

THE DIGITAL DILEMMA 2

Perspectives from Independent Filmmakers, Documentarians and Nonprofit Audiovisual Archives



SCIENCE &
TECHNOLOGY
COUNCIL

THE ACADEMY
OF MOTION PICTURE ARTS AND SCIENCES

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PREFACE

The digital revolution in filmmaking began some 25 years ago with the introduction of digital sound and visual effects. The changes have kept coming at the industry in waves, and the most recent areas to be transformed by digital technology – cinematography, mastering and exhibition – brought to light an unanticipated problem: how to preserve and maintain access to digital motion picture materials.

The Digital Dilemma, published in 2007 by the Academy of Motion Picture Arts and Sciences, articulated the growing concern about the longevity of digital motion picture materials and other valuable digital data. That report explored the issues facing those responsible for preserving digital data in the medical, military and geoscience arenas, and found that they all shared the same problem: there was no guaranteed long-term access to their digital data.

This report was produced through a partnership between the Library of Congress's National Digital Information Infrastructure and Preservation Program (NDIIPP) and the Academy. Although the Library had completed major studies on film preservation in 1993 and television and video preservation in 1997, the impact of digital technologies on the independent filmmaking and nonprofit audiovisual archive communities did not become evident until well into the current century. This project, a follow-up to *The Digital Dilemma*, examines long-term preservation of digital motion picture materials from their perspective. The Library and the Academy felt a separate study was necessary

Preface

because independent filmmakers – both narrative filmmakers and documentarians – create, and nonprofit archives collect and store, a sizeable portion of the nation’s audiovisual cultural heritage. These chronically under-resourced communities should not be allowed to fall through the cracks.

From 2008 through 2011, broad surveys were conducted, many representatives were interviewed, and archival case studies were undertaken to examine the current preservation practices and digital preservation concerns of independent filmmakers and nonprofit audiovisual archives. These communities are decentralized and loosely coupled, and thus very different from the highly structured and commerce-driven Hollywood studios. We therefore developed an approach that we believe has resulted in the most comprehensive study done to date on the challenges facing these communities, and is representative of their current status relative to digital preservation. Relevant historical and technical background information was included in this report to provide sufficient context for otherwise uninitiated readers.

This report also offers suggestions from those interviewed and surveyed, as well as from members of the team that produced this report, that may help independent filmmakers and nonprofit audiovisual archives navigate their way toward a safer environment for their digital works. Some of these suggestions appeared in the earlier film and television preservation studies referenced by this report, but have not yet been implemented. The fact remains that digital data cannot survive unattended, and with the passage of time, answering the call to action becomes increasingly urgent.

Milt Shefter, *Lead, Digital Motion Picture Archive Project*

Andy Maltz, *Director, Academy Science and Technology Council*

A Note about Sources

Many individual filmmakers and senior and staff-level employees of audiovisual archives spoke openly and candidly about what they see happening around the industry and within their own organizations. As with *The Digital Dilemma*, we chose to encourage the continuation of a productive industry-wide conversation by providing a safe environment to express the unfettered views and facts as seen by the “boots on the ground,” and in support of that openness, we chose to leave this information unattributed except where noted. – Ed.

EXECUTIVE SUMMARY

The Digital Dilemma, published in 2007 by the Academy of Motion Picture Arts and Sciences, focused on issues of digital motion picture data longevity in the major Hollywood studios and included comparative investigations of scientific, government and other major enterprises and industries. Among the report’s conclusions was that although digital technologies provide tremendous benefits, they do not guarantee long-term access to digital data; compared to traditional filmmaking using motion picture film stock, digital technologies make it easier to create motion pictures, but the resulting digital data is much harder to preserve. Long-term preservation – maintaining access to content for 100 years or longer – is a key requirement for studio archives. Meeting this requirement necessitates professionally managed digital storage systems and processes at substantial, perpetual operational and capital expense, and oftentimes major enterprise reorganization. This reality will exist as long as technology obsolescence remains an integral part of the digital storage technology business model.

Independent (“indie”) filmmakers operating outside of the major Hollywood studios supply 75 percent of feature film titles screened in U.S. cinemas, despite facing substantial obstacles in doing so. As digital moviemaking technologies have lowered the barrier to entry for making films, competition among indie filmmakers seeking theatrical distribution has increased. Without the benefit of studio backing, these filmmakers must navigate the distribution waters on their own.

New digital distribution platforms may make it easier for indie filmmakers to connect their films with target audiences and possible revenue streams, but these platforms have not yet proven themselves.

Most of the filmmakers surveyed for this report have given little thought to what happens to their work once it is completed. Most pay for some type of storage for the master version of the completed work, but few store their film masters in proper environmental conditions or manage their digital masters using appropriate preservation practices. Many depend on distributors (traditional theatrical distributors, packaged media, pay TV) or new “streaming” platform providers to take responsibility for preservation. In general, independent films that beat the odds and secure some form of distribution do so after a much longer time period than movies produced by the major studios. This time period quite likely exceeds the “shelf life” of any digital work; that is, by the time distribution is secured, the digital data may become inaccessible. Most of the filmmakers surveyed and interviewed for this report were not aware of the perishable nature of digital content, or how short its unmanaged lifespan is compared to the 95-plus years that U.S. copyright laws allow filmmakers to benefit from their work.

Documentarians, defined in this report as independent filmmakers specializing in nonfiction topics, have access to funding sources that are not generally available to the broader group. These funding sources include grants as well as work-for-hire contracts. Unlike narrative filmmakers, documentarians achieve distribution primarily through broadcast and pay television; only a relatively small number achieve wide theatrical distribution. Many documentarians license archival footage for their work, and those surveyed noted the shift to acquisition of historical footage from film to videotape beginning in the 1970s, and then to digital formats in the early 2000s. Surveyed and interviewed documentarians did not seem concerned about or aware of the possibility or likelihood of digitally acquired historical footage being lost. To the contrary, they believed that the Internet and today’s digital technologies offered unprecedented access to historical footage.

Most surveyed indie filmmakers, including documentarians, expressed two primary concerns: getting their work seen by an audience and moving on to the next project. They were therefore focused on securing distribution, with an eye to some measure of revenue generation. Today indie filmmakers face greater challenges in getting their work accepted to film festivals, which historically have been their primary path to theatrical distribution. They have consequently pursued nontheatrical distribution platforms such as direct-to-video and the newer Internet-based video-on-demand services, which can provide an easier path to a paying, if smaller, audience. Unless an independent film is picked up by a major studio’s distribution arm, its path to an audiovisual archive is uncertain. If a filmmaker’s digital work doesn’t make it to such a preservation environment, its lifespan will be limited – as will its revenue-generating potential and its ability to enjoy the full measure of U.S. copyright protection.

The final destination for many independent films – as well as much historical footage – is one or more of the hundreds of nonprofit audiovisual archives in the U.S. (and hundreds more worldwide) that actively collect materials in support of their particular missions. Many years can pass between the creation of such content and its entry into an archive. Archives surveyed for this report stated that increasing amounts of digital materials are entering their facilities through two mechanisms: analog holdings being digitally reformatted, and collections being created in digital form.

The archives estimate that their collective digital holdings will grow from approximately 183 terabytes in 2009 to more than 2.7 petabytes by 2014, a 15-fold increase that will result in individual collection sizes in excess of 100 terabytes. Although archives can take advantage of digital technologies to provide greater access to their holdings, they are generally ill-equipped and inadequately resourced to properly store and manage such relatively large collections of digital materials for the long term. Well-established, time-tested analog preservation practices do not apply to digital holdings; digital materials are fundamentally different from motion picture film and other analog materials. Suitable long-term preservation and access mechanisms for digital motion picture materials have not yet been developed.

At nonprofit audiovisual archives, the decision to start digitizing analog materials, as well as the digitizing itself, quite often precedes the establishment of a digital preservation program. The digital files are typically created to satisfy an immediate need – for end-user access or to preserve deteriorating materials already in a collection – so the program's overall design and implementation are often deferred.

The broader digital library community, which deals with smaller digital files in smaller numbers relative to audiovisual archives, has made progress in addressing digital preservation issues. While the motion picture industry has increased collaboration around these issues, independent filmmakers and nonprofit audiovisual archives suffer from a dearth of financial resources and active collaborative forums. This report describes proposals that may improve the outlook for these groups:

- Facilitating collaboration among representative organizations from these communities on issues of funding, technology and practice
- Organizing cooperatives to share technical infrastructure and knowledge
- Offering more educational opportunities at industry conferences, film festivals and film schools and greater exposure to the technical standards activities of major Hollywood studios and motion picture industry organizations

Executive Summary

The digital dilemma is far from solved. Unless preservation becomes a requirement in planning, budgeting and marketing strategies, it will remain unsolved for independent filmmakers, documentarians and nonprofit audiovisual archives alike. These communities, and the nation's artistic and cultural heritage, would greatly benefit from a comprehensive, coordinated digital preservation plan for the future.

INDEPENDENT FILMMAKERS

1

Introduction

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*More than three times as many independent films
as studio pictures are released each year.*

INDEPENDENT FILMMAKERS

Introduction

The metrics of feature film distribution indicate that more than three times as many independent (“indie”) films as studio pictures are released each year. Of the 706 feature films released in domestic theaters in 2010, the six major Hollywood studios and their subsidiaries released 174 and other entities produced and screened 532.¹ In 2009, members of the Independent Film & Television Alliance, a trade association for independent producers and distributors, produced more than 400 independent features.²

As a group, independent filmmakers typically distinguish themselves from their studio counterparts by having both total creative control of their films and limited financial resources with which to make them. As one interviewed filmmaker astutely noted, the term should be “dependent filmmakers” because they are dependent on friends, relatives and other contacts to help with the production, financing and distribution of their films. That said, a film’s indie provenance does not preclude it from achieving wide critical or box office success. Since 1980, more than half of the films that won the Academy Award for Best Picture have been independent productions, including such recent winners as “Crash,” “No Country for Old Men,” “Slumdog Millionaire,” “The Hurt Locker” and “The King’s Speech.”³

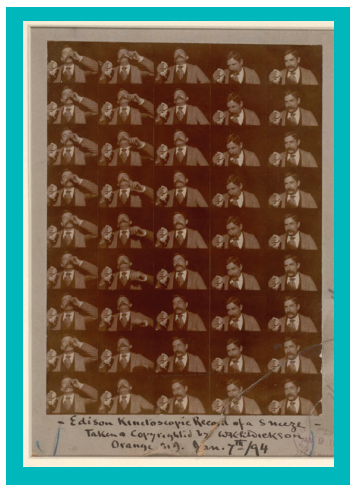
Films developed by studios’ specialty film divisions, or acquired by studios for “art house” or other targeted distribution, are generally

not considered independent films. And while indie films may seem to comprise a fairly new facet of the motion picture industry, these productions have a long and illustrious history going back to very origins of cinema.

A Brief History of Independent Filmmaking

American indie filmmaking arguably dates back to the invention of the motion picture camera.ⁱ

In 1888, Thomas Alva Edison had an idea for augmenting the phonograph, a popular product that played music recorded on wax cylinders. Edison envisioned manufacturing and selling a machine that displayed moving images in time with music. He assigned his assistant, William Kennedy Laurie Dickson, to begin working on the design of a motion picture camera and a hand-cranked peep-hole viewer, which became known as the kinetograph and kinetoscope, respectively.⁴



Edison kinetoscopic record of a sneeze

Dickson arranged for Eastman Kodak to provide for these devices 50-foot-long rolls of motion picture film that were 35mm in width. After building the kinetograph and kinetoscope, he produced a short film of a man smiling, waving, bowing and tipping his hat. Dickson produced many other short films, one of the most famous being of his associate Fred Ott's sneeze in 1894.⁵

By the start of the 20th century, fiction and nonfiction short films were being produced around the world. In addition to kinetoscope parlors, some producers arranged to project their films in makeshift cinemas that were built in empty stores and vacant lots where temporary screens, a projector and chairs were all the accoutrements needed.

In 1908, the Motion Picture Patents Company (also known as the Edison Trust) was formed, and with it came an awakening of certain filmmakers to the inherent problems of one corporation being able to control their art form (and their business).⁶

These filmmakers believed in preserving the artistic integrity of filmmaking – as well as their own authority to distribute and exhibit their films – and took matters into their own hands. Escaping the Trust's patent-based monopoly on film equipment and raw film stock was a major factor contributing to both the development of Hollywood as the center of the motion picture industry and the American independent film movement. The first acknowledged group of filmmakers to launch an independent film studio in the United States was composed of Mary Pickford, Charles Chaplin, Douglas Fairbanks and D.W. Griffith, who together formed United Artists in 1919.⁷ Their aim was to gain more control over their work, and the power of self-determination was to become a major current in independent filmmaking from that point forward.

ⁱ The history of independent filmmaking outside the U.S. is beyond the scope of this report.

