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The 20th century saw the rise of audiovisual media and with it the birth of audiovisual archiving, a profession that confronted many challenges in dealing with a variety of mostly analogue formats. With the increasing dominance of digital formats, the current century will see far more profound challenges for audiovisual archivists.

The following essays address this issue from two different perspectives: an overview of the digital technology specifically related to projection, and the digital strategy of an audiovisual archive. Setting the scene, the first article examines the state of digital cinema with the aim of giving the reader an insight into the potentially dramatic transformation that awaits movie goers. However, digital cinema is just one of many new technologies that an institution like the National Film and Sound Archive (NFSA) will have to cope with in the next few years; thus, the second article explores what a NFSA digital strategy might involve and the particular challenges that will be faced by all institutions collecting audiovisual works.

A REVIEW OF DIGITAL CINEMA

David Watson

Whole books have been devoted to the subject of digital cinema, a technology that has the potential to dramatically change what we see on the big screen, not just in the format of the images, but in our choice of programs. In this article, I will analyse the impact of digital cinema by attempting to answer four basic questions:

- **What is digital cinema?**
- **What is digital cinema being used for today?**
- **What is the future for digital cinema?**
- **What is Australia doing with digital cinema?**

My brief is to review the subject from a technological perspective; therefore, some of what I have to say may require the use of specialised language. However, it is my hope that by the end of this article the reader will have a better grasp of the questions I have posed. Also, I aim to provide a clear understanding of the intellectual and strategic position of the National Film and Sound Archive (NFSA) on this subject and how the organisation will use digital cinema in the future.

WHAT IS DIGITAL CINEMA?

Since the birth of the motion picture industry over a century ago, what the audience has experienced in cinemas has mostly been based on the projection of 35mm film prints. The business model that underpins our cinematic experience has changed little in that time. A negative is used to strike the requisite number of prints according to the perceived commercial prospects of a film. The prints are then distributed to individual cinemas according to the release pattern and the dictates of the associated marketing campaign. If we get the opportunity to see the film early in its first run in a major market, we will share in the pleasure that can be derived from seeing a new print. However, if we don't get to see the movie until late in its release pattern, we may witness a print that has been projected many times and we run the risk that our enjoyment will be diminished by print problems, with scratches being the most common. If we're in a regional area and therefore well behind the major metropolitan areas, it is even more likely that we will have a less than optimal cinematic experience owing to the fact that the print will have been projected hundreds of times.

One thing that has changed substantially since the birth of cinema is the marketing and distribution of films. Now, it is common to release films across the world in a very narrow window of time. This is partly a marketing tactic, but it is also about minimising the amount of revenue lost to piracy. Such release patterns require a large number of prints and this has led to a substantial increase in the cost of distributing films.

In recent years, as a response to these concerns, the motion picture industry has become interested in the development of an alternative presentation methodology based on the use of digital technology. This model is based on the distribution and projection of digital files (instead of prints). This approach is attractive for four main reasons:

- **Cost.** The average cost of creating a film print in Australia is around A$2–3,000. A common Australian release pattern would see at least 50 prints struck. If you look at much bigger markets such as the USA, India or China and calculate the cost of a print run for a major film, it is easy to see that there is a powerful incentive for reducing this overhead. In addition to the expense involved in striking prints, there is the cost of their shipping and destruction

after projection.

- **Quality.** With projection based on digital files, the quality of the moving images on screen will be the same on the thousandth screening as on the first.
- **Security.** Digital files reduce the impact of piracy.[1]
- **Flexibility** of programming in the cinema(s). If all screenings are file-based, then an exhibitor has far more options for juggling the screening schedule.

It is vital to understand that what I am discussing is a presentation format and that the concept of digital cinema used in this article has nothing to do with the film production process. Whether a movie is shot on film, high definition video or any other format is immaterial in this context. How it is processed into a finished form is also not pertinent. At some point in the production process, a digital master file of the final release version can be created, and it is from here that our story about the digital cinema presentation process begins.

One of the beauties of current film presentation is that it is standardised, and has been so for over 100 years with no significant change in the basic structure of the projection equipment. Yes, there are things like aspect ratios to worry about, but if you have the right lens on your projector and the ability to mask the projected image, you can show any pristine 35mm film print and know that the images will be sharp, clear, and hopefully, if the director intended it, you'll be able to experience the warmth and richness of images shot on film.

However, with digital file-based projection, life is not so simple and before proceeding further, it is important to talk about two concepts that impact on the quality of the image you see projected on the screen: resolution and image compression. In digital cinema a single frame of 35mm film is represented as a series of pixels. Pixel is short for 'Picture Element', a tiny dot that is the smallest part of an image as represented by a computer. It is the matrix of these dots that constitutes the entire image. The more pixels you have, the higher the resolution and the more detailed the image will be.

In this article, 'resolution' refers to the number of pixels represented horizontally in a frame. In the film industry, this is a common shorthand and is used as an indication of the depth of detail or quality of the images. For example, the commonly used term '2K resolution' is 2048 pixels represented horizontally. Or, to be more exact, a 2K image resolution is 2048 pixels by 1080 vertical lines for each frame[2]. The term '4K resolution' stands for 4096 horizontal pixels or 4096 by 2160 for each frame. A resolution of 1.4K is 1400 horizontal pixels by anything up to 1050 vertical lines, which essentially means you have a lot less digital information with which to display the moving images than with 2K resolution. By way of contrast, a 4K resolution has many more pixels and therefore should offer a richer, more detailed image when projected than either a 1.4K or 2K resolution. It should be borne in mind that the digital image is an approximation of the film image and does not offer the same kind of textural quality. This does not imply that it is better or worse: it is merely a different mode of visual representation.

Turning to the concept of image compression, if we digitise a film to achieve a 2K resolution, we will need over 2 million pixels to represent a single frame. This equates to approximately 10 megabytes of computer file storage. For a two-hour film, just under two terabytes of computer disk will be required to store the film. These large file sizes are not practical for use with the storage and transmission technologies available today. For digital cinema to be commercially viable, there is a need to compress the images so that the file sizes are more manageable.

Broadly speaking, there are two forms of compression that are relevant to digital cinema: 'lossless' and 'lossy' compression. Lossless compression is a technique whereby the image content of a digitised moving image object gets compressed without loss of information and the image is not altered. 'Lossy' compression, on the other hand, does involve altering the image and information is lost. Lossy compression is always more efficient in terms of file storage, but at high levels of compression the image is markedly different to the original. Lossless compression is less efficient in terms of storage (achieving approximately a three to one reduction in the file size needed for moving images). There are many lossy compression standards and some prominent examples include MPEG[3] 1, MPEG 2 (the most widely used standard for digital video) and MPEG 4.

