photographs.

The proposal to proceed with this undertaking was submitted and approved as a Bicentennial project, and resulted in the establishment of Search Tech Pty. Ltd., as a joint venture between the GPO and the NSW Investment Corporation. The proposal had two major aims:

1. The intellectual and physical control of the 200,000 photographs. This included identification, description and indexing of each image, then recording them on video disc and linking this with specially designed software, for fast and simultaneous access to image text.

2. To develop optical video disc systems and services that could be marketed to others.

The first aim has been almost achieved as the fourth disc of images covering the years 1981-87 is currently in production. All the photographs from the 1870s to 1987 are now on optical disc. The GPO, through its Laser Picture Studio business venture, is marketing both photographs and discs.

The Search Tech system includes a video disc player and a standard micro-computer. All negatives and prints are first transferred to 35mm slide format, then recorded with sequential control numbers onto video tape. After checking and error correction this is transferred to optical disc. Trained indexers prepare text for the database by combining information from original catalogues with appraisal of the photographs themselves. A standard description sheet was adopted during the project. The image descriptors conform closely to the Australian Photographic Access Network (APAN) draft standards. Contract staff are used to input description sheet details into the database.

Two software packages were developed during the project, JUST IMAGINE and IMAGEX. JUST IMAGINE allows serious users to search a large database containing detailed descriptions of photographs. The search is made using a combination of words, phrases or dates. Both images from the disc and textual information from the databases are presented simultaneously. IMAGEX allows public access to the database and images, but operates through menus rather than commands. This is designed primarily for casual users in unmanned public exhibitions, and was used in the Bicentennial Exhibition at Sydney's Darling Harbour. Coin operated thermal printers can be linked with both systems. Plans are in hand to publish an extensive thesaurus of contemporary subject terms and place names.

The joint venture Search Tech Pty. Ltd., is actively promoting its numerous services, which include image copying and transfer to disc, indexing and cataloguing, video disc production, software supply, video disc sales and project management. They are committed to analogue optical disc, including the recently available direct-to-disc recording methods.

The GPO project is the largest picture image transfer project to take place in Australia. It could not have been achieved however without the extensive funding it received.

CASE STUDY 3—MUSEUM OF VICTORIA

In March 1985 the Museum of Victoria began a pilot project to collect copies of pictures taken by the general public from 1839 to 1939. The Curator of Photography, while responsible for an existing collection of 250,000 photographic items , undertook this project for two main reasons. Firstly to overcome a perceived bias in the existing collection towards important events and notable people, by increasing the stock of ordinary popular or "snapshot" photographs. Secondly to preserve images being lost for all time through poor storage or destruction, by those failing to appreciate their worth. Subject areas of interest covered by this project include living and working conditions, housing, farming methods, dress, sport and social activities.

The resulting collection of images cannot be regarded as valid archival records. Proper consideration is not given to context or provenance, and accepting the resulting individual photographs in isolation reduces their informational value. They are not original records, thus the preservation of the informational content is really only a desperate measure to preserve at least some images from the past. However it is of interest as optical disc technology is used as a way to manage the collection, and it is the only known use of this medium for image storage in Victoria.

The project involves inviting the public in selected Victorian locations to bring photographs to temporary project centres. Chosen photographs are copied several times on site by Museum staff, and donors are asked to complete data collection sheets and copyright releases for each photograph. Originals are then returned to the owners. Back in the Museum, one 35mm negative is filed as a master and the other as a working negative. The data is transferred to catalogue work sheets for input into a personal computer. Every descriptive word and number is cross-referenced and 14 basic categories with various sub-categories are available on the database, which is multilevel and updateable. A sequential numbering system is used for each image.

Initially a basic library software program CARDBOX was used in conjunction with images on microfische and this proved a quite inexpensive way of establishing access. However images have been transferred to video tape and optical video disc with 11,000 photographs now stored on two discs. CARDBOX PLUS has now been adopted for the database, along with a locally developed program LASER, for linking the disc storage with the database. Searching is achieved by use of keyword, an index of subjects, or access number. Scrolling of images is possible as are printouts of both text and images. Quality photographic prints may be ordered and are provided from the working negative.

A wide range of users is anticipated and sale of discs is seen as a marketing possibility. Two books of images have been published from the project, *Private Lives-Public Heritage* and *Mum and Dad Made History*.

The visual history collection project, while not archival in principle, is safeguarding many thousands of images that may otherwise have been lost, and minimal expenditure has been a feature of its achievements so far.

FOOTNOTES

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6. Victoria. *Evidence Act 1958 No. 6246* (incorporating all amendments to 1987).
7. Pennix, op. cit., p. 28.
8. R. Kesner. *Automation for Archivists and Records Managers: Planning and Implementation Strategies*, Chicago: American Library Association, 1984, p. 112.
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10. At this point an explanation of the word DISC is necessary. When discussing video (analogue) images, the accepted spelling of the storage mediums are tapes or DISCS. However the terms used for general computer information (digital) are either tape or DISKS of various types. Up until recently optical video disc has been the only medium of this kind being used for photographic image storage, however very recent developments in digital storage mean that digital disk is being used as well. The DISC/DISK may be exactly the same physically but the information storage method (analogue/digital) causes the use of different spelling. The correct contextual spelling has been adopted throughout thus the word DISC/DISK varies accordingly. DISC has been adopted where both types are discussed collectively.
11. International Museum of Photography. *On-Line Use of GEH Interactive Cataloguing Including Biography File and Videodisc*, (paper) New York: International Museum of Photography, 1988 (Unpublished).

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