With the introduction of portable and relatively inexpensive cameras during World War II, anyone (theoretically) could write, direct and produce a film without studio support. Like the wide availability of today's digital cameras and post-production tools, this had a democratizing effect – practical and economic barriers to entry were reduced. Several acclaimed filmmakers, such as Maya Deren (“Meshes in the Afternoon”), Kenneth Anger (“Fireworks”) and Raymond Abrashkin (“Little Fugitive”) came out of the productive 1940s. In the 1950s and '60s, artist-run organizations such as the New American Cinema Group and its offshoot, the Film-Makers' Cooperative, began to support and encourage films as works of art.⁸ Improved, inexpensive technology also gave rise to the “exploitation” film genre, represented most notably by the films of producer-director Roger Corman. Corman mentored some of the next generation's top directors on their earliest films – Peter Bogdanovich (“Targets”), James Cameron (“The Terminator”), Jonathan Demme (“Caged Heat”) and Ron Howard (“Grand Theft Auto”), to name a few – and his low-budget, quick-turnaround output matched and sometimes exceeded that of the major studios.^{ii 9}

As the 1960s led to “The New Hollywood,” directors such as Francis Ford Coppola (“Dementia 13,” “You're a Big Boy Now”), Dennis Hopper (“Easy Rider,” “The Last Movie”) and Martin Scorsese (“Boxcar Bertha”) helped change the studio system from a completely in-house production line to an acquisition-balanced approach that placed financing, marketing and distributing activities alongside production – a business model that is maintained to this day. On the other side of the country, filmmakers including John Cassavetes (“Shadows,” “Husbands”) and Robert M. Young (“Nothing But a Man”) led the independent movement in New York, continuing through the 1970s and '80s with Melvin Van Peebles (“Sweet Sweetback's Baadasssss Song”), Charles Burnett (“Killer of Sheep”), John Sayles (“The Return of the Secaucus Seven”), Spike Lee (“She's Gotta Have It”) and others.

In 1979, the Independent Filmmaker Project (IFP) formed as an advocacy group for indie filmmakers, followed by the Sundance Institute in 1981 and Film Independent (formerly IFP/West) in 2005. These nonprofits and other similar organizations continue to nurture independent filmmaking today.¹⁰

The indie movement has been a consistent source of significant cultural content in American films. Roger Corman, accepting a 2009 Honorary Award from the Academy of Motion Picture Arts and Sciences, stated:

*“...the finest films being done today are done by the original, innovative filmmakers, who have the courage to take a chance and to gamble. So I say to you: keep gambling...”*¹¹

Independent Filmmaking and Digital Materials

It is not surprising that independent filmmakers were among the earliest adopters of digital filmmaking technologies. Inexpensive digital camcorders and tape stock, desktop nonlinear editing systems, and sophisticated, low-cost visual effects software put powerful creative tools in the hands of any filmmaker with a few thousand dollars to spend, even on a credit

ⁱⁱ The films listed here are these filmmakers' early independent films.

**Almost all
motion pictures
produced today –
regardless
of the capture
medium –
reach a point
of digital
existence.**

card. The elimination of raw film stock and laboratory processing expenses reduces production costs even further. But the same digital-versus-film trade-offs exist for low-budget independent films as they do for studio pictures: the digital data that represents the recorded images and sound needs to be handled very differently from motion picture film and analog audio tape. This topic is covered in detail in the Archives section and reference materials, but some discussion of digital motion picture storage and handling practices here will help provide context for non-technical readers to understand the survey and interview sections that follow.

Born Digital Materials

Digital materials come into existence in one of two ways: they are either digitized from original analog source materials, or they are “born digital.” In the case of motion pictures, a digital film scanner is used to convert film images to digital data for subsequent operations such as visual effects integration or color adjustment, or the images are digitally recorded using digital cameras or digitally created using computer imaging tools. Almost all motion pictures produced today – regardless of the capture medium – reach a point of digital existence when they pass through digital image processing tools during post-production. Motion picture sound tracks are almost exclusively born digital.

Analog materials are relatively easy to care for; little more than proper environmental storage conditions are required to maintain their viability for decades or longer. On the other hand, most digital storage media containing digital data – hard disk drives, data tape, DVDs and the like – cannot simply be stored on a shelf in a cold room. They require active management on an ongoing basis to maintain access to the data. It is important to note that digital videotape formats such as Digital Betacam (“DigiBeta”), HDV and DVCPRO are generally not considered to be as management-intensive as general-purpose digital data recording formats. Because digital videotape recording and playback systems incorporate sophisticated error correction and concealment mechanisms, most physical audiotape and videotape media can be preserved similarly to analog materials as long as the associated recording and playback systems are available.

Active Management of Digital Materials

Motion picture film is a direct-access medium. That is, filmed images can be seen objectively by the human eye, requiring little more than a light bulb and a lens for practical viewing. Digital

motion picture data is an indirect access medium – there are several technological layers between the digital 0s and 1s that represent the images and the fully realized visible picture.

Motion picture film deterioration is easily managed with proper environmental controls, simple inspection procedures and passive detectors that warn of possible chemical degradation. By contrast, digital data of any type is subject to invisible failure mechanisms at many levels – the actual recording media, the data reading and writing system in the digital storage device, the data interface that connects the storage device to a computer, the computer network that connects individual machines, and the many levels of software that control the overall system. Although digital systems can be made to be highly reliable, they must be constantly monitored to detect failures or conditions that may lead to failures, and preventive or corrective actions must be taken to avoid data loss. Regular backup of digital data (copying to another storage medium and transporting to a remote physical location) and verification of primary and backup data are examples of active data management processes.ⁱⁱⁱ

Data Migration

All digital technologies – hardware and software – have a finite useful life. Hard disk drives eventually fail, all computers are replaced by newer models (often with different electrical connections to peripheral devices and new storage media), and computer software never stays at version 1.0. It is true that new generations of technology-based products bring new capabilities and sometimes even cost savings, but one of the consequences of these ongoing advancements is “technology obsolescence,” that is, the continual need to replace old hardware and software with new and sometimes very different hardware and software. The same is true for the digital data containers called “file formats” that hold the 0s and 1s in logical arrangement. File formats evolve over time, and maintaining compatibility among different generations of file formats is not always a priority for technology suppliers. An extreme example of this dynamic is eight-inch floppy disks holding 1980s-vintage documents in the then-popular WordStar word processing format – such documents are very difficult to access today.

One common strategy for dealing with technology obsolescence is to regularly copy digital data to new file formats and storage media, which is called “migration.” In practice, migration requires regular capital investment for upgrading hardware and software, and ongoing operational expenditures to reliably perform the data transfers from the old formats and storage media to the new, which in turn requires dedicated staff with specialized training. This strategy works for some applications and has been used for many years as part of the film preservation process, e.g., creating copies on new film stock, but for technical and operational reasons, its implementation becomes exceedingly difficult and expensive for the large amounts of digital data generated in motion picture production.

Survey Methodology, Results and Analysis

Respondent Profiles

By definition, independent filmmakers are a highly diverse and dispersed community, and they therefore presented a challenge in doing the research for this report. Representative viewpoints

ⁱⁱⁱ The same is true for digital audio data.

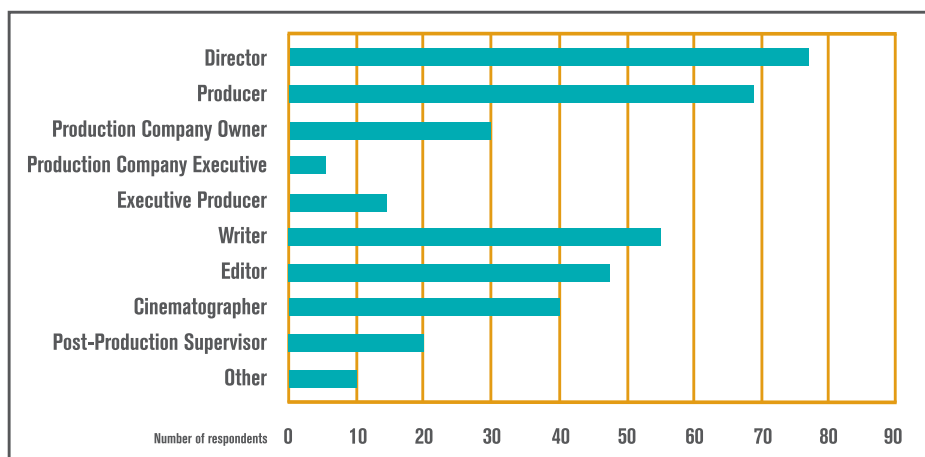
were collected via an online survey form and interviews with approximately 150 indie filmmakers, industry leaders, marketing consultants, film festival staff and others who are involved with various aspects of independent film production and distribution. The survey questions were developed and then made available through *Filmmaker Magazine*, an IFP publication whose editorial content specifically targets the independent filmmaker community. The survey was expected to reach a sizeable pool of indie filmmakers not easily accessed through traditional one-on-one or roundtable interviewing methods, and was expected to produce representative views, but not necessarily statistically accurate or precise data. Subjects agreed to be interviewed without attribution, and their wide-ranging viewpoints are important contributions to developing an understanding of the independent filmmaking community and how its digital dilemma might compare to the one facing the major studios.

In the *Filmmaker Magazine* story that accompanied the survey, indie filmmaker Tom Quinn (who wrote, directed and produced his debut feature “The New Year Parade” about the famous Philadelphia Mummers) foreshadowed much of what was about to be discovered by noting:

“...archiving is not a topic that comes up often when filmmakers trade war stories.”¹²

The following sections summarize the survey and interview responses, and provide selected survey data as well as representative views on the storage and handling of materials, the costs of and responsibility for preservation, and the development of alternative distribution mechanisms. The survey results are reprinted in their entirety in the Online Appendix. The open-ended questions elicited both consensus views and conflicting opinions, and representative statements were selected for inclusion where appropriate. Survey respondents were asked to identify themselves by job function. They were allowed to select more than one job function, since many independent filmmakers “wear many hats.”

CHART 1 Survey Respondent Job Function

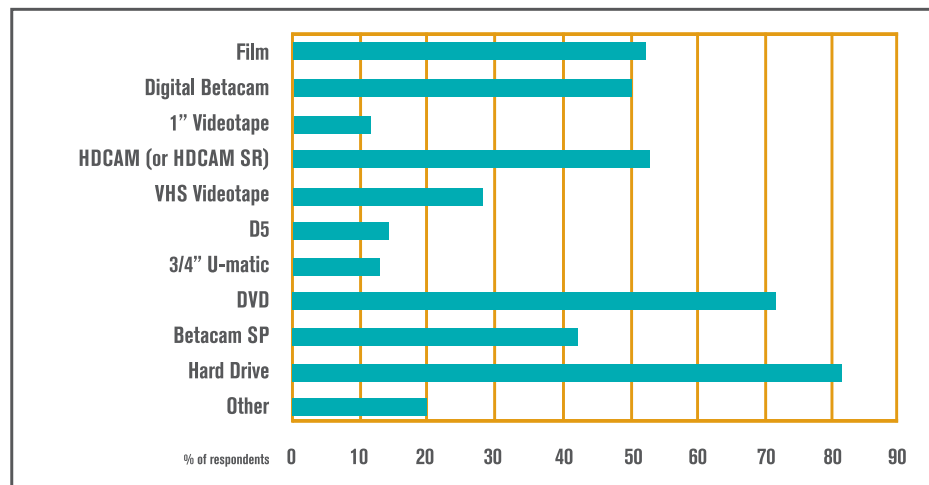


Storage of Production and Master Materials

Several survey questions were designed to identify capture and storage technologies and practices used by independent filmmakers. Most respondents (81 percent) stored some of their created

content on computer hard drives, and more than half (52 percent) used motion picture film.

CHART 2 Storage Technologies Used



As previously mentioned, environmental storage conditions are very important for extending the life of analog and digital videotape as well as film. Slightly more than half of respondents maintained at least some level of environmental controls for both their production and master-level content. It is important to note that storing hard drives on a shelf in a cool, dry room, as some respondents reported, is not a preservation strategy. Hard drives must be occasionally powered on to maintain internal lubrication, and data integrity must be periodically validated.