Basically, there are two major types of digital file-based projection in the world today, and the main difference between them is screen resolution (the role of compression will be discussed later). Moving images projected digitally with a screen resolution of less than 2K are commonly known as E-Cinema (for 'electronic cinema'). Moving images projected digitally with a screen resolution of 2K or greater are known as D-Cinema (for 'digital cinema'). In this article, I will stick to these two definitions when referring to either format specifically. However, the reader should be aware that in the film industry the phrase 'digital cinema' is often used across the whole spectrum of screen resolutions. In other words, the term is collectively employed as a descriptor for both D-Cinema and E-Cinema. As the current terminology has nothing better to offer, I too will use the term digital cinema in this generic sense for the purposes of my argument.

So, let's take a look at the two types of digital cinema. First, a quick overview of D-Cinema. An important development in the digital cinema field is the release in 2005 of a standard which sets out the technical requirements for the encoding, mastering, distribution, security and presentation of digital cinema works. This standard, the Digital Cinema System Specification (version 1.0, issued on July 20, 2005), is the product of a consortium known as Digital Cinema Initiatives, LLC (DCI), which was created in March 2002 as a joint venture between Disney, Fox, MGM, Paramount, Sony Pictures Entertainment, Universal and Warner Bros Studios. The DCI consortium has stated that "DCI's primary purpose is to establish and document voluntary specifications for an open architecture for digital cinema that ensures a uniform

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[1] This is a significant issue in a country such as India, where it was estimated that piracy was depriving the film industry of at least 40 per cent of its potential revenue prior to the introduction of digital cinema.

[2] To keep matters simple, I have used the DCI standard which is described later in this article rather than go into aspect ratios and scanning rates.

[3] MPEG stands for the Moving Picture Experts Group, which is an ISO (International Standards Organisation) working group responsible for defining standards for the encoding, compression and playout of video images.

and high level of technical performance, reliability and quality control" (see the website www.dcimovies.com).

There are three key elements of the DCI standard for our discussion: resolution, compression and security. The first key element is that the standard defines 2K resolution as the minimum projection standard for digital cinema. The standard also supports 4K resolution, and many in the industry recognise 4K as the eventual future standard for digital cinema. Importantly, the DCI standard has no room for resolutions below 2K (hence the term E-Cinema, which Hollywood insiders often use in a pejorative sense). In the future, and for many years to come, Hollywood studios will be producing two distribution formats for their films – 35 mm film prints and 2K DCI-compliant digital cinema files, which can only be screened in cinemas with DCI-compliant equipment.

The second key element of the DCI standard is that its protocol mandates the use of the lossless compression standard JPEG 2000[4] for the creation of the digital files that are distributed to DCI-compliant cinemas. This means that the server used in each DCI-compliant cinema must be capable of decoding JPEG 2000 for screenings.

The third key element of the DCI standard is security. The standard mandates both the encryption of digital cinema files and the use of secure pathways in all stages of the distribution and exhibition chain. In addition, digital cinema files can be distributed via satellite, via a Virtual Private Network over a high speed telecommunication link, or via hard disk (usually a USB drive). The DCI standard is agnostic on which methodology is used. As long it is secured by tight access controls, any distribution method can be employed. This is an area of substantial savings, as the cost of shipping a multi-reel film is significantly higher than the cost of shipping a hard disk, which at the moment is the most economical method of distributing digital cinema files.

The DCI standard has been in development over three years, and while it is an important milestone in the distribution of films produced by Hollywood, other parts of the world have been pursuing a different direction based on what is currently known as E-Cinema. This is selling extremely well in India and is also doing well in China, although the Chinese market seems divided between 2K and 1.4K installations. There are also significant E-Cinema installations elsewhere in the world; for example, the CinemaNet Europe project which I will discuss later.

So, why has E-Cinema carved out a significant niche despite its lower quality, and why isn't everyone waiting for the DCI standard and then implementing that? Let's examine the situation in India, where E-Cinema represents a leap forward compared to the existing film distribution and exhibition model, and the business case is strong. There is a relatively low dependence on Hollywood for content in India, as the local film industry produces over 800 feature films a year spanning a number of centres and languages. It is so much more than the Hindi-language film industry centred in Mumbai – the so-called Bollywood – that most people know about in the West. A typical Indian film release involves 200 to 300 prints; the first wave of distribution targets the major metropolitan markets and larger regional cities. Piracy is rife in India, and by the time a new film makes it to the rural areas, most of the audience has already seen it at one of the local video clubs specialising in screening pirated films. Additionally, the prints are worn and scratched by the time they get to cinemas in the villages. This fact, combined with the often poor quality of projection equipment in rural areas, leads to an often sub-standard cinematic experience.

It is important to note that to date, and in contrast to the DCI standard, all E-Cinema installations use an MPEG compression standard for the creation of the digital files. Predominantly, this is MPEG 2 with files encoded at very high bit rates (generally in the vicinity of 80 megabits per second so as to achieve a quality suitable for projection in a cinema), but more recently we have seen the emergence of MPEG 4 AVC (H.264)[5] as a viable alternative for E-Cinema encoding and presentation.[6] The advantage of MPEG 4 AVC (H.264) is that a good-quality result can be achieved with much smaller file sizes than can be achieved using MPEG 2, which alters the cost equation of the various distribution methods (for instance, satellite and data links become feasible options). The other major advantage of using an MPEG encoding standard is that it is mature technology – the standards are widely used, well understood, and there are plenty of equipment choices available at affordable prices.[7] Regarding security, it's reasonable to say that most E-Cinema installations implement a good level of security over distribution and exhibition, but not with the rigour required by the DCI standard, and therefore the cost of the security regime is almost certainly lower with E-Cinema.

Indian producers are quite happy about having their films screened digitally at 1.4K resolution. They are also happy with the quality of MPEG 2 (and more recently MPEG 4) encoding. E-Cinema provides a means by which a new film can have a wider release pattern than is the case with current film distribution (especially if satellite distribution is used). This has an obvious marketing benefit, but can also help reduce the impact of piracy on revenues, as the content can be out in rural areas much earlier than would be the case in a traditional film distribution model. It is also worth noting that a movie projected digitally at 1.4K resolution represents a much better viewing experience for people accustomed to heavily worn film prints, and although the projected images may not have the sharpness of 2K resolution, 1.4K images are still vastly better than what the audience has been used to. The economic argument is stronger too, as the cost of a 1.4K projector is far less than the average 2K projector.

The DCI-compliant 2K resolution-based future is now starting to gather some momentum with the number of announcements of installations starting to grow. Late in 2005, Sony commenced production of the world's first 4K digital cinema projector. Support for the DCI-adopted standard JPEG 2000 is growing as manufacturers release encoding equipment and digital cinema servers capable of creating and playing JPEG 2000 formatted content. However, despite the hype, there is a strong degree of resistance from exhibitors about installing DCI-compliant equipment. Today, a typical DCI cinema installation (projector, server and associated equipment) will cost in excess of A$150,000. This is three to four times the cost of a 35mm projector (not to mention the upgrading costs, something

[4] JPEG means Joint Photographic Experts Group, an ISO committee. This committee developed the compression standard JPEG 2000.

[5] This is a relatively recent standard which enables the creation of good quality video images at much lower bit rates than is possible with MPEG 2. The resultant video files are smaller in size, therefore requiring less storage. Also, they consume less bandwidth when transmitted. This standard is considered highly promising for use in High Definition television as it will enable the transmission of two to three times as many High Definition channels than is possible using MPEG 2.

[6] For example, DG2L Technologies was awarded a contract in 2005 for installing an MPEG 4-based digital cinema solution in 2,000 cinemas controlled by Indian exhibitor United Film Organisers. At the time of writing, 150 systems have been installed.

[7] JPEG 2000 encoders and cinema servers only started entering the market in late 2005.

which is unnecessary for 35mm projectors). On the other hand, a 1.4K E-Cinema installation (projector, server and associated equipment) can be done for about A$60,000.

Moreover, there are higher operating costs[8] and the prospect that in five years time, the digital equipment will be obsolete and need to be replaced. Turning your hardware over every five years is a standard practice in the IT industry where PCs and servers are considered obsolete after that length of time. This is in part due to the increased risk of hardware failure and in part due to the hardware's inability to support contemporary software. Digital cinema is essentially a computer system – why would we expect it to be different to any other computer system? If we are willing to accept this premise, we face the challenge of getting payback on the high cost of DCI-compliant equipment over a five-year life cycle.[9] Needless to say, many people have been wrestling with this issue and inevitably the answer they point to is reaping the benefits of digital cinema today through E-Cinema, with its much lower cost of ownership.

WHAT IS DIGITAL CINEMA BEING USED FOR TODAY?

The lower cost of distribution and exhibition, together with the programming flexibility of digital cinema, provides an opportunity to broaden the range of cinematic works available to the public. Around the world, the question is being posed; can digital cinema be used to provide specialised films with a narrow target audience greater opportunities to reach their audience? Let's look at two examples with contrasting approaches.

CinemaNet Europe (formerly known as EuroDocuZone) has built a network that had the original purpose of providing distribution for documentary films, but now shows a wide range of specialised works to audiences who otherwise would not have had the opportunity to see these films in a cinema. The network was launched in 2004 and now comprises about 180 cinemas across eight countries: Austria, Belgium, France, Germany, The Netherlands, Spain, Slovakia and the UK. The projection standard is based on 1.4K resolution, primarily because with the available funds, this allows many more installations than if they adopted 2K as a standard. Also, their experience has been that audiences are often unable to distinguish between 1.4K and 2K projections. Indeed, in small cinemas the 2K projectors have been found to be too bright.

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Last year an alternative to the approach used by CinemaNet Europe was launched by the UK Film Council. Using National Lottery funding, the Council commenced rollout of its Digital Screen Network project, a network involving over 200 cinemas across the UK, at a cost of approximately £13 million. The Council has contracted Arts Alliance Media Limited to install 2K projectors and cinema servers with JPEG 2000 capability – in other words, a DCI-compliant solution, although initially and up until JPEG 2000 reaches maturity in the marketplace, digital cinema encoding and playout will be performed using QPE (Quality Priority Encoding). The main reason that the UK Film Council mandated 2K projectors for its digital cinema rollout is to ensure that the participating cinemas will be able to screen Hollywood-sourced digital content when it becomes available. In exchange for the installation of the equipment, each cinema commits to showing a certain amount of specialised cinema per year.

Other examples of digital cinema network rollouts include the RAIN Network in Brazil, AVICA's program in Ireland, Emerging Pictures in the USA, the Folkets Hus och Parker network in Sweden, and the AFC's Regional Digital Screen Network in Australia (see page 5). Some of these networks use 1.3K resolution projectors, some use 2K. Some have commercial objectives, some have the objective of providing alternatives to mainstream cinema.

What all of these projects demonstrate is a definite interest in using digital cinema to broaden our cinematic horizons beyond that which is offered by mainstream commercial cinemas. In other words, to reverse the trend towards the narrowing of choice that we have witnessed since the rise of the multiplex. Many people who care about diversity in cinema see digital cinema as an opportunity, not a threat.

WHAT IS THE FUTURE FOR DIGITAL CINEMA?

By the time you read this, the worldwide total of digital cinema installations will have passed the 1,000 threshold. A recent estimate of the total number of commercial cinemas in the world was in excess of 120,000. Clearly, there is a long way to go. Who is going to pay for this equipment, its continued maintenance and upgrade and its replacement in five years time? This debate has been going for a few years and probably will for the foreseeable future. The most optimistic estimates talk in terms of five to 10 years before digital cinema installations outnumber film-only installations.

Perhaps it is time for some innovative business models to foster a move toward critical mass. For example, the Thomson company recently announced a deal with Twentieth Century Fox for a services-based approach: "Under the terms of the agreement, Twentieth Century Fox will distribute its film content digitally throughout the United States and Canada, and pay a virtual print fee to Technicolor Digital Cinema for content played on screens equipped with Technicolor systems, beginning in the first quarter of 2006. Twentieth Century Fox's support of the Technicolor Digital Cinema plan covers an initial rollout of complete digital projection systems in up to 5,000 DCI-compliant screens over the next 3–4 years. Thomson, through its Technicolor Digital Cinema business, intends to deploy at least 15,000 digitally-equipped screens in the United States and Canada over the next 10 years through the initial rollout and additional phases."[10]

For a number of years, discussion about digital cinema has been concerned with the technology – what will be used, standards and how it compares to film, to name but a few issues. Now, discussions about digital cinema are increasingly centred on business issues. It is still quite common to focus on the technology, but with its maturation and the promulgation of standards, what really

[8] For example, lamps need to be replaced every 1,000 to 2,000 hours of operational life, filters need periodic changing and the projectors require servicing on an annual basis.

[9] In the motion picture industry, some people argue that this life cycle is more likely to be seven years. However, this would entail a higher level of risk in terms of system breakdowns as the equipment ages.

[10] See www.dcinematoday.com/dc/pr.aspx?newsID=362 for more details.

matters is the business model. As digital cinema is essentially built on computer hardware and software and not mechanical devices (eg 35mm film projectors), the operating paradigm is more akin to a traditional IT system where it is paramount to ensure that the level of support for the system is appropriate to the perceived risk of failure and the impact of revenue loss due to any system outages. Over a five-year life cycle, this probably means putting in place a support structure that will be more costly than that required for film projection. Thus, in the foreseeable future, the business model for digital cinema must account for both higher capital and operating costs. This is undoubtedly a daunting prospect for exhibitors.