CHART 3 Storage Environment for Production Materials

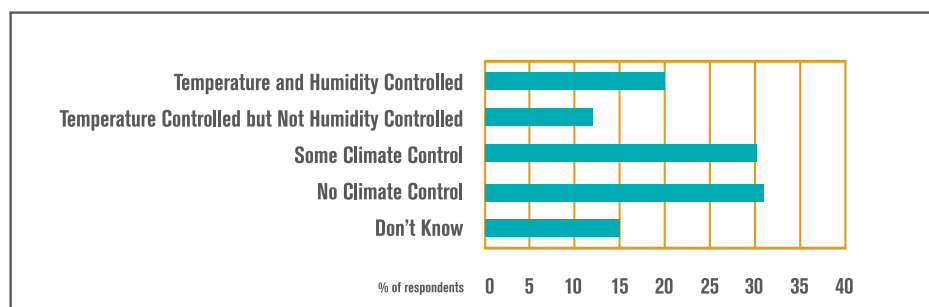
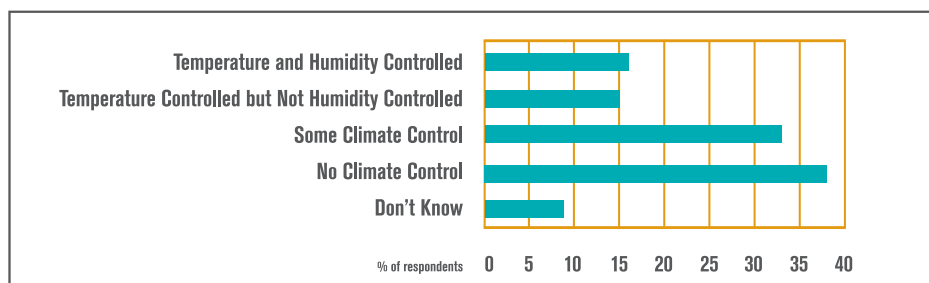


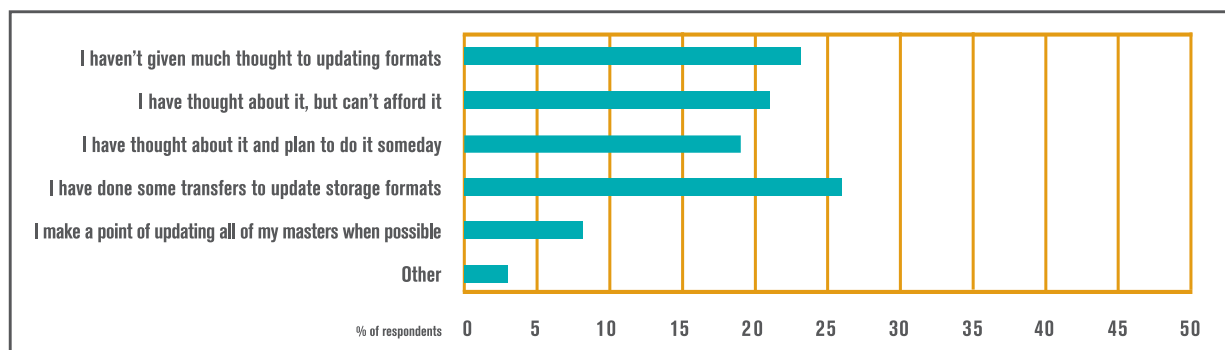
CHART 4 Storage Environment for Master Materials



Transfer to Newer Storage Technologies (Migration)

It is well known that the primary methodology available today to maintain ongoing access to digital materials is to periodically migrate the materials to newer storage technologies. The consequences of neglecting to do this were highlighted by indie filmmaker Quinn, who reported that after spending seven years producing his project, he screened it once for his family and friends, and then a week later found his hard drive had crashed. He was left with a highly compressed DVD as the only copy of his completed work. Of the respondents with digital materials, only 8 percent reported migrating regularly, with 26 percent migrating occasionally. Over 60 percent did not migrate at all, and almost half of those respondents haven't given much thought to the process.

CHART 5 Respondents' Thoughts about Migration



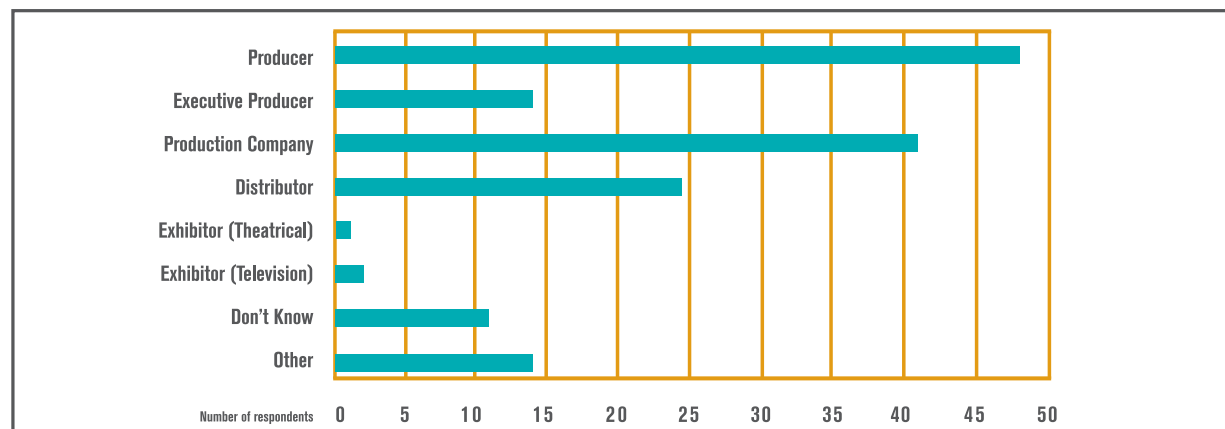
Many respondents noted the substantial and ongoing expense of migration:

“...hardware and software have half-lives of only 5 to 10 years at most.... We will have to upgrade our digital copies every 5 to 10 years. Unless the cost of those upgrades is nominal (and you know it NEVER is), it will cost a lot more than preservation of film elements.”

Costs of and Responsibility for Preservation

The cost issue led to the question of who should be responsible for preservation. Survey respondents were split on this issue, with producers, production companies and distributors being assigned the most responsibility.

CHART 6 Preservation Responsibility^{iv}



^{iv} Respondents were allowed to select more than one answer.

When asked who actually pays for preservation, almost two-thirds of the respondents answered “I do.” It is worth noting that those who identified themselves as filmmakers consistently gave this answer. Besides an ongoing financial incentive from potential distribution deals, some filmmakers had other motivations to cover the preservation costs:

“I think it’s out of respect for the effort that went into the project and the medium that I preserve the film at my own expense.”

Others suggested sharing the costs and responsibility for archiving, which could be approached as a cooperative venture:

“It would be great if a collective were started to house digital transfers of films in one central server location.”

“We need archives that make it easy for independent image makers to donate their work. And those archives need to have the wherewithal – finances, storage space and staff – to preserve the work and store it for the very long term.... I’m really terrified that once I die, all the work I’ve created will vanish with me.”

Also suggested was a free service:

“There should be a place – a library or other institution – where we can have our works archived. It should be free and sponsored by a major cultural institution.”

The survey answers and comments reflect a substantially expressed view that the burden of preservation should be borne by other individuals and/or institutions, even though most of those surveyed who are preserving their work are also paying for it.

Attitudes about Short-Term and Long-Term Preservation of Created Content

Surveyed indie filmmakers were asked about their attitudes towards preservation of their created content for the short term (20 years or less) or long term (more than 20 years). This distinction was made because analog materials generally survive for the short term – which generally covers the commercial life of their work – with little preservation effort and expense. Long-term preservation generally comes at a greater cost and more often with less economic incentive. The responses were similar for both time categories: approximately half said they sometimes think about long-term preservation, less than 20 percent do not think about that at all, and 8 percent do not think about short-term preservation at all. “Thinking about it” did not mean that preservation action was taken.

Reasons for preserving created content were expressed in various ways:

“The work we do becomes part of our collective history, even when it was not initially intended to be.”

“I think it [my work] has historical value, but little commercial value beyond the initial pick-up, purchase or exhibition.”

“It’s essential for every filmmaker to pay attention to preserving their work for future generations, as well as for future revenue options.”

Summary

One respondent was concerned enough to write:

“I’m beginning to understand the long-term implications of indifference.”

The conflict between cost and convenience was also evident:

“There is no argument that there are great advantages to digital acquisition and distribution. But it may be that we are accepting short-term advantages with long-term loss. I am very concerned that the next generation will not have the rich archive of historical and classical films that we have today.”

“Though I’d love to shoot on film, it’s too expensive for my budgets. When I consider digital preservation, I think it’s important to remember that nothing is forever, including hard drives and DVDs. Everything needs to be backed up over and over if it’s held long enough. That’s why we make films after all, isn’t it? To tell stories that will be preserved forever? I am all for ‘protecting’ my films and any other film, for that matter, as long as possible.”

A survey respondent who stated he is a new father put it in this perspective:

“I do think about how and when my children will see my work, and in turn, their children. I do consciously try to make statements about my vision of the world and I certainly want to share that with as many people as possible, so of course that means people both now and those unborn.”

Non-Theatrical and Self-Distribution

Less than half of the respondents (46 percent) considered theater-by-theater distribution (making individual exhibition arrangements with individual theater operators as opposed to a multi-theater distribution deal). By contrast, 78 percent of respondents said they considered the Internet for distribution, 71 percent considered downloads of full and short versions of their created content, and 69 percent considered direct release to DVD. Both interview and survey responses reflected considerable interest in and consideration of “do-it-yourself” marketing and distribution – so much so that an entire section of this report is devoted to marketing and distribution of independent films.

Summary

The survey responses represent disparate viewpoints, which is to be expected from such a diverse group of creative individuals. While some indie filmmakers recognized the need for and value of preservation for cultural or financial reasons, getting their created content in front of an audience was their first and foremost goal.

DOCUMENTARIANS

2

Introduction

A Brief History of Documentary Filmmaking

Survey Methodology, Results and Analysis

Summary



Documentaries are a distinct type of independent film.

The original concept of a documentary film was, as its name suggests, to document reality.

DOCUMENTARIANS

Introduction

Documentaries are a distinct type of independent film, and this is recognized by honorary and professional organizations: the Academy of Motion Picture Arts and Sciences has a Documentary Branch, whose members have distinguished themselves in short and/or feature-length theatrical documentaries, and the Academy of Television Arts & Sciences includes documentarians in its Nonfiction Programming Peer Group. As documentary filmmakers generally rely on access to historical footage for their storytelling, a careful look at this segment is required to sufficiently represent the independent filmmaker perspective.

A Brief History of Documentary Filmmaking

In a presentation at the Academy of Motion Picture Arts and Sciences, Academy Award-nominated cinematographer Caleb Deschanel said:

“When motion pictures were first invented and exhibited in the 1890s, the earliest movies were not scripted, there was no director, and there were no movie stars. There was just someone with a camera. They turned the crank and watched something happen. Watch a horse-drawn carriage drive by. Watch the baby eating. Or just watch people leave after a day’s work. No matter how ordinary the subject, it would prove to be fascinating to an

Documentaries

generally

have greater

access to

funding sources

such as

nonprofit

foundations.

*audience who had never seen photography come to life before. Soon people with cameras would travel the world and visit really exotic places, places people had only heard about but had never seen. Thomas Edison and the Lumière brothers, who did some of this photography, and others filmed these faraway places and the lives of the people who lived there, and the audiences were enchanted. One hundred and ten years later, these kinds of movies are still informative and fascinating.”*¹³

The original concept of a documentary film was, as its name suggests, to document reality. Also called “actuality films,” some of the earliest examples captured aspects of daily life.¹⁴ This term was first used in a *New York Sun* review of Robert Flaherty’s film “Moana” in 1926. Reviewer John Grierson, who later became a documentarian, wrote about these films’ cinematic potential. He described the “creative treatment of actuality,” which predicted reenactments as part of the documentary repertoire. In referring to nonfiction films, he included travelogues and instructional films.¹⁵

The invention of the 16mm film format in 1923 was conceived as a medium for producing home movies. Independent and government documentary filmmakers later embraced it as an affordable and practical medium for their work. Through the years of the Great Depression and World War II, 16mm and 35mm newsreels produced independently and by the studios accompanied the presentation of feature-length narrative films on cinema screens and in newsreel theaters.

Today, television rather than theaters is the primary market for documentaries – a result of the growth of broadcast television since the 1950s. In the early days of the medium, local and network news programs were recorded on 16mm film, and many local television stations also produced documentaries on film.¹⁶ Stations maintained libraries of these recordings, because management realized that filmed content was an asset that could be used in the production of future programming.

The impact of documentaries is enormous – consider eye-opening studies of social institutions, such as Frederick Wiseman’s “Titicut Follies” and piercing, deeply human portraits, such as the Maysles brothers’ “Salesman.” Historian Stephen Ambrose observed that “more Americans get their history from Ken Burns than from any other source,” and indeed, Burns’s documentaries on the Civil War, jazz, baseball and Prohibition, have drawn television audiences in the tens of millions.¹⁷

It is worth noting that in his nine-part series on baseball, Burns made extensive use of 70- to 80-year-old 16mm black-and-white archival

newsreel footage, which he augmented with contemporary interviews with historians, surviving athletes and journalists from the period.

A short list of contemporary documentarians who also made their mark in television includes Robert Drew, Henry Hampton, D.A. Pennebaker, Charles Guggenheim and Barbara Kopple. Today independent documentaries rarely get broad theatrical distribution, but there are notable exceptions, such as Davis Guggenheim's "An Inconvenient Truth" and Michael Moore's "Roger & Me," "Fahrenheit 911" and "Sicko."^v

The rules and rigors of making and marketing documentaries are generally the same as for other independent films, with certain key distinctions. Documentaries generally have greater access to funding sources such as nonprofit foundations, which may underwrite production costs. And broadcast and pay television outlets have become major commissioners and purchasers of documentaries as well as avenues to much larger audiences than could be achieved through theatrical release. Those interviewed for this report said that of the documentaries screened at most independent film festivals, a large majority have television distribution deals in place prior to the festivals, and those that do not have such deals by that time probably never will. Nonetheless, short and feature-length documentaries have opportunities to raise their profiles through festival and theatrical screenings, especially if they go on to receive Academy Awards or other recognition.

While documentarians do commissioned work, or "work for hire," they can and do create documentaries "on spec" and then try to sell them. This is no different from a director of narrative films, who can either accept work as a director-for-hire or raise funds for a personal passion project. Except in those "work for hire" situations, independent narrative filmmakers and documentarians appear to face common challenges in financing their projects, getting their work before an audience and securing distribution.

Survey Methodology, Results and Analysis

Respondent Profiles

As with the larger independent filmmaking community, representative views were collected from documentarians via interviews and surveys. One-on-one interviews were conducted with a cross-section of accomplished documentarians, and members of three representative organizations were surveyed: the International Documentary Association (IDA), the Documentary Branch of the Academy of Motion Picture Arts and Sciences (AMPAS) and the Nonfiction Programming Peer Group of the Academy of Television Arts & Sciences (ATAS). Survey results were circulated to each group's leadership and were then followed up with a series of telephone interviews. The complete set of survey questions and anonymous answers are published in the Online Appendix.