WHAT IS AUSTRALIA DOING WITH DIGITAL CINEMA?

Until very recently, Fox Studios (Sydney) and the Australian Centre for the Moving Image (Melbourne) were considered to be the only cinemas in Australia equipped to show features digitally. Both sites are endowed with projectors capable of projecting 1.2K resolution digital cinema. This situation changed with the release of the Disney film *Chicken Little* – some cinemas showed this film digitally, and in 3D. However, there has been a substantial take-up of digital technology for pre-show use such as trailers and advertising. Well over 250 cinemas in Australia are equipped with digital projectors with resolutions ranging from 1K to 1.4K.

The NFSA has a substantial collection of analogue audiovisual material, and the vast majority of access and preservation is performed using analogue means. It is stating the obvious that there is rich potential to utilise digital technologies to improve the preservation and availability of the national collection. With the increasing trend towards 'born-digital' material, the need to install digital infrastructure becomes more imperative; thus the NFSA has developed a Digital Strategy based on archival principles and practices. Part of the Digital Strategy is devoted to outlining how the NFSA sees digital cinema fitting into its collection-building, preservation and exhibition activities.

With respect to digital cinema, there are two major areas that will have a direct impact on the NFSA in the near future. First, the NFSA needs to develop the ability to support requests for encoding, encryption and distribution via hard disk of both E-Cinema and D-Cinema (at 2K resolution and compliant with the DCI standard) material. This will be needed to support the likely increase in demand for digital cinema content as the number of digital cinema installations increase. If, as anticipated, there is a trend towards diversification in what type of content is shown, then there is the possibility that more archival screenings will be programmed in order to demonstrate and promote the specificity of the cinematic experience in its original form. This means the NFSA will need to maintain both 35mm prints and digital cinema masters of the most important films in its collection. The NFSA is building an archival theatre in its own premises, a venue that will be offering diverse programming highlighting the cultural significance of the national and international moving image heritage. As the NFSA Theatre project evolves, the NFSA will need to install support for digital cinema and be capable of projecting up to 2K or higher resolution (in compliance with DCI standards). However, digital cinema screenings will only be an adjunct to one of the core missions of an audiovisual archive – the presentation of programs projected on film, thus preserving the enjoyment of watching a film on a big screen in a venue with a large number of people sharing that unique experience.

Second, by installing encoding facilities for JPEG 2000 – the DCI standard – the NFSA can use these facilities not only for digital cinema mastering, but as a preservation tool for videotape. The storage costs associated with digitising the NFSA's over 40,000 hours of videotape and storing the content in an uncompressed format are daunting. By storing the content using the lossless compression standard, JPEG 2000, the disk storage required drops to almost one-third of what would be required if the content was stored without compression. This is very important to a national audiovisual archive. Digitisation of videotape could take place with MPEG 2, but as this is a 'lossy' compression standard, information will be lost forever. JPEG 2000 offers the opportunity to digitise videotape without throwing away information and the resultant digital files will require far less computer storage than would be the case if the files contained uncompressed video.

In other words, JPEG 2000 represents an excellent cost-effective compromise.

In the longer term, the NFSA will need to position itself for the challenge of acquiring works that are only available in a digital cinema format. The NFSA will need to make decisions as to what digital format it will preserve – will it seek the uncompressed digital 'originals' or will it be sufficient to preserve the digital cinema distribution master? How will the NFSA acquire these digital files and how will it store them? Also, how will the NFSA manage the migration of the large files that a digital archiving strategy mandates?

The Australian Film Commission's Industry and Cultural Development (ICD) Division is establishing a digital network focusing on regional sites that have virtually dropped off the radar as far as distributors are concerned. The sites on the Regional Digital Screen Network (RDSN) may be cinemas (already operational or not), or they may even be community centres. In regional Australia, there are currently limited opportunities for the screening of films. Freight of 35mm films is expensive, and it is difficult to recover this cost due to the small size of the audiences. Also, by the time a film gets to regional venues, it is often long after the major city release, by which time the effect of the national marketing campaign has dissipated.

One of the major goals of the RDSN is to enable the simultaneous release of films in regional areas and Australia's major cities. It is hoped that the lower cost of the digital cinema model, including the lower cost of shipping hard disks to regional centres, will facilitate exposure to a wide range of Australian works. Currently, regional audiences are either denied these opportunities, or else the quality of presentation is often mediocre as the prints are usually well into their lifecycle and may be damaged or scratched. The works screened on the RDSN will not only be narrative fiction features, but also documentaries and short films.

Digital cinema represents a chance to create greater avenues for specialised or independent works to be screened.

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The current commercial cinema structures are heavily skewed towards the screening of Hollywood products. The art house sector, the major challenger in the past, is suffering a sharp decline. Can digital cinema, with its greater flexibility and lower distribution costs, provide a means of exposing more specialised works to audiences? Does this mean we could have a reversal of the trend towards everything being controlled by the US industry?

Finally, is there an opportunity to create a digital cinema network model somewhat akin to the UK model or the CinemaNet Europe model? Is there the possibility of providing an exhibition alternative which will enable less commercial products to be screened? Getting low-budget Australian films into cinemas is often a great challenge – can a digital screen network alleviate this and provide audiences with more choice? These are all important questions, the answers to which will depend upon the action being taken at this time of dramatic change in the way we experience moving images, both individually and collectively.

CONCLUSION

The year 2005 may prove to have been a watershed in the history of the development of digital cinema. A standard for 2K and 4K resolution digital cinema has been issued. This will almost certainly lead to more movies being available in dual formats – film and digital. However, there is still a great divide in the world between the two forms of digital cinema. Less than one per cent of the world's cinemas have installed digital projection for features, and E-Cinema has established a strong foothold. Such duality is likely to exist for many years to come, as the higher capital and operating costs of D-Cinema will mean its adoption is beyond the reach of many exhibitors across the globe.

How will this play out in Australia? The use of E-Cinema for pre-show content has achieved significant market penetration, yet exhibitors are wary as the business case for D-Cinema does not yet seem compelling enough. Few seem willing to shell out A$150,000 or so for technology which is likely to be obsolete in five to seven years and for which little content is currently available. Furthermore, exhibitors ask, who is going to benefit from the savings? The debate between the various sectors of the industry may well lead to new business models that progress the rollout of digital cinema from its present state of near invisibility.

For the NFSA, it is vital to maintain the dual choice between the photochemical experience and the digital experience. It would be a betrayal of the NFSA's mission if such choice was not available to future generations – that's why archives and museums exist.