The survey questions covered several topic areas, such as preferred capture and storage technologies, environmental storage conditions for master materials, media transfer practices and preservation responsibility.^{vi} The responses from these three representative organizations were generally similar to one another, but there were also interesting differences, as noted in the following discussion.

^v Charles Guggenheim and Barbara Kopple are also well known for their theatrical work and have won Academy Awards, as have Davis Guggenheim and Michael Moore.

^{vi} Technical background information on these topics is provided in the Independent Filmmakers section of this report.

Storage of Production and Master Materials

Many more AMPAS respondents (88 percent) reported having used film as a capture medium and therefore have used film as their primary storage medium, as opposed to 32 percent and 25 percent reported by ATAS and IDA respondents, respectively. Possible reasons for this disparity are that AMPAS Documentary Branch members have tended to produce more feature-length documentaries for theatrical distribution than the other groups, and a greater number of AMPAS members began their careers before digital filmmaking technologies became predominant. However, majorities of all three groups have used digital equipment and media for acquisition as well. Respondents reported using computer hard drives and digital videotape formats such as HDCAM SR and Digital Betacam for both production and master materials.

CHART 7 Storage Technologies Used: AMPAS

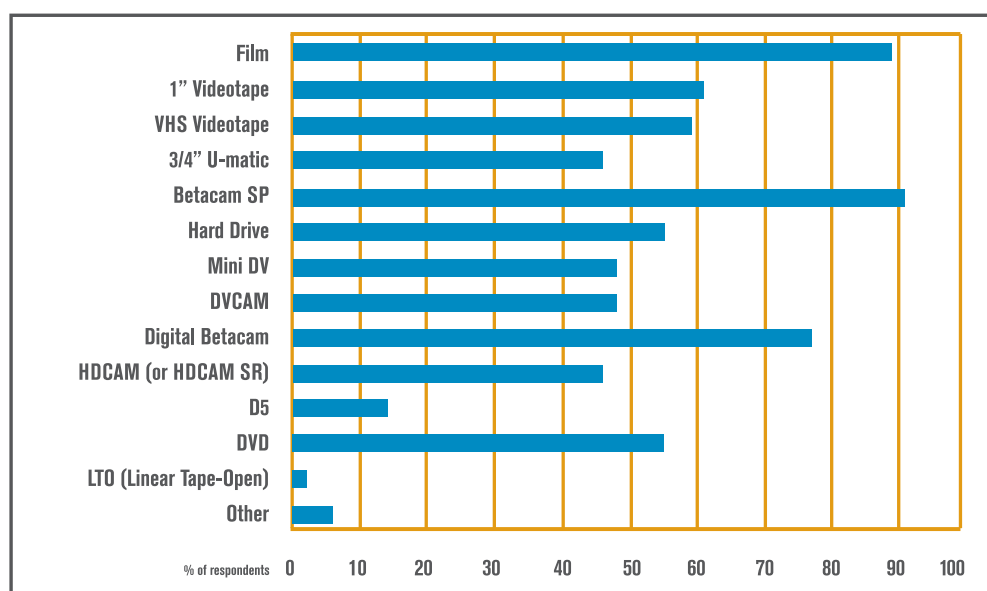


CHART 8 Storage Technologies Used: ATAS

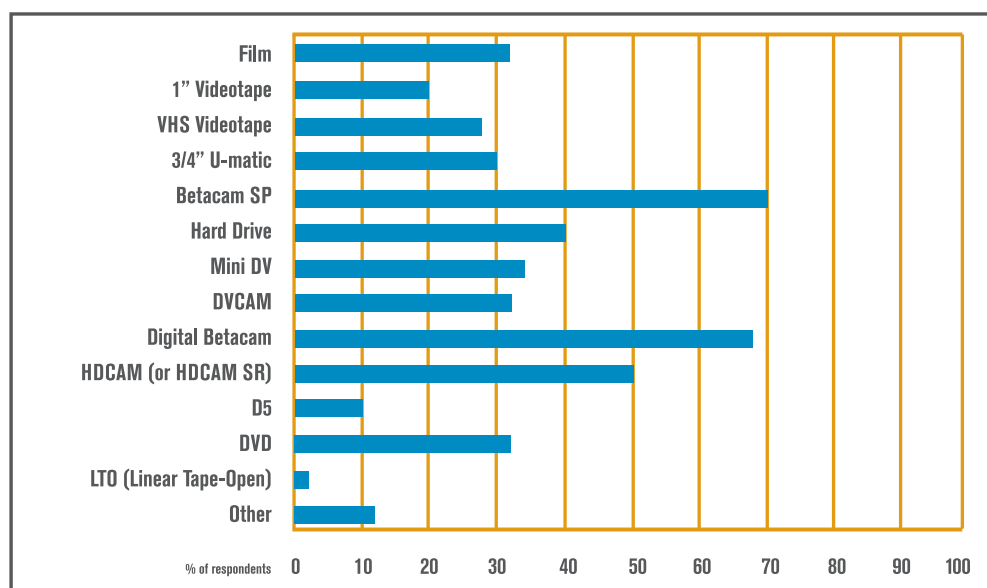
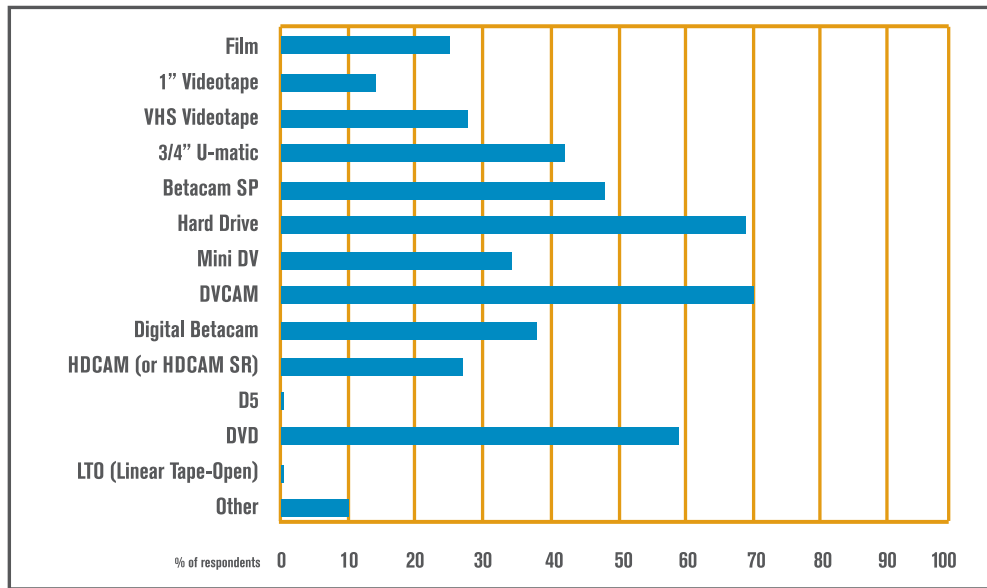


CHART 9 Storage Technologies Used: IDA

The environmental conditions under which analog and digital source materials are stored are known to have a major impact on the lifespan of recorded media, but among the surveyed groups, use of temperature and humidity-controlled storage for master-level content remains relatively low: 18 percent of AMPAS respondents, 12 percent of ATAS respondents and 8.5 percent of IDA respondents store their source materials in climate-controlled environments. Answers of “no climate control” and “don’t know” were 38.7 percent for AMPAS, 37 percent for ATAS, and 50.7 percent for IDA. Overall, documentarians’ responses on this topic were not substantially different from those of the larger independent filmmaking community.

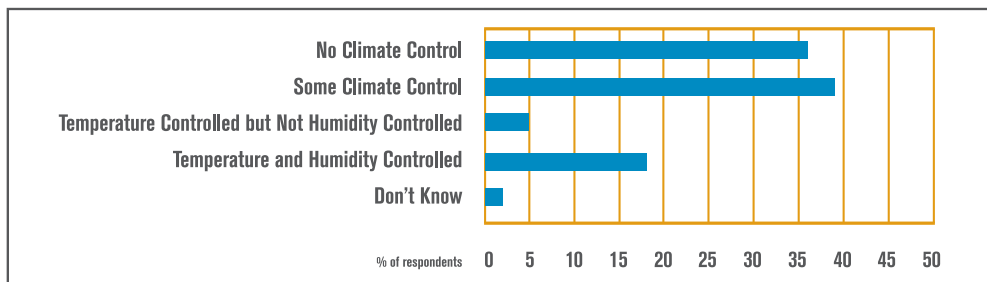
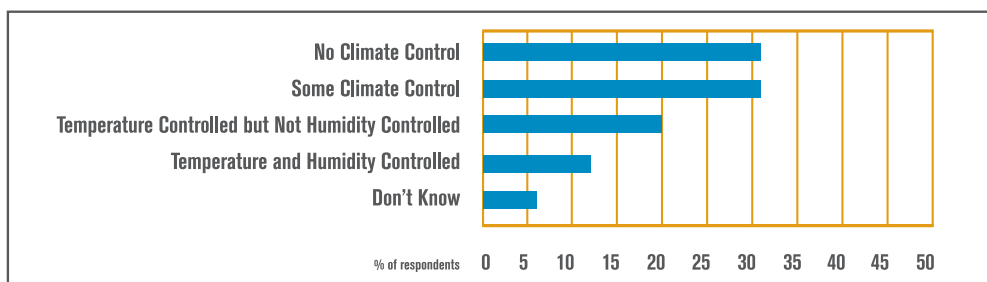
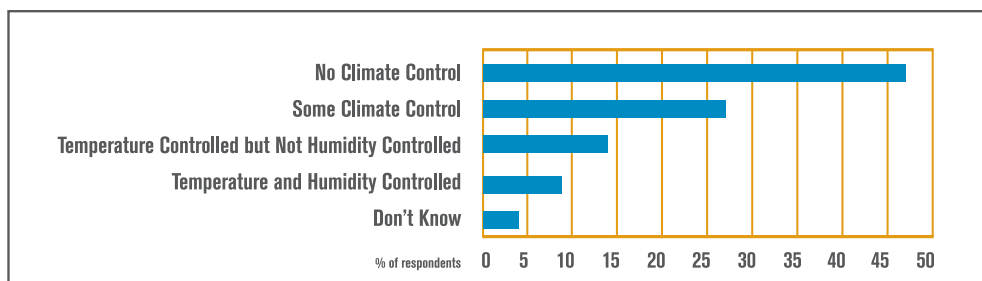
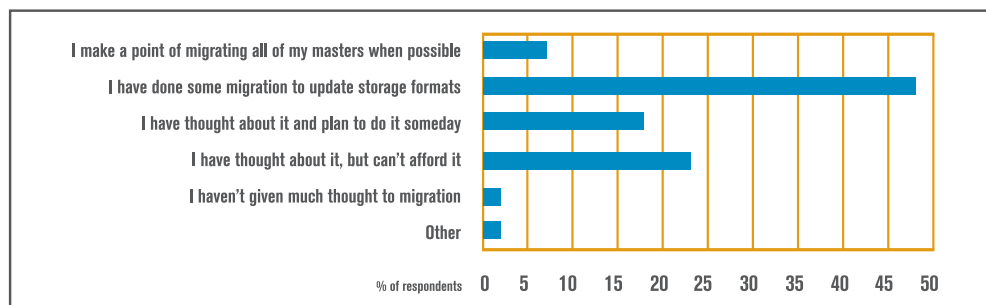
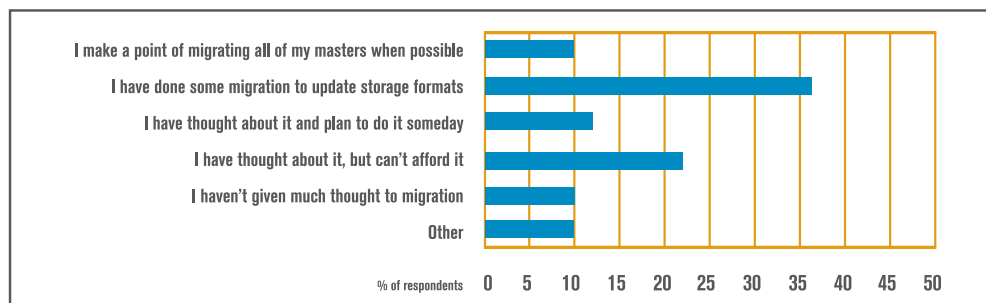
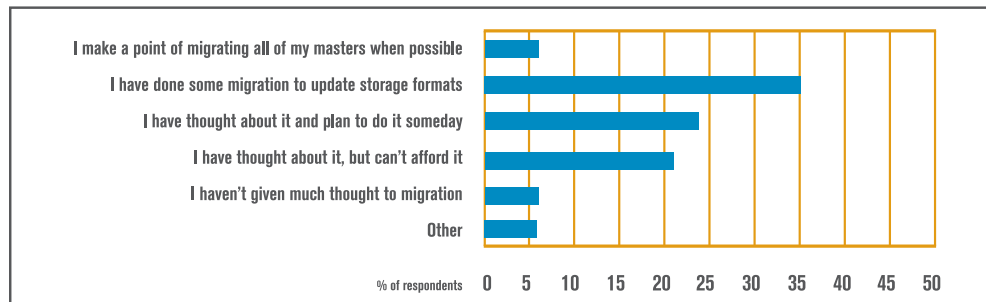
CHART 10 Storage Environment for Master Materials: AMPAS**CHART 11 Storage Environment for Master Materials: ATAS**

CHART 12 Storage Environment for Master Materials: IDA

Transfer to Newer Storage Technologies (Migration)

As discussed earlier in this report, all digital content, regardless of storage format, must be copied to newer media at some point to prevent losses due to media degradation and/or technology obsolescence. Less than 10 percent of the documentarians surveyed stated that they regularly migrate their created content to preserve their work or to maintain access to it.