Finally, is there an opportunity to use digital cinema as a means of expanding the range of films available to Australian audiences, and enhancing the role of museums and archives dedicated to the history and culture of the moving image experience? This is possibly the most exciting aspect of digital cinema's future – using all of digital cinema's advantages to make a dent on the homogenisation of viewing choice that we have witnessed over the last couple of decades. Recently, I was reminded of one of my regrets in my past experience as a filmgoer when I saw Jacques Audiard's *The Beat That My Heart Skipped* (2005), a remake of *Fingers*, directed by James Toback and released in 1978. I have never seen *Fingers*, and its release in Australian cinemas was limited – it was clearly a marginal film; today *Fingers* would be a straight-to-video release in this country. Perhaps in the future, via digital cinema, so-called marginal films will have a chance to be screened in a cinema. You still may have to be quick to catch the film, but perhaps a home theatre viewing will not be your only option for all the films that do not fit the definition of mainstream.

This is possibly the most exciting aspect of digital cinema's future – using all of digital cinema's advantages to make a dent on the homogenisation of viewing choice that we have witnessed over the last couple of decades.

THE QUEST FOR A DIGITAL STRATEGY – QUIXOTIC OR REALISTIC?

David Watson

The main objective of this article is to provide a rationale for the NFSA's newly finalised Digital Strategy and to inform readers of the particular challenges audiovisual archives face in making their collections available online. To begin with, I need to provide some context, as recent changes in the audiovisual media offer the prospect of having a profound impact on audiovisual archives and their future. In mapping out a digital strategy, it seems important to have a good understanding of how our users are interacting with the digital landscape.

Over the last few years, we have witnessed an explosion in the availability of content in digital formats. This phenomenon can be explained by The Long Tail theory, a term coined by Chris Anderson[1], according to which markets fragment into many small niches. Each niche may not represent many consumers, but when combined the aggregate is substantial. For online retailers such as Amazon, money can be made not only from popular products, but from catering to niche tastes as well. For a 'bricks and mortar' retailer, the cost of keeping a slow selling title on the shelf cannot be justified. However, in the online world, not only are the inventory costs less, but with the aid of powerful filtering and recommendation tools consumers for niche products can be reached wherever they are in the world.

Two examples are worth mentioning. First, the astonishing growth in material available on DVD, from commercial blockbusters to television series from the 1960s. Recently, I saw an advertisement for a series of works by the great Japanese film director Kenji Mizoguchi, and wondered what the size of the worldwide market for such a series would be. Would it be measured in the hundreds? Whatever the size, it is definitely a niche

[1] Chris Anderson, *The Long Tail* (London: Random House Business Books, 2006).

market that was seldom reached during the days of VHS.

Second, the explosion of content available on the Internet. At the time of writing, the number of music tracks available for downloading was well over a million. The music available online covers a wide spectrum of genres. Again, in accordance with The Long Tail theory, many very specific niche tastes are being satisfied. This trend looks set to be replicated in the online video world. With recent advances in video encoding, the quality of moving images that can be streamed in the range of 500 kilobits per second (Kbps) to one megabit per second (Mbps) will suffice for a wide range of consumers, especially as the content can ultimately be viewed in a wide range of situations. Purists may be alarmed, but remember, most people were quite happy with VHS. Importantly, at these bit rates and with the kind of now legal 'BitTorrent'-style peer to peer file sharing solutions now available, one does not need to have a connection to the Internet measured in megabytes per second. Recently released movies are now available for download from websites and it seems inevitable that the trend towards downloadable moving images is going to be as the same as that for music.

THE DIGITAL FUTURE – SOME SCENARIOS

Is any of the above relevant for audiovisual archives? Is it a threat or an opportunity, or can it be completely ignored? I think the answer is complicated and to a large extent depends on what sort of archive we are talking about. If it is an archive that concentrates on collecting feature films, then perhaps there is something to worry about. In 10 to 20 years time, when digital cinema is pervasive, will these kinds of archives struggle in their attempts to collect digital cinema files? Will copyright owners say "you can have our film negatives because it costs real money to store them, but not our digital file masters as it costs peanuts to store them"? Undoubtedly, the big studios may well be able to afford the necessary digital infrastructure required to preserve their films digitally, but what about independent producers?[2]

If we are talking about an archive such as the NFSA which has a collection with a breadth well beyond feature films (some would say its strength is in newsreels, news film and actuality footage), then perhaps the digital future represents an opportunity. If we are able to digitise a significant amount of our large holdings of analogue material, then we will create a vast pool of content that people will want to access online. For example, the NFSA could be one of the few places in the world where people will be able to listen online to songs performed by Billy Williams.[3] Also, our newsreel holdings may become a valuable online resource for people who want to learn more about life in Australia in the first half of the 20th century. It's true that the copyright owners may decide to undertake the expense of performing the digitisation required,[4] but not all rights owners will make this choice, so I do believe there are opportunities for an audiovisual archive in an online world.

What about analogue feature films in the NFSA's collection? In Australia, for the producers who own the rights to Australian-made analogue feature films, the cost of creating a digital cinema version is likely to remain prohibitive for the foreseeable future, but what about versions for the Internet? If a producer can afford the cost of issuing a DVD, then a low-resolution Internet version is perhaps not too much of a stretch, but then they will need someone to host it.

The Norwegian Film Institute has initiated a project called Filmarkivet.no, which is providing online access to films where the rights are controlled by third parties. As of early 2006, the Institute had contracts with more than 100 rights owners spanning approximately 2,000 film titles of a wide variety of types. The contracts (or licences) specify the revenue split for each online film use. Apparently, Norwegian rights owners have been very keen to participate as most of the films are no longer in commercial distribution and thus the online service provides a revenue stream for very little effort on the part of the rights owner.

This example suggests that it is possible for an archive to participate in this kind of market. The evidence so far is limited, but in markets devoid of large studio systems (such as Norway and Australia), audiovisual archives potentially have a role to play in the digitisation of analogue features and their subsequent digital distribution – either as low-resolution online viewing copies or high-resolution copies screened in a digital cinema. Is this situation so different from today's analogue world? Do we leave the creation of online versions to the private sector, or should the NFSA have a role if the private sector is unwilling?

What I am less confident about is the role of an audiovisual archive in a world where all commercial products are born-digital. Will producers be willing to give copies to a national audiovisual archive? I do not know the answer to this question and the shape of future collecting is a subject for another essay. I do believe that with its substantial collection of analogue material, the NFSA could have a role in the online world. Currently it lacks the means to achieve this, but if it can overcome the resources hurdle, there is an opportunity to become an online destination for a wide range of niche audiences.

THE NFSA'S DIGITAL FUTURE

Given growing expectations about the availability of digital content in Australia, people have begun to ask the question "why are our audiovisual cultural institutions so far behind other cultural institutions when it comes to making their collections available online?" A common question from clients of the NFSA who conduct online searches of our collection database is "where is the online content?" A valid point when you consider that the total number of digital objects available for online access from the NFSA's website totals almost 9,000, of which 95 per cent are still images and the remainder audio items.