CHART 13 Respondents' Thoughts about Migration: AMPAS**CHART 14 Respondents' Thoughts about Migration: ATAS****CHART 15 Respondents' Thoughts about Migration: IDA**

However, when presented with a multiple-choice question about their feelings about data migration for these purposes, none of the respondents selected “It’s a bad idea.” Substantial numbers selected “I am relieved” (22, 40 and 43 percent for AMPAS, ATAS and IDA, respectively), and smaller numbers selected “I have some concerns” (11, 38 and 36 percent). The range of responses suggests a general lack of awareness regarding the risks associated with migration – the risks of data corruption and other process errors, as well as the risks of doing nothing at all.

The few respondents that commented on this question were aware that digital copies are not a guarantee of long-term access:

“I am not sure any format is really safe.”

“I know that it is not as secure as when stored as film.”

“I feel depressed and hopeless because there seems to be no intelligent agreed upon solutions for long-term archiving.”

Costs of and Responsibility for Preservation

As for who pays for storage of production or master materials, a high percentage of all respondents pay for migration themselves (88, 79 and 91 percent for AMPAS, ATAS and IDA, respectively). These numbers track with their responses regarding responsibility for these costs: more than two-thirds stated that it should be the producer’s or production company’s responsibility to pay for preservation, which is how a corresponding percentage of respondents identified their own job functions.

Attitudes about Short-Term and Long-Term Preservation of Created Content

When documentarians were asked about their attitudes towards short-term preservation (less than 20 years) and long-term preservation (more than 20 years), the distribution of responses was similar to that of other independent filmmakers: most thought about it “sometimes,” fewer thought about it “often” and still fewer thought about it “always.” Short-term access seemed to be of less concern than long-term access.

The responses to open-ended questions in both the survey and interviews highlighted the conundrum presented by new technologies: like independent narrative filmmakers, documentarians say they want their work available for future generations, but they also acknowledge that digital technologies, while offering great benefits for image capture and post-production, present greater uncertainty with regard to future access.

Third-Party and Archival Footage Access

As documentaries are by definition grounded in reality, documentarians tend to rely heavily on news and archival source material. Much of the archival footage used today to depict the “pre-electronic-capture” era (prior to the mid-1980s) comes from analog film masters. When questioned about the future availability of archival footage, the documentarians surveyed did not see a problem at this time. To the contrary, one documentarian stated that this is a “golden age” for archival footage access and licensing, with more historical material available online than ever before. There was and is an assumption that archival footage – whether analog or digital – from any time

Summary

period will always be available. In the interviews, however, documentarians did not seem to recognize that when today's current events become tomorrow's history, an audio or visual record of these events may not exist, because today's digital systems do not offer guaranteed long-term access. In other words, 25 years from now there may not be much usable archival footage pertaining to the world as we experience it today.

Summary

While documentarians are a distinct type of independent filmmaker, their experiences and practical challenges are similar to those of narrative filmmakers because of the widespread adoption of digital production and post-production tools. In both surveys and interviews, documentarians cited several benefits of digital technologies, including greater freedom to shoot covertly, more editorial flexibility and better compatibility with digital distribution platforms. Some recognized that digital films are not "forever," but they generally did not take steps to ensure long-term access to their completed work. Moving on to the next project seemed to be a higher priority.

MARKETING AND DISTRIBUTING INDEPENDENT FILMS

3

Introduction

A Brief History of Film Festivals

The Role of Film Festivals in

Independent Film Distribution

The Changing Distribution Landscape

Future-Proofing Independent Digital Motion Pictures



While digital technologies have made it easier for independent filmmakers to create their movies, they have also fractionalized distribution channels.

MARKETING AND DISTRIBUTING INDEPENDENT FILMS

Introduction

The major Hollywood studios integrate all of their motion picture production, distribution and archiving functions within their individual corporate structures. They develop and/or acquire theatrical motion pictures; finance, promote and distribute them; and maintain long-term access to their motion picture materials through comprehensive library and archive management departments. Studios' assets are managed within a closed ecosystem.

Independent filmmakers do not have this scale of resources at their disposal or a guaranteed path to an archive unless studios or other distribution entities acquire rights to their work. Indie filmmakers are therefore almost solely responsible for getting their work in front of an audience, recovering their production costs, and hopefully generating some profit, which would enable them to move on to their next project. The surveys and interviews strongly suggest that these are indie filmmakers' highest priorities, and it follows that their approaches to distribution are most likely to affect their work's path to an archive.

The surveys and interviews also showed that while digital technologies have made it easier for independent filmmakers to create their movies, they have also fractionalized distribution channels. Before the advent of digital distribution platforms, these filmmakers' best hope of reaching an audience was that a private showcase or festival screening of

A Brief History of Film Festivals

their film would capture a theatrical distributor's interest. Today, indie filmmakers have a variety of digital distribution options to consider that may result in their work reaching an audience and generating revenue. Given that archival activities typically occur for independent films after distribution, the changing nature of film festivals and the rise of self-marketing and self-distribution were deemed important research topics for this report.

Motion picture marketing and distribution are two different disciplines requiring different skill sets, but both are needed to connect a movie and its audience. Marketing is the strategy and tactics for creating anticipation among members of a movie's target audience; distribution is the mechanism that gets the movie in front of paying customers. As the surveys and interviews for this report showed, unless today's indie filmmakers perform both functions, they will likely have to pay for outside expertise in these areas. With or without expert help, most interview subjects still considered film festivals as the starting point for independent film marketing and distribution.

Film festivals are organized, multiday events, usually in a single geographic locale with several screening venues. Festival programming ranges from celebrity-focused Hollywood premieres to showcases for specific genres, formats, subjects or countries of origin; the offerings vary by program length (feature versus short form) and sometimes include retrospectives, tributes to individual artists, filmmaker panels and other events. For the better part of the last 80 years, festivals have been the launch platform for many talented filmmakers seeking independent or studio-backed distribution for their work. But as festivals explore broader and broader programs, the number of available screening slots often decreases within each category and genre. The challenge of raising an indie film's profile becomes more difficult when the film must compete with other attractions that are key to promoting the festival itself.

A Brief History of Film Festivals

The Venice Film Festival (Mostra Internazionale d'Arte Cinematografica), the oldest film festival on record, premiered in 1932. Toward the end of the 1930s, the Venice festival only exhibited films with Fascist themes, which inspired Jean Zay, the French minister of national education, to support a proposal for an international film festival in Cannes, France. In 1939 Louis Lumière was named president of the planned festival, but those plans were put on hold by the outbreak of World War II, and the first Cannes Film Festival was held in 1946. Today the list of filmmakers from around the globe who launched their careers with Cannes premieres is a virtual who's who of the motion picture industry.¹⁸

The first North American film festival was the Columbus International Film & Video Festival, held in 1953. The San Francisco International Film Festival began four years later with an emphasis on feature-length dramatic films; it introduced such foreign-language classics as Akira Kurosawa's "Throne of Blood" and Satyajit Ray's "Pathar Panchali" to American audiences in its founding year.

The Sundance Film Festival is high on most U.S. independent filmmakers' lists of venues for premiering their features, documentaries and short films. The festival traces its roots to 1978, when Robert Redford, then-Utah governor Scott Matheson and others collaborated to establish the Utah/U.S. Film Festival in Salt Lake City (later renamed the Sundance Film Festival). The festival moved

to Park City in 1981, adjacent to a major ski resort. Redford founded the Sundance Institute that same year, and its Feature Film Program and Documentary Film Program now offer several labs annually to independent directors, screenwriters, producers and composers.¹⁹ The Sundance Institute Documentary Fund provides grant support to documentarians exploring contemporary issues, and the Institute also maintains the Sundance Collection at UCLA to conserve and archive independent films.²⁰

Today there are hundreds of film festivals around the world that offer independent film screening opportunities. The major North American festivals include the following:

- The Toronto International Film Festival, which started in 1976, is the most widely attended film festival worldwide.
- The Seattle International Film Festival runs for more than three weeks, and in 2011 it screened 450 feature films and approximately 150 short films.²¹
- The Los Angeles Film Festival showcases more than 70 new works in American and international cinema, along with premieres, preview screenings and film education programs.
- New York City's Tribeca Film Festival, founded in 2001 by Robert De Niro, Jane Rosenthal and Craig Hatkoff, has a mission to assist filmmakers with reaching the broadest possible audience, as well as promoting New York City as a major filmmaking center.

The Telluride Film Festival in Colorado and the South by Southwest Film Festival in Austin, Texas, are also considered significant festivals for independent film. Documentaries are also well represented at film festivals, and in their book *A New History of Documentary Film*, authors Jack Ellis and Betsy McLane credit festivals as the platform where most documentaries that have been produced outside the mainstream are discovered for cinema, television and alternate distribution. Notable documentary-focused film festivals include Toronto's Hot Docs and the Full Frame Documentary Film Festival in Durham, North Carolina.²²

The Role of Film Festivals in Independent Film Distribution

Film festivals' primary focus, according to their own promotional materials, is to attract audiences, although independent features are not always the main draw. For many talented filmmakers, festivals have been a key part of their strategy to get their films seen and move them into distribution, but that landscape is changing. In today's marketplace, the odds of being selected by a festival for screening, picked up by a distributor, or bought outright by a studio are poor. For example, Sundance received 10,279 submissions for its 2011 festival, of which only 194 titles became screening selections – an acceptance rate of less than 2 percent. Acceptance rates were also low among the other top film festivals in 2010 and 2011:

The Changing Distribution Landscape

- The 2010 New York Film Festival received about 1,700 submissions but screened only 138, including short (three-minute) avant-garde films (8 percent)
- The 2011 Los Angeles Film Festival received 4,521 submissions and screened 153 (3 percent)
- The 2011 South by Southwest Film Festival received 4,900 submissions and screened 293 (6 percent)
- The 2010 San Francisco International Film Festival received 3,200 submissions and screened 181 (6 percent)
- The 2011 Chicago Film Festival received 3,640 submissions and screened 194 (5 percent)
- The 2011 Telluride Film Festival received 1,423 submissions and screened 84 (6 percent)²³

As more indie films are made and festivals explore programs that extend beyond new indie productions, indie filmmakers are finding it more and more difficult to get their movies seen at these events. This dynamic was articulated by one of the surveyed filmmakers:

“Today, with the new electronic cameras and editing systems, it’s easier to make an indie feature, but harder to get (it) seen.”

Despite the low acceptance rates, festivals are still considered a major force in getting indie filmmakers exposure. If screenings are successful, they will generate a following for the filmmaker and enough “buzz” around the film that could lead to a pick-up by a distributor.

Most people recognize that it is very difficult to make a living as an independent filmmaker, and that those challenges underlie indie filmmakers’ rush to secure distribution. The revenue from each film they make must pay off investors, post-production facilities, equipment rental houses, and cast and crew members who deferred compensation; it must also become the funding “stake” for their next project.

The Changing Distribution Landscape

Beyond film festival screenings and negative pick-up (an outright purchase of a movie by a studio or distributor), distribution today can be more audience-direct than in the past through Internet streaming, video-on-demand (VOD), DVD/Blu-ray direct sales or other modes of electronic distribution.²⁴ These lower-cost, seemingly easier options are not without their own complications, as one survey respondent noted:

“VOD is cheaper than theatrical distribution, but more of an impulse purchase... and how do you promote?”

The increased risk of content theft is another consideration for indie filmmakers who are exploring electronic distribution platforms. Much reporting has been done on the extent of revenue

losses from unauthorized duplication of electronic versions of a movie, and the impossibility of putting an end to the copying once it starts.²⁵

These new distribution mechanisms are raising questions about independent feature films' traditional route to theaters, as a marketing professional responding to the survey noted:

“The industry is changing, and the old theatrical exhibition model may not work for the indies. We may see day-and-date (simultaneous) release in theaters and online.”

According to marketing consultant Cheryl Boone Isaacs, “Once the marketing strategy is set, a digital consultant can be brought in to interact with digital aggregators to enable a filmmaker, production company or other rights holder to understand their cash outflow in advance, evaluate costs for expenses and marketing services, gain access to collection stats, and review their collected funds balance from retail platforms, such as iTunes, Netflix, Hulu or cable VOD operators like Comcast, Time Warner, etc.”²⁶ Aggregators charge a commission for this service, but even with commissions, marketers claim that these new do-it-yourself (DIY) distribution options can lead to potentially greater income for independent filmmakers.

Filmmakers attempting to realize the potential benefits of these new distribution opportunities have to add yet another skill to their multidisciplinary role – that of marketer. Filmmakers and independent marketing consultants interviewed for this report stress self-marketing as a new need, because compared to traditional theatrical distribution, the barriers to entry for electronic distribution are relatively low, and quite often no sales agent or other middleman is required to effect the sale. However, most marketers interviewed for this report still recommend using a sales agent for foreign distribution, as the DIY approach is difficult to execute given the territorial fractionalization of the international marketplace.