There are almost 700,000 items in the NFSA's online collection search database and the total size of the NFSA's collection is more than 1.4 million items. Thus, only about one per cent of the items described in the NFSA's online collection search database are available for online access. However, the total number of audio and still image items in a digital format is just over 54,000. A little over 19,000 items are browse quality and thus approximately 53 per cent of these browse quality digital objects are not available for access via the Internet.

The NFSA's new collection search tool features a Google-style interface which makes it much easier for clients to search the NFSA collection. It will be so much easier for them to identify the content of interest to them, but this ease of use carries a downside – the new system will highlight the lack of content available for Internet

[2] This is not a trivial point as I will explain later – if the studios want to still be making money from their digital feature films in 40 years, then they will need to have performed at least eight migrations of the master over that period.

[3] Billy Williams was an Australian singer whose recordings date back to the early part of the 20th century.

[4] The British Pathe Film Archive is an example where this has happened. See www.britishpathe.com, where digitised newsreel items spanning 1896 to 1970 are available for online preview.

access. Users will cry "you've made it easier to search your collection, but why can't I look at any of it on my desktop?" Users will contrast the NFSA's situation with that of other cultural institutions that have much larger percentages of their collection online. They will also reflect on the fact that in the era of online video sites such as YouTube and Google Video, the NFSA has not a single item of moving images available for preview from its website.

So what is stopping us? If we know the user's needs, why have we been unable to provide online access to our collection? Australia is not the only country grappling with this challenge. Recently, a consortium of six Dutch audiovisual institutions announced a massive project called 'Images for the Future' which involves €173 million invested over seven years. This project aims to preserve, digitise and make accessible 137,000 hours of video, 22,510 hours of film, 123,900 hours of audio and 2.8 million photographs.[5] In the consortium's report, two major obstacles were identified to making this material widely available. The first was the deterioration of the analogue media; the second was lack of accessibility to that media. Their report described the growth in demand from the education sector in the Netherlands and how there was a need for audiovisual material to be integrated into the curriculum.

In the United States, the Library of Congress is undertaking the development of a National Audio Visual Conservation Center at a cost in excess of US$120 million. The Library of Congress has one of the world's largest collections of audiovisual material and one of the main purposes of the new Center is to undertake the mass digitisation of a substantial component of their collection.

Another recent announcement is the Video Active project,[6] the aim of which is to improve online access to 11 European television archives holding 10,000 television titles. The project's website states that "Video Active will also explore the historical role of the media in shaping these European experiences. There is a very large appetite for this kind of material, both within educational and academic communities, but also amongst a sizeable general public. People want to see and use broadcast archival material concerning the cultural history of the European nations."

If the NFSA commenced digitising its videotape collection using three staff, the task would take about 30 years to complete. The salary costs alone would be in excess of A$4 million.

To return to the question of what is stopping the NFSA from providing greater online access, in my view there are two fundamental impediments to making audiovisual collections available online. First, the scale of digital infrastructure required and second, the challenges that emanate from the rights ownership complexities for the bulk of our collection.

As can be seen from the examples quoted previously, in each case a massive financial investment is being committed to the goal of digitising a large collection of analogue material. In compiling the NFSA Digital Strategy, the NFSA identified a number of digital infrastructure challenges that needed to be overcome in order for the NFSA to make the great leap forward from the heavily analogue-oriented organisation that it is today. Meeting these challenges over the next few years will require substantial funds. So, are there features inherent in audiovisual material that demand large investments to achieve digital goals? In planning the infrastructure required, the NFSA addressed similar issues to those most probably faced in the planning of the projects I have quoted as examples. I believe that any audiovisual archive that wishes to avoid the perception of being a digital laggard needs to face up to the two fundamental impediments identified in the previous paragraph by answering the following key questions:

- What are the digitisation priorities?
- How do we go about the digitisation task?
- How do we store the digital copies?
- How do we preserve our digital copies?
- How do we make the digital copies available?
- How do we handle the rights issues?

I am not suggesting these are the only questions to consider, but if you have a clear strategy for handling these questions, you will be well on the way to having a relevant digital strategy for a 21st century audiovisual archive. Owing to space constraints, in discussing these key questions, I am going to focus on what the NFSA needs to do in order to transform a large analogue collection into a large digitised analogue collection. I do this because of the urgency of some of the tasks and because of the costs involved. If this agenda can be met, it will be a good start. Issues to do with born-digital objects is a story for another day.

WHAT ARE THE DIGITISATION PRIORITIES?

On the whole, digitisation for preservation purposes has been avoided by audiovisual archives, largely because it is widely believed that analogue audiovisual media remain best for preserving content. This is fine for stable media such as film, which if stored properly is usable for many decades. However, this is not the case for magnetic media. For example, videotape formats from the 1960s probably only have a few more years of life due to hardware obsolescence and deterioration of the tape stock.

Given these issues, audiovisual archives are looking seriously at digitisation as a preservation tool for tape-based material. As there may only be one opportunity to digitise, and rather than be stuck with a low-resolution browse quality copy (which will look awful on the display technology of 30 years hence), many archives have made the best digital copy they can and called that the preservation copy. This does not mean the analogue original is discarded – it is stored in case it is ever needed again.

The NFSA has preservation digitisation programs in place for both still image and audio material, which will take 25–30 years to complete. With the encoding standards being used, this should be a once-only task, and barring a disaster we should not need to re-digitise this material. The NFSA's collection of videotape (estimated to total 40,000 hours) represents a significant slice of Australia's television history and is in urgent need of preserving. Already, due to the deterioration of videotape, some iconic Australian television programs (eg episodes of *Homicide*, *Division 4*, and *This is Your Life*) have been lost for future generations.

[5] See www.beeldenvoordetoekomst.nl/documents/Beeldenvoordetoekomst_summary.pdf for more information on Images for the Future, site hosted by Beeld en Geluid (Sound and Vision).

[6] See http://videoactive.wordpress.com/ for more information.

HOW DO WE GO ABOUT THE DIGITISATION TASK?

If the NFSA commenced digitising its videotape collection using three staff, the task would take about 30 years to complete. The salary costs alone would be in excess of A$4 million (the capital costs are also substantial as will be explained later). Undoubtedly, migrating the videotape content to a digital format is the best way of preserving it, but a migration program that spans 30 years is fraught with risk.

All audiovisual archives with large collections of videotape face this dilemma and the only viable solution is to embark on a mass digitisation program. A number of archives have already commenced digitising their video collections using a pool of staff. It's a labour intensive, time consuming process, but until recently there was no alternative. However, a highly cost-effective methodology has become available involving a robotic digitisation system. The acquisition of a robotic digitising system does require significant funds, but such a system would ensure that all 40,000 hours of videotape could be copied in less than three years for a total cost far less than in the alternative described above.