Dispensing with the middleman requires filmmakers to take a detached view of their work. This is not always easy, because it takes passion and dedication to get a film from concept to completion. Marketers interviewed for this report say their first question to a filmmaker always is: “Who is the audience for this movie?” All too often, they say, filmmakers have no clear answer to this question, and therefore no apparent market for their films. During the research phase of this report, many indie filmmakers were seen at various film festivals pitching their projects from computer laptops and tablet screens on the trunk of a car or inside a van. And the predominant question asked by viewers was:

“Who is it for? Who will want to spend money and two hours of their time to see this?”

The interviewed marketers also stated their belief that indie filmmakers should “make features that have long lives” to take advantage of the Long Tail theory of retail sales. First covered in 2004 by Chris Anderson in *Wired* magazine, the Long Tail theory proposes that large amounts of digital content for which there is low demand can collectively generate significant revenue, for very low distribution costs, in a digital delivery environment such as the Internet. Those interviewed for this report believe that the theory applies to all entertainment content, including independent films and documentaries. The belief in the existence of future markets provides both an incentive and obligation to “future-proof for future revenue.” Whether the Long Tail theory proves true or not, given that copyright protection lasts for 95 years (or longer),²⁷ there seems to be sufficient commercial

justification for indie filmmakers to be concerned with preservation for long-term access to their created digital content.

Future-Proofing Independent Digital Motion Pictures

It is future-proofing for future revenue that first raises the digital preservation issue in discussions with the independent filmmakers, marketers and distributors. As one marketer recognized:

“There is a problem with elements getting technically outmoded and obsolete.”

Put another way, the technology that makes it easy to make the picture also underlies the lack of guaranteed long-term access to it. The length of time it takes to secure a distribution deal and the Long Tail potential for ongoing revenue make it imperative that independent filmmakers consider preservation strategies for their work, especially in the absence of a clear, guaranteed and timely path to an archive. One near-term path, however, is available through the partnership between the Sundance Institute and UCLA Film & Television Archive noted earlier. Established in 1997, the Sundance Collection at UCLA contains films that have been screened at the Sundance Film Festival.²⁸ While long-term preservation is a consideration for the Sundance Collection, its primary emphasis is to support the Sundance Institute’s broader mission that includes enabling artists to reach a wider audience. Since most distribution deals for independent films are for a finite period of time, providing archival resources increases the chances that these films and their source elements will survive long enough to secure follow-on distribution. Outfest, which organizes the Outfest festivals focusing on lesbian, gay, bisexual and transgender (LGBT) culture, also partners with the UCLA Film & Television Archive with an emphasis on preserving LGBT films.²⁹

While festivals offer a prime forum for engaging in a discussion with both independent filmmakers and documentarians on the issue of long-term access to their digital work (both completed films and source material), only a few discussion panels at a few film festivals have focused on digital preservation issues. In general, festival organizers interviewed for this report programmed events that reflected the primary interests of emerging filmmakers and other likely festival attendees, such as the creative process, production and post-production, financing and distribution. Digital preservation was not a topic requested by film festival attendees.

NONPROFIT AUDIOVISUAL ARCHIVES

4

Introduction

A Brief History of Audiovisual Archives

Audiovisual Archives and Digital Materials

Defining Digital Preservation

Access vs. Preservation

Reformatting Analog Materials and

Born Digital Content

File Formats, Metadata and Codecs

Storage Systems and Software Tools

Basic Preservation Practices: Data Backup,

Verification and Migration

Survey Methodology, Results and Analysis

Issues and Challenges

General

Relationship with IT Departments

Funding

Archivists' Recommendations



As audiovisual content becomes increasingly digital, all archives are now facing, or soon will face, the challenge of digital preservation.

NONPROFIT AUDIOVISUAL ARCHIVES

Introduction

As stated earlier in this report, the major Hollywood studios have a defined path to their archives for their motion picture materials. By contrast, independent narrative films and documentaries are by definition produced outside the studio system, and unless they are purchased for distribution by a studio, their path to a bona fide archive is unclear. Independent filmmakers typically do not plan for their work's archival future while they are in the midst of making and marketing a film, and once they secure distribution, most move on to their next project. But despite these tendencies, nonprofit audiovisual archives have managed to amass substantial holdings of independent films and documentaries.

There are approximately 550 public moving-image archives in the United States and its territories, and an additional 310 archives worldwide according to the National Film Preservation Board.³⁰ None of these archives were mentioned as an archival destination by any of the independent filmmakers, documentarians, marketers, distributors and film festival organizers surveyed or interviewed for this report, with the exception of the UCLA Film & Television Archive and its partnerships with the Sundance Institute and Outfest. Nonprofit public audiovisual archives, which also hold other historic and culturally important audiovisual materials, build their collections through filmmaker and copyright holder donations as well as their own

proactive collecting activities. The proactive effort usually brings in independent films long after their commercial lives are over. These archives are, in many cases, the repositories of last resort.

A cross section of archives was surveyed to develop an understanding of how archives acquire independent films and how digital storage technologies are impacting their operations. The archives were categorized by types of content they collected, collection focus, organizational model (stand-alone or part of a larger institution such as a library or museum) and whether the archives were actually handling and storing digital materials. A smaller sample of archives was selected for direct interviews, and four archives, somewhat typical and representative of the whole, were chosen for in-depth case studies to more fully investigate how independent, public and nonprofit archives are dealing with their digital dilemma.

A Brief History of Audiovisual Archives

There are hundreds of archives, libraries, universities, television stations and individuals across the country that collect and store moving images and recorded sound. Audiovisual materials have come into these numerous and varied repositories over the years from personal holdings, motion picture studios and distributors, independent filmmakers, television stations and other sources. As audiovisual content becomes increasingly digital, all archives are now facing, or soon will face, the challenge of digital preservation.

The Library of Congress, as the repository for U.S. copyright materials, began collecting motion pictures in 1893 when Thomas Edison submitted his kinetoscopic records to the Library for copyright protection. Because the kinetoscope materials were recorded on highly flammable cellulose nitrate film, only the written descriptions of the work were actually kept at the Library.³¹

In those early years, Klaw and Erlanger, Vitagraph, and other production companies desired copyright protection for their motion pictures, but a mechanism for doing so did not yet exist. They consequently exploited the existing copyright law by converting films frame by frame to paper prints, and applying for copyrights for each individual image in the set.³² Changes to the copyright law in 1912 resulted in diminished paper print submissions, but the Library retained other printed descriptive materials such as synopses, shooting scripts, press books and photographs for copyright purposes.³³ Later, the Library recognized the need to preserve motion pictures as a historical record and started holding the actual films. Films made for television were collected beginning in 1949.³⁴

Collaboration and individual passion are also hallmarks of audiovisual archives. In 1942 the Library of Congress discovered paper print copies of several thousand motion pictures produced between 1894 and 1912 deteriorating in one of their vaults. The Library restored and converted approximately 3,000 of these paper prints to motion picture film through collaborations with the Academy of Motion Picture Arts and Sciences and Renovare (a company formed for this specific project).³⁵

The National Archives Act of 1934 recognized the documentary value of motion pictures “pertaining to and illustrative of historical activities of the United States,” an accessioning authority later codified into various laws and regulations governing the management of motion pictures as federal records.³⁶ Today the National Archives houses one of the world’s largest collections of documentary, newsreel and other nonfiction films, most of which originated from government activities and funding.

It is important to note that new productions of documentaries about America's participation in World War II and other historic events would be difficult, if not impossible, to create without continued access to holdings of the National Archives, the Library of Congress, UCLA Film & Television Archive (which holds the Hearst newsreel collection), the University of South Carolina (which holds the Fox Movietone collection) and other audiovisual archives around the world. However, despite the extraordinary efforts of these institutions, silent-era newsreels survive only fractionally as remnants of a once innovative and widely accessed news source for the general public.

The five largest film archives in the United States – the Library of Congress, UCLA Film & Television Archive, George Eastman House, the Museum of Modern Art and the Academy Film Archive – handle nitrate film on a broad scale. This capability primarily distinguishes these institutions from all other U.S. film archives.³⁷

In the 1960s, during its first years of existence, the American Film Institute's media campaign articulated the need for film preservation. The campaign noted that the major repositories collecting and preserving Hollywood feature films were not motivated by the films' potential commercial value, but for their artistic or cultural value. It is interesting to note that beginning in mid-1980s, in anticipation of future revenue from the nascent home video and pay television markets, the major Hollywood studios began investing considerable resources to extend the life of their audiovisual assets by building new storage facilities, upgrading existing ones, and restoring and copying these assets to new recording media.

The National Film Preservation Act, first passed in 1988 and updated several times since, codified the importance of motion pictures “as an art form and a record of our times.”³⁸ The Act and its subsequent revisions established the National Film Preservation Board, the National Film Registry and the National Film Preservation Foundation (a public/private partnership), as well as articulated a national plan to preserve the country's film heritage.³⁹

Audiovisual archives, especially the nonprofit public archives, came into being because archivists, curators and historians accepted that moving image and recorded sound materials were as legitimate a part of society's cultural heritage as books, documents, photographs and other media. As a result, the universe of audiovisual media preservation extends well beyond Hollywood's borders. In the last few decades, it has become apparent that many of these archives have custody of films that have been ascribed “permanent” value, i.e., enduring historical and cultural significance, even if these films

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Audiovisual Archives and Digital Materials

did not generate much revenue in theatrical release. The various collections range in size from a handful of rare films, such as home movies acquired along with personal papers of important historical or cultural figures, to collections consisting of thousands of reels from large, complex, local and national television news libraries. In a large institution, preserving film collections may represent only one of many important programs and activities, such as book rebinding, paper conservation and digitizing photographs. Most specialized film collections closely support an institution's mission. For example:

- The Country Music Hall of Fame and Museum holds films about leading country music performers and culture.
- The Hoover Institution holds films about the history of communism and Eastern Europe.
- The Human Studies Film Archives of the National Anthropological Archives (Smithsonian) holds ethnographic and anthropological films about the world's cultures and peoples.
- The U.S. Holocaust Memorial Museum holds films about the history of Jewish life in Europe during the Holocaust.
- Northeast Historic Film holds films about the history of and life in the New England region.
- Anthology Film Archives holds films with a specialized focus on avant-garde, experimental and independent filmmakers.

Motion pictures have been used to not only entertain, but to document and communicate almost every aspect of American life since the turn of the last century. In the United States, the widely dispersed and diverse use of motion picture film and now, digital recording technology, has made motion picture preservation a highly decentralized activity spread across hundreds of institutions and organizations.

Audiovisual Archives and Digital Materials

Preservation practices for motion picture film and pre-digital audiovisual materials such as vinyl records and analog audiotape and videotape are well known and well documented, and the reader is referred to the many books and papers on the subject for more information. Nonprofit audiovisual archives have generally implemented these practices.

By contrast, preservation practices for digital audiovisual materials have been widely discussed, but the surveys and interviews conducted for this report indicate that their level of adoption varies. This is most likely due to differences in the archives' size, their funding, and the resources they have available from parent organizations (if they exist). For those readers who are not familiar with digital preservation concepts and practices, this section is provided to explain key terms used in the ensuing discussion. Sources of more detailed information on digital preservation concepts and practices may be found in the Bibliography.

Defining Digital Preservation

“Digital preservation” from the audiovisual archivist’s perspective must first begin with the basic concepts of archiving, of which preservation is just one part. Archival work requires actions such as appraisal, arrangement and description (cataloging), preservation, management and providing access.

For analog materials, preservation is an umbrella term that includes conservation (storage in archival conditions), preservation (cleaning and reformatting) and restoration (proactive work to return the item to as close to its original state as possible). The critical conservation step means essentially “do no harm.” If analog materials are stored in a cold, dry environment in appropriate containers, their life expectancy will be extended with minimal human intervention.⁴⁰ Also known as the “store and ignore” approach, this relatively passive strategy is not possible with digital media.

Recent definitions of “digital preservation” by professional associations stress file management and related actions. For example, the Association for Library Collections and Technical Services definition reads:

“Digital preservation combines policies, strategies and actions to ensure access to reformatted and born digital content regardless of the challenges of media failure and technological change. The goal of digital preservation is the accurate rendering of authenticated content over time.”⁴¹

The United Kingdom’s Joint Information Systems Committee definition reads:

“Digital preservation is the series of actions and interventions required to ensure continued and reliable access to authentic digital objects for as long as they are deemed to be of value. This encompasses not just technical activities, but also all of the strategic and organisational considerations that relate to the survival and management of digital material.

“Digital objects will cease to be accessible without active management and intervention. The biggest risk to the accessibility of digital objects is the continual development of computing hardware and software. Many digital files or formats are dependent upon a particular computing environment for accurate presentation of their content. Any change to the rendering environment could result in change to the rendered representation of a resource (or result in not being able to render the resource at all).”⁴²

If anything, the term “digital preservation” is a misnomer. Some use the term “digital archiving,” which is different from what traditional information technology (IT) staff consider “archiving” (regular backup to digital data tape with or without verification steps). Others prefer “data curation,” which emphasizes the active management of a digital file throughout its life cycle.⁴³

Whichever term is used, preserving digital media is an active process that comprises all stages of traditional archival work and important additional actions, some of which are very complex. Some of these additional actions must be taken even before the digital audiovisual data is created – selecting file formats and storage media, for example, and considering data-handling workflows that facilitate downstream preservation.

In traditional analog archiving, archivists typically face substantial backlogs of incoming materials, but they can appraise and catalog them well after they are received, because analog objects are generally

able to remain in an input queue for long periods without decaying. By contrast, digital collections must be appraised and cataloged at the time of their creation, because there is insufficient time, resources and technical information available to process them for guaranteed long-term access once the digital collection reaches the archive. The fundamental difference is that the unmanaged life expectancy of digital materials is much, much shorter than that of their analog counterparts. Several other actions are required to preserve digital media: copying to new media and file formats (“migration”), maintaining redundancy and verifying data integrity, as well as scheduling and managing the actions themselves. A further consideration is that assessing and cataloging digital collections require specialized hardware and software tools that may vary from collection to collection, and these tools require specialized technical skills to operate.

For purposes of this report, the term “digital preservation” is used to refer to both reformatting (using digital techniques to preserve analog or digital originals) and preserving the digital files themselves.

Access vs. Preservation

Audiovisual archives have digital materials in their holdings for one or both of the following reasons: to provide access to analog or digital materials, and to preserve content that is available only in digital form or is digitized from decaying or obsolete analog sources.

The growth of the Internet and the public access opportunities it provides, as well as the increased monetization opportunities that come with access to archival collections, are the primary drivers of digitization of analog audiovisual materials.^{vii} Since the original analog source material is not discarded, there is no need to invest the resources required to preserve the digital copies; the digital copies can be regenerated if necessary for as long as the analog source material is accessible.

Digital files for which there are no analog source materials are handled differently: they are treated as preservation master copies and therefore must be managed according to best digital preservation practices to maintain their viability. If preservation actions are not taken, the files become unreadable and are effectively lost.

Reformatting Analog Materials and Born Digital Content

For archivists working with audiovisual content recorded on analog media with relatively short life expectancies, such as obsolete videotape formats or older audiotape and videotape media that are deteriorating, the term “digital preservation” has two parts. The first is the use of digital techniques to preserve analog originals, which is known as “digital reformatting.” The second is preserving the digital files themselves, whether the digital content was born digital (originated in digital form) or was created from decaying analog originals or previous digital copies. Reformatting analog originals as a preservation action is especially important for aging collections of audiotape and videotapes, since archives must digitize the holdings if the original tape stock is no longer manufactured. Once the original tape reaches the end of its life, only the surrogate digital file will remain.

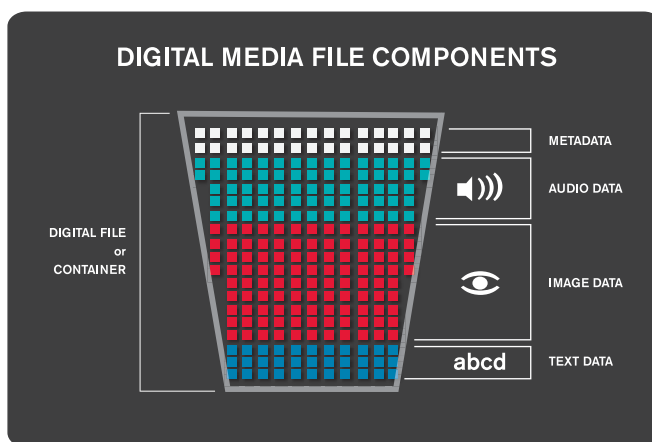
Surveyed archivists agreed that digitizing for preservation must not alter the original analog content in

^{vii} “Digitization” in this context is defined as the creation of a digital data file intended to be stored on and managed by a computer system. Recording on a digital videotape format such as Digital Betacam or HDV is not considered digitization, because these formats are handled similarly to analog videotape formats.

any way, that is to say, excessive “cleanup” of the original material or introducing digital artifacts should not be allowed.

File Formats, Metadata and Codecs

The zeros and ones that are the digital representation of recorded sound, images and text (also known as “essence”) are stored in digital files, which also contain data describing their organization and technical parameters. The size of the file can be reduced by data compression techniques, commonly implemented through the use of computer software or hardware components referred to as “codecs” (abbreviation for compressor/decompressor). The data describing the essence and codec (if used) is called metadata. Put another way, metadata is “the data about the data.” Metadata can be stored in a separate location, usually under the control of a computerized database that tracks the relationship between the metadata and the files it describes.



There are many types of files (also called “file formats”), many variations on individual file formats and many kinds of codecs. The survey respondents identified 26 different moving image file formats with 15 different codecs, and 15 different audio file formats with 6 different codecs. Many of these formats are supported today by commodity operating systems running on popular computer platforms, but some require specialized software and/or hardware. Accessing these files requires at least basic computer literacy, and in some cases more technical skills, especially when it comes to long-term access.

Metadata is organized by the specific function it serves: technical, descriptive, administrative or preservation. Among the several metadata schema that are used in archival applications, PREMIS (Preservation Metadata Implementation Strategies) and PBCore (Public Broadcasting Core) are two of the most common. Essence data is quite often “wrapped” together with the metadata; MXF (Material eXchange Format) is an example of such a wrapper, which may also be referred to as a file format.

Technical metadata is most easily generated at the time of content creation, because the hardware and software that create a digital file “know” the file’s technical details. They are therefore able to incorporate this information, even though they may not be designed specifically to do so. Other types of metadata are usually generated by archive personnel, but as previous studies

have shown, the earlier the metadata is created in the production process, the more likely it is to be created at all.⁴⁴

Storage Systems and Software Tools

Digital files must be stored somewhere, preferably in an environment where the storage system will facilitate digital preservation actions (discussed below) and even automate many of them. Digital storage systems in use today can be as simple as portable hard drives purchased at a retail store, or as complex as a data center that is part of an institution's IT infrastructure. These larger and (generally) actively managed systems are also called "enterprise storage systems."

Whatever the storage system, access to it is usually via a desktop computer with the appropriate physical and network connections. But digital storage alone is insufficient for preservation purposes. Specific preservation actions must be taken and tracked, with file locations and other information noted. Today tracking can be accomplished using a simple database software tool such as FileMaker Pro or Microsoft Access, or a full-function software tool known as a digital asset management system (DAM or DAMS). Other software tools such as file readers and transcoders (for converting one digital file format to another) are also needed to effectively implement preservation actions.

There are many tradeoffs to be considered when selecting software tools for archival applications, and this topic is covered in depth in the recent case study report published by the Academy of Motion Picture Arts and Sciences, *Long-Term Management and Storage of Digital Motion Picture Materials*.

Basic Preservation Practices: Data Backup, Verification and Migration

As previously mentioned, preservation of digital files is an active, ongoing effort. The proper execution of three key activities increases the likelihood that accessibility to digital files will be maintained:

- **Data backup:** Making multiple (two or more) copies of a digital file. The copies should be stored in different geographic locations and on different types of storage media to protect against physical or technical disasters.
- **Verification:** Regular inspection of all copies of digital files to protect against media or data transfer failure. A related activity is fixity checking, which verifies that a digital file has not been changed, either intentionally or unintentionally.
- **Migration:** Regular transfer of all digital file copies to currently supported media and file formats to protect against technological obsolescence.

Failure to effectively practice any one of these basic activities will eventually result in data loss.

Survey Methodology, Results and Analysis

Respondent Profiles

Twenty-one archives with audiovisual holdings completed a detailed survey on their digital preservation activities. These archives represent a cross section of institution size, mission and collection focus:

Academic Film Archive of North America
 Anthology Film Archive
 Archives of Appalachia, East Tennessee State University*
 Berkeley Art Museum and Pacific Film Archive
 Film & Media Archive, Washington University in St. Louis*
 Franklin Furnace*
 Getty Research Institute
 Harvard Film Archive
 Hoover Institution, Stanford University
 New York Public Library, Dorot Jewish Division
 New York Public Library, The Rodgers and Hammerstein Archives of Recorded Sound
 Northeast Historic Film
 Stanford University Libraries and Academic Information Resources
 University of Texas at Austin, Harry Ransom Center
 University of Virginia Library
 Walter J. Brown Media Archives and Peabody Awards Collection, University of Georgia*
 Wisconsin Center for Film and Theater Research
 Witness
 Anonymous (3 archives)

Archives listed with an asterisk (*) also took part in the in-depth case studies for representative views from a diverse group of audiovisual archives, and these case studies are included in the Appendix.

Of the surveyed archives:

- 10 identified themselves as university-based archives
- 5 as independent nonprofit organizations
- 2 as state archives
- 2 as public libraries
- 1 as a museum
- 1 as an independent moving image archive

The surveys and in-depth case studies requested detailed information from the archives on:

- The nature of their collections
- What content types they are digitally reformatting for preservation
- How they are digitally reformatting content (file formats and technical details, in-house vs. outsourcing)
- What content they are receiving as born digital files
- Their digital infrastructure
- Policies for the preservation of digital materials
- Funding strategies

The following sections summarize the nonprofit audiovisual archives' survey and interview responses regarding the most critical issues they seem to be facing today. Direct quotes were edited for readability without altering the respondents' intent. For more details, the complete case study reports are provided in the Appendix, and the survey data is provided in the Online Appendix.

Digital Preservation Activities

The archives were asked to provide their own definitions of the two parts of digital preservation: reformatting (using digital techniques to preserve analog originals) and preserving the digital files themselves. The archivists interviewed for this report mostly aligned their digitization practices with traditional archival philosophies, with one important distinction: they acknowledge a shift away from preserving a physical object to preserving the object's content, which in this context is the image and/or sound essence contained in a digital file.

As one archivist stated:

“Philosophically, my definition of digital preservation does not differ from other media because the goal of preservation, regardless of content format, is to care for and maintain the integrity of the materials for future generations. This implies not altering the original or introducing new elements (i.e., ‘cleaning up’ the image or audio signal during digitization). However, I recognize that there has been a paradigm shift in the ‘how’ of preservation. Previously, preservation meant that the physical object or item was preserved. With digital preservation, it is the content and not the carrier that must be preserved.”

The archives vary in some of their approaches to preservation and are consistent in others. In general, all of the interviewed archives developed their own approach to preserving digital materials in response to one of two stimuli: digital materials entering via new collections, or format obsolescence of analog media items already in their possession. The surveyed archives began digitally reformatting analog originals between 2003 and 2007, and most have been receiving born digital content sporadically over the past ten years. Some reported their first digital deposits in the late 1990s and early 2000s – before they started digitally reformatting analog originals.

Reasons for Digitizing Content

As described earlier, digital content is handled according to its intended function: digital files created to provide user access to an archive's holdings do not need to be handled with the same diligence and care as files created for preservation purposes, because they are simply “working copies” that can be re-created if they are lost or damaged. Surveyed archives reported that the desire to provide digital access to their holdings usually got their first toe in the digital pool. They began to build digital capabilities in response to this need, but they generally did not build sufficient infrastructure at that time to meet the requirements for digital preservation.

Digitizing for access

The following table illustrates how the surveyed archives ranked their motivations for digitizing for access, with “5” being most important and “1” being least important. Importance of content and user request received the highest rankings.

TABLE 1 Motivations to Digitize for Access Only

| MOTIVATION | AVERAGE RANKING |
|--|-----------------|
| IMPORTANCE OF CONTENT | 4.09 |
| USER REQUEST | 4.05 |
| DETERIORATION OF ANALOG ORIGINAL | 3.53 |
| DONOR REQUEST | 3.48 |
| FUNDING OPPORTUNITY | 3.38 |
| OBSOLETE ORIGINAL ANALOG FORMAT | 3.19 |
| OBSOLETE ORIGINAL DIGITAL FORMAT | 2.86 |
| ADMINISTRATION/PARENT ORGANIZATION REQUEST | 2.52 |
| ENABLE FOOTAGE LICENSING | 2.48 |
| CONSORTIUM PROJECT | 2.29 |
| DVD SALES/DISTRIBUTION | 1.81 |

The archives were also asked to rank the types of moving image and audio content most often digitized for access purposes. Their top 10 responses are summarized in the following tables.

TABLE 2 Top 10 Moving Image Content Types Digitized for Access

| MOVING IMAGE CONTENT TYPE | % OF HOLDINGS DIGITIZED FOR ACCESS (AVERAGE) |
|---|--|
| PERFORMANCE DOCUMENTATION (music, dance theater, performance art) | 11.91 |
| DOCUMENTARIES (1923 to present day) | 11.38 |
| EXPERIMENTAL FILM | 10.55 |
| HOME MOVIES | 10.35 |
| TELEVISION BROADCASTING (including aired news programming) | 9.73 |
| FIELD RECORDINGS | 8.53 |
| ANIMATION | 6.15 |
| ORAL HISTORIES/INTERVIEWS | 4.93 |
| LITERARY READINGS | 4.88 |
| EDITED PACKAGES (educational, subject-specific, etc.) | 4.66 |

TABLE 3 Top 10 Audio Content Types Digitized for Access

| AUDIO CONTENT TYPE | % OF HOLDINGS DIGITIZED FOR ACCESS (AVERAGE) |
|--|--|
| ORAL HISTORIES/INTERVIEWS | 13.55 |
| FIELD RECORDINGS | 5.90 |
| PERFORMANCE DOCUMENTATION (music, theater) | 5.56 |
| LECTURES | 4.22 |
| MOVING IMAGE SOUNDTRACK | 3.30 |
| SOUND ART | 2.64 |
| RADIO ENTERTAINMENT BROADCASTS | 2.33 |
| LITERARY READINGS | 1.56 |
| NONFICTION SOURCE MATERIAL (raw news) | 1.43 |
| RADIO DOCUMENTARIES/AUDIO ESSAYS | 0.44 |

Digitizing for preservation

In selecting the content to be digitally preserved, the surveyed archives have been applying a mix of criteria that include uniqueness or importance of content, format obsolescence, and condition of the original object. Uniqueness is a key metric in the selection process. If an object was on an obsolete or deteriorating format, but was not unique, an archive would consider digitizing the item for access but not necessarily for preservation. If an item was unique, and the format was obsolete or deteriorating, it was a prime candidate for preservation. The following table illustrates how the surveyed archives ranked their motivations for digitizing for preservation, with “5” being most important and “1” being the least important.