Another important topic for consideration when planning a digitisation task is compression. Nobody is going to fund the huge cost of storing uncompressed audiovisual digital material. To illustrate this point, a number of broadcasters have commenced the task of digitising their archives of videotape commonly using lossy compression standards (see page 2 for a discussion of 'lossy' and 'lossless' compression standards).[7] Basically, this means that some of the video information is lost. As there is no intention of ever re-doing the digitisation,[8] this high-resolution version will become the best copy available.

For most broadcasters, who have tens of thousands of hours of content, they probably feel they have little choice. If their mass digitisation projects were to either create uncompressed files or even use a lossless compression standard,[9] the computer storage required would increase the cost of the projects dramatically to the point where the business case was no longer justifiable. Also, it can be argued that most of the re-purposing potential of a broadcast archive lies in low-resolution media such as Internet streaming and handheld devices. The compromise made in creation of the master will not be a problem as the loss of quality will not be noticed in the eventual display destinations. When watching a segment from a favourite sitcom on a mobile phone while sitting on the train going to work, how likely is it that people will say "I wish the TV company had digitised to the highest quality possible all those years ago when they had the chance"?

My intention here is not to take a pot shot at broadcasters, but to illustrate the commercial reality of their archival decisions. For a public archive such as the NFSA, these arguments are simply not tenable. For television material, the NFSA needs to digitise to the highest quality available to maximise the chances of survival for posterity. Ideally, this means we would choose to create uncompressed digital files, but when faced with large collections and high storage costs, even public archives need to compromise and use lossless compression standards such as JPEG 2000 (as described in the previous article on digital cinema).

HOW DO WE STORE THE DIGITAL COPIES?

To digitise 40,000 hours of video requires 2,000 terabytes (equivalent to two petabytes) of computer storage. The good news is that by using JPEG 2000 compression, we save 4,000 terabytes of storage – encoding the video into uncompressed files would require 6,000 terabytes of storage. The bad news is that with 2,000 terabytes (TB) of content, we still have substantial technology infrastructure requirements. Many people keep telling me the price of disk storage is dropping and to think disk, but if I was able to get all the disk I needed for A$4,000 per TB, the cost to store all 40,000 hours of video content would still be A$8 million.[10]

At this cost, the only realistic option is to store the content on computer tape. Using the preferred three copy model,[11] we need 18,000 tapes[12] to hold three copies of our JPEG 2000 compressed video files – one copy in the tape robot, one stored on-site and one off-site. The cost of the tape stock alone is of the order of A$1.4 million. We might decide to increase our risk exposure and just operate with two copies – one in the tape robot and one off-site. Purists will object, but I would argue at this order of magnitude, it's a reasonable compromise which leads to a saving of about half a million dollars. If we make this compromise, factoring in the cost of the tape robot and associated hardware still leaves us needing A$1.5–2 million.

HOW DO WE PRESERVE OUR DIGITAL COPIES?

The methodology for preserving analogue items is reasonably straightforward and well understood. However, digital preservation throws up new challenges that are neither straightforward nor well understood. For the NFSA in the future our digital collections will broadly comprise two types of objects – those dependent on a computer operating system (usually these objects have an interactive element) and those that are not (eg digital cinema files).

It is not my intention to fully describe all the challenges of digital preservation, but I do need to make this point. Analogue preservation and digital preservation share the need for copying as a major strategy for preserving the original. What differs is that the analogue task, if done properly, may well only need to be done once in the case of film, or occasionally, in the case of tape (for the purposes of exposition, I make the assumption that the resources are available to perform these tasks).

In the digital domain, the copying task should ideally occur at least every five years for the entire lifespan of the digital object. This task is called migration. For a small collection, this might be a disk to disk transfer, but for larger collections, this means a computer tape to computer tape transfer. For anyone not familiar with the

[7] The standard often used for the creation of high-resolution digital masters is MPEG 2 at 50 Mbps I Frame.

[8] The original videotapes will most probably find their way into the collections of public archives – the broadcasters are keen to get rid of the tapes as they take up valuable storage space.

[9] It should be noted that JPEG 2000, the most practical lossless compression standard for moving images, is still not widely implemented. When a number of the digitisation projects were commenced, the choice of a lossless compression path was simply not an option.

[10] By way of contrast, for a digitised collection of 500,000 photographs, we will need approximately 75 gigabytes (GB) of disk storage, and 15,000 GB (15 Terabytes) of nearline tape storage. For backup copies, we will need to store approximately 30,000 GB on about 76 tapes if we are using LTO-3 tapes. The cost of all the tapes we need for this regime is just under A$10,000. Throw in the cost of disk storage, a server, a small tape robot and a few other bits and pieces (eg network equipment), and I could reasonably expect change from a budget of A$100,000. Of course, there are ongoing costs and over three to five years, I can expect to spend at least that much again on keeping the system operational.

[11] The common practice for cultural institutions is to maintain up to three copies of each digital object. For large digital objects, one preservation copy would typically be stored on a nearline device such as a tape robot, while two backup copies would be maintained, one on on-site and one off-site, ideally several kilometres away. There also may be copies in existence on a web server, but for the purposes of this exposition I am not including these.

[12] Based on using LTO-3 tapes.

vagaries of the computer industry this might seem strange, but for those who manage information technology and have the task of ensuring the longevity of data, this is a perfectly normal paradigm. The reason being format obsolescence – computer tape formats are replaced every few years and if you do not migrate your data every five years, you run the risk of not being able to do it all. IT specialists know this and factor it into their planning. Hence, an audiovisual archive's digital preservation strategy needs to factor in the cost of the tapes and the cost of the periodic migrations. As we saw in our previous tape cost calculation, for the NFSA's 40,000 hours of video, this will amount to a substantial operational cost.

Another important consideration in a digital preservation strategy is what type of digital objects we are talking about migrating. For digital objects that do not depend on a computer operating system, then the task is straightforward – you just migrate the file from one tape format to another.[13] However, if we have digital objects with computer dependencies, life is harder. For example, a short film encoded in Flash Video in 2005 can certainly be migrated from one computer tape format to another as it is only a file. However, if somebody wants to view the content in 15 years time, what are the chances of it being playable on their Windows 2020 PC? It is highly unlikely. I raise this example to highlight the fact that in a digital preservation strategy, routine migration cannot be relied upon exclusively.[14]

HOW DO WE MAKE THE DIGITAL COPIES AVAILABLE?

Broadly speaking, there are two main ways in which an audiovisual archive can make its collection available to online audiences. First, via curated selections such as online exhibitions or virtual galleries. In this type of collection access, the content is presented in a context – for example, it may be organised in thematically linked ways or as part of a narrative.

[13] Some day in the future there will be a format conversion required as the original encoding format will eventually become obsolete, but based on available evidence, this will not happen very frequently.

[14] Over the last decade or so, a lot of work has focused on a technique called emulation. Put simply, this is a way one computer environment can allow another (older) computer environment to be operable. In our example, the Windows 2020 PC would support a piece of software – an emulator – operating so that the 2005 file can be viewed as if it were a 2005 viewing experience.

Even if we had all the infrastructure needed to digitise the collection and make it available online, we would still have the rights issue to deal with.

The second way of providing access can loosely be described as uncurated. In this method, a user will typically employ an online collection search tool to seek out topics of particular interest. During these searches, the user may discover that for some of the results a digital object is available for online browsing or auditioning. By accessing this, the user experiences an online representation of the object – for example, it may be a full-length program as it was originally broadcast at a low resolution, an excerpt of fixed duration, or a series of thumbnail images. There are a multitude of ways an uncurated object can be presented to an online audience, but what is common is that the object is presented without context over and above the metadata that is made available with the search result. This will probably include a brief synopsis of what the object is, but it is unlikely to provide a curatorial perspective on the object and its relationship to any other material in the collection.

Whichever access method is used, an audiovisual archive faces challenges particular to the media it predominantly collects. A choice is faced between making the files available only for download or making the files available for streaming.[15] For any files that involve long play times, most users find the download times quite inconvenient. If streaming is the preferred method, then we need a server capable of handling the anticipated number of simultaneous streams together with sufficient bandwidth. This infrastructure can be costly to acquire, and is certainly costly to operate.

HOW DO WE HANDLE THE RIGHTS ISSUES?

Approximately 96 per cent of the NFSA's collection is analogue in format, and the rights for perhaps 90 per cent of the collection are controlled by external parties. Very few of the NFSA's holdings are available for online access and thus very few Australians have an opportunity to enjoy the rich diversity of the collection. Even if we had all the infrastructure needed to digitise the collection and make it available online, we would still have the rights issue to deal with.

In this article, I'm not going to go into the complexities of the relevant Australian legislation as there are a number of excellent articles on what is permissible. Furthermore, the legislation has been reviewed recently and there is now the promise of a new legal framework that provides audiovisual archives with more scope to digitise their collection materials. This should provide audiovisual archives with a clear right to digitise collection material to ensure the preservation of the analogue object. In addition, users may be able to access low-resolution digital copies on the premises of audiovisual archives without first having to seek the permission of copyright owners.

For want of a better term, let me introduce the phrase 'analogue access business model'. By this, I mean a situation in which the NFSA provides the bulk of its access on-site – if you want to view or listen to analogue collection material away from NFSA premises, you have to obtain permission from the copyright owner, who may or may not levy a fee. The copyright clearance process can take time – a couple of days is good, a few days typical. Then, when the clearance comes through, the NFSA ships it to the client's location. Hence, the time from the initial request to actually getting the material to preview may take a week or so.

For filmmakers and researchers, this business model works well enough, but what do we do if we have a digital access copy? Do we say to our clients, you have to get copyright clearance before you can have the file streamed to you? Some clients might find it laughable that we would use an analogue access business model to provide online access to digital content. So, what might a 'digital access business model' look like?

Several years ago, I had a pretty clear idea of how I thought audiovisual archives needed to address the digital rights issue. Essentially, I believed that there were two major aspects to the business model that the NFSA needed to

[15] Streaming is a form of data transmission between a server and an end user computer (client) which enables the user to commence playing the content during transmission. Strictly speaking streaming is a form of file download, but streamed files are not stored on the client computer. Files are transmitted in small blocks, stored temporarily, played out and then the blocks are deleted to clear space for subsequent blocks.

RESEARCH FELLOWSHIPS

CALL FOR APPLICATIONS

The Centre for Scholarly and Archival Research (CSAR) at the National Film and Sound Archive (NFSA) has been established to encourage and facilitate research into Australia's historic and contemporary moving image and recorded sound culture.

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pursue. One was the licence – I believed that there needed to be a clear agreement between the rights owner and the NFSA over a period of time as to what digital content could be made available and in what form. Second was the revenue – if the rights owner stipulated that Internet delivery could only take place for a fee, then the NFSA needed a Digital Rights Management (DRM) system in place to manage the collection and disbursement of fees. This was at a time when DRM systems were starting to come into vogue and before the dot com crash. It was my view that an audiovisual archive could not only be a source of content, but also a content broker between the client and the rights owner. At the time, very few people shared my view and now, with hindsight, I am doubtful that this will ever come to pass.

Clearly, if we were content with only providing online access to that part of the collection where rights are not controlled by an external party, then our situation is relatively easy as all we would have to do is solve the infrastructure issues which I touched on earlier. If we want to do better than that, then we need a rights management system – by this I mean a system where we capture all of the rights information which we have obtained, usually via a licence agreement. It seems to me that the licence issue is fundamental. The licence might be limited to specific audiences (eg educational) or very low-quality digital copies, but importantly it defines the means of online access to content controlled by a rights owner.

How many rights owners will be willing to sign up to licences for free access to their content? If the answer is deemed to be insufficient to meet our access obligations, what can we do? I believe there are basically two answers to this question, an optimistic answer and a pessimistic answer.

The optimistic answer is what I used to believe and that is to tackle the digital rights dilemma by offering rights owners a revenue stream as outlined above. The Norwegian Film Institute, referred to earlier, is one audiovisual archive following this approach. The pessimistic answer is that rights owners will want to maintain full control of all potential revenue streams and thus there is little or no opportunity for audiovisual archives to provide online access to their content.

GAZING IN THE CRYSTAL BALL

Assuming the NFSA secures the funding it needs to digitise some of its analogue holdings and it has reached a point where there is very little, if any, analogue audiovisual material left to collect, what will the NFSA collection look like and what will be its future shape? My crystal ball gazing, for what it's worth, suggests that we will still have a very large collection of analogue material safely stored and rarely used in analogue form. Analogue feature films will be shown in those cinemas that still have the capability, but access to the rest of the collection will be via the digital copies of the analogue master. Some of this digital access will take place on site, but the bulk may happen over the Internet as we will have been licensed to provide access. The success of our future collection building will be determined by how well content producers are able to manage an IT infrastructure themselves.

To summarise, the NFSA will have a large analogue collection, a digitised analogue collection and a born-digital collection with poor representation in some categories (eg digital cinema) and better representation in other categories (eg shorts, radio plays, early sound recordings, animation, documentaries, home movies, websites). This will still be valuable content. The Dutch archives believe that their holdings will be a valuable educational resource and a resource for creative industries, and have secured the requisite funding to achieve their goals. Surely the same could be true for the NFSA's collection.

My crystal ball gazing…suggests that the NFSA will still have a very large collection of analogue material safely stored and rarely used in analogue form. Analogue feature films will be shown in those cinemas that still have the capability.

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