TABLE 4 Motivations to Digitally Preserve Content

| MOTIVATION FOR DIGITIZING FOR PRESERVATION | AVERAGE RANKING |
|--|-----------------|
| IMPORTANCE OF CONTENT | 4.43 |
| OBSOLETE ORIGINAL ANALOG FORMAT | 4.34 |
| DETERIORATION OF ANALOG ORIGINAL | 4.29 |
| OBSOLETE ORIGINAL DIGITAL FORMAT | 3.52 |
| USER REQUEST | 3.33 |
| FUNDING OPPORTUNITY | 3.10 |
| DONOR REQUEST | 2.48 |
| ADMINISTRATION/PARENT ORGANIZATION REQUEST | 2.29 |
| ENABLE FOOTAGE LICENSING | 2.14 |
| DVD SALES/DISTRIBUTION | 1.75 |
| CONSORTIUM PROJECT | 1.71 |

As with access, the archives were also asked to rank the types of moving image and sound content most often digitized for preservation:

TABLE 5 Top 10 Moving Image Content Types Digitized for Preservation

| MOVING IMAGE CONTENT TYPE | % OF HOLDINGS DIGITIZED FOR PRESERVATION (AVERAGE) |
|--|--|
| DOCUMENTARIES (1923 to present day) | 6.59 |
| PERFORMANCE DOCUMENTATION (music, dance, theater, performance art) | 6.52 |
| EXPERIMENTAL FILM | 6.26 |
| LECTURES | 6.19 |
| FIELD RECORDINGS | 5.89 |
| VIDEO ART | 4.19 |
| COMMERCIALS/ADS | 1.45 |
| HOME MOVIES | 1.10 |
| ANIMATION | 0.88 |
| ORAL HISTORIES/INTERVIEWS | 0.86 |

TABLE 6 Top 10 Audio Content Types Digitized for Preservation

| AUDIO CONTENT TYPE | % OF HOLDINGS DIGITIZED FOR PRESERVATION (AVERAGE) |
|--|--|
| ORAL HISTORIES/INTERVIEWS | 7.74 |
| LECTURES | 6.21 |
| PERFORMANCE DOCUMENTATION (music, theater) | 5.73 |
| FIELD RECORDINGS | 4.14 |
| SOUND ART | 2.64 |
| LITERARY READINGS | 1.71 |
| RADIO ENTERTAINMENT BROADCASTS | 1.13 |
| MOVING IMAGE SOUNDTRACK | 1.10 |
| TELEPHONE CONVERSATIONS | 0.54 |
| RADIO NEWS BROADCASTS | 0.32 |

The surveyed archives have been preserving unique moving image items such as field recordings, lectures, oral histories, interviews, performance documentation and home movies, as well as “orphan works.” Orphan works are those works for which the copyright holder cannot be located, or the creator lacks the means to preserve what limited copies exist (works such as an experimental film or video).⁴⁵

The uniqueness criterion explains why broadcast television content was not among the top 10 content types digitized for preservation, although it ranked high in digitizing for access. Duplicate copies of older, previously-aired television programs are quite often held at several different archives as well as at the originating network or television station, so such content is generally not a priority for preservation.

As with moving image content, the majority of audio content that was digitized for preservation was selected because of its uniqueness. An interesting audio preservation dynamic was noted by one archive with collections of independent filmmakers’ production elements. If there wasn’t

“...analog
recordings
made more
than 100 years
ago are more
likely to
survive than
digital
recordings
made today.”

enough funding to preserve an entire film, the archive digitized the soundtrack for preservation, because soundtracks are often recorded on magnetic stripe film, which is prone to deterioration by a chemical mechanism called “vinegar syndrome.”⁴⁶

Summary

Digitizing original audio materials for preservation was widely acceptable to the surveyed archives, and they were in agreement on a preservation file format and technical specifications (discussed later in this report). Surveyed archivists said that standards work by the Audio Engineering Society (AES) and other organizations made them comfortable with their technical decisions regarding preservation of digital audio files.

It is worth noting that a standardized audio preservation file format is not sufficient to ensure long-term access. *The State of Recorded Sound Preservation in the United States: A National Legacy at Risk in the Digital Age* was published by the Library of Congress’s National Recording Preservation Board (NRPB) after the surveys and interviews for this report were completed. The study’s findings state that newer content, such as born digital audio, is at greater risk of loss than older recordings on such media as 78 rpm discs, and that analog recordings made more than 100 years ago are more likely to survive than digital recordings made today.

Institutions, archives and libraries hold an estimated 46 million recordings, yet the study found that major areas of America’s recorded sound heritage have already deteriorated or are inaccessible. One of the NRPB study’s conclusions is that the advent of digital technologies and distribution platforms has made preservation issues and access issues for sound recordings inseparable.⁴⁷ The authors of the NRPB study state that “digital technology alone will not ensure the preservation and survival of the nation’s sound history.”⁴⁸ This is consistent with the findings of other digital preservation studies: policies and procedures that fill technological gaps also must be put in place to achieve long-term access to digital materials.

For moving image content, the surveyed archivists agreed that film should continue to be preserved as film, that is, new film copies should be made if the older ones deteriorate. One reason for this may be that under proper storage conditions, film has a longer life expectancy than electronic media. The archivists also felt that more visual information is held in a film frame than could be digitally captured with their current technical capabilities.

Digitizing video originals for preservation is a gray area. Surveyed

archivists believed that Betacam SP and Digital Betacam videotape stock might be harder to acquire in the near future, and therefore they felt that they must begin digitizing their tape-based video holdings. The lack of a clear standard preservation file format and technical specifications for digitizing video was unsettling to them, but it was not the main factor influencing their digital video preservation decisions. As will be discussed later in this report, other factors such as storage capacity and technical infrastructure were stronger influences.

Reformatting Content

Some of the surveyed archives have been practicing a two-pronged approach to preserving audio and moving image content, preserving both digital files and analog audiotape and videotape. Although they acknowledged that tape stock supplies are dwindling, they were comfortable with analog preservation and were reluctant to abandon the practice unless they had no other choice. If audiotape and videotape originals existed on fully obsolete media, or required unavailable or unserviceable playback equipment, these archives digitally reformatted them to provide a serviceable master record for the near term. The surveyed archives reported that they are also reformatting born digital content. The main reason they did this was immediate usability:

“One thing we’ve experienced with born digital formats from a few [digital] camera types is the need to up-convert the original so that it can be edited [for access purposes]. At present we archive both the original format and the up-converted files.”

Four archives mentioned that on occasion, they have rejected born digital content. They gave a variety of reasons for doing so:

- Digital video files harvested from the Internet may carry viruses that could damage a collection
- The items had been removed from their original context, so no provenance information was available
- There were too many file formats “to juggle”
- Their parent institution had not yet supplied a repository with a “proper digital asset management system to store, preserve and stream these materials”
- They lacked the software to view the digital files

The surveyed archives received born digital oral histories/interviews, field recordings and lectures, with moving image file formats outnumbering audio file formats. Interviews suggested two possible reasons for this larger number of image file formats are digital video’s ease of use for acquisition and the fact that there are more moving image formats than audio formats.

In-House vs. Outsourced Digitization Programs

For some organizations, establishing an in-house digitization program that is capable of creating thousands of digital files is often the first step toward developing a digital preservation program.

The immediate need is typically the creation of access or preservation files; designing and implementing a digital preservation program generally happens much later.

Whether they were focused on access or preservation, the surveyed archives had varying digitization capabilities: 13 of the 21 archives (62 percent) could create digital preservation files from 17 different analog formats in-house. Five archives reported digitally preserving analog video, and only one could make preservation files of film. The creation of relatively large quantities of digital audio files is primarily due to archives' widespread in-house capability to digitally preserve audio content.

Several of the surveyed archives built in-house digitization labs to create digital preservation files for their audio and/or video originals. Three of these archives received grants that enabled them to buy equipment to build in-house labs, and two others mentioned receiving funds from donors. Another three said developing a digitization and digital preservation program was a necessity, because their original archival objects were on obsolete or fragile analog media. In these cases, the equipment for an in-house lab was supported by either the parent organization (two archives) or by the archive itself (one archive). One archive built upon its institution's established still-image digitizing infrastructure. Two specifically mentioned having a good relationship with their institution's IT department, which would be able to help with digital storage issues.

A table listing all film, video and audio formats mentioned by survey respondents and where content is digitized can be found in the Online Appendix.

Preservation Policies and Practices

Archives participating in the survey and case studies were asked about how they were preserving their digital content, with emphasis on their current practices and the challenges they faced:

- Does the archive have a digital preservation policy, and is it fully implemented?
- What is the technical infrastructure to digitally preserve the files (storage systems, backup systems and process, physical carriers)?
- What digital preservation actions are performed? These actions include data verification, migration, and managing file format obsolescence, as well as scheduling and tracking these actions.
- Who controls how the digital preservation actions are performed and managed, e.g., the archive or another department such as IT?
- What technical and preservation metadata are captured?
- Does the archive use a digital asset management system or some other software tool to track its digital preservation workflow and manage digital media objects?

Many surveyed archives are actively digitally reformatting their audiovisual collections. Only three of the surveyed archives that create digital files have implemented some level of digital preservation or curation policies. Twelve reported that they are actively working on creating policies, but must overcome significant impediments:

- Lack of funding
- Lack of technical infrastructure
- Lack of trained staff
- Lack of institutional support

File formats and technical specifications

The surveyed archives were asked to list the file formats and related technical specifications they used for reformatting moving image and analog audio originals. They were asked to provide information regarding archival originals (original analog sources that are reformatted for preservation) and born digital files for three use cases:

Preservation: Creating a digital file from the archival original at the highest image quality, and using the least amount of data compression. Preservation files are not regularly accessed, in part because their large size makes them difficult to manage.

Mezzanine: Creating a digital file that is the equivalent of a “copy master” that is used to make other duplicates, generally for viewing purposes. A mezzanine file generally uses a data compression scheme to reduce its file size for easier handling, with an often corresponding (but acceptable) reduction in image or sound quality.

Access: Creating a digital file that is provided to users for content access. An access file uses a “consumer-friendly” file format and is typically highly compressed.

Because mezzanine files are transitional by nature, the following sections discuss findings related to preservation and access files only.

Moving image preservation file formats

In total, 16 of the 21 survey respondents (76 percent) created digital moving image files. Of the archives responding to this question, all except one preserved film as film; the sole archive that digitally reformatted film for preservation digitized at a pixel count of approximately 2K x 1K and stored this data in DPX files.^{viii} Surveyed archives gave these reasons for preferring photochemical preservation:

- Film’s long life expectancy if properly stored
- The belief in the superiority of film’s image quality over that of its digital surrogate
- The high cost to digitize film and the attendant high cost to store and manage the resulting digital files
- Lack of a standard digital preservation file format

^{viii} DPX files are digital image files conforming to SMPTE 268M-2003, a standard published by the Society of Motion Picture and Television Engineers.

Although some archives reported digitizing analog video for preservation, there was no consensus on the particular file format and technical specifications. The archives not digitizing analog video for preservation preferred creating analog tape preservation masters from their videotapes for several reasons:

- Familiarity with analog tape formats
- Comfort with storing easily accessible physical objects on a shelf
- Lack of a digital infrastructure
- Belief that analog transfers are more true to the information on the original media

Table 7 lists the file formats (and technical details, where provided) used by the surveyed archives for moving image preservation masters. The lack of consensus on a standard format for moving image preservation is underscored by the use of 12 different file and tape formats with varying technical parameters.

TABLE 7 File and Tape Formats Used for Moving Image Preservation

| MOVING IMAGE FORMATS FOR PRESERVATION | NUMBER OF ARCHIVES THAT USE |
|--|-----------------------------|
| UNCOMPRESSED 10-BIT (unspecified data container) | 4 |
| BETACAM SP | 3 |
| AVI | 3 |
| JPEG 2000 (50 mbps) | 2 |
| DIGITAL BETACAM | 2 |
| MPEG2 (DVD quality; 3-5 mbps) | 2 |
| D5 | 1 |
| UNCOMPRESSED 8-BIT (unspecified data container) | 1 |
| DPX (2k) | 1 |
| ProRes 422 | 1 |
| QUICKTIME (unspecified details) | 1 |
| MOV (uncompressed, 30 mbps) | 1 |
| MPEG4 (H.264; unspecified bitrate) | 1 |
| MPEG4 (H.264/800 kbps) | 1 |
| MPEG4 (H.264/300 kbps) | 1 |

Moving image access file formats

All 16 archives that created moving image digital files also created access files. Surveyed archives with a more sophisticated technical infrastructure provided online access to these files, and those without such infrastructure created DVD copies for on-site access.

TABLE 8 File Formats Used for Moving Image Access Files

| MOVING IMAGE FILE FORMATS FOR ACCESS | NUMBER OF ARCHIVES THAT USE |
|--------------------------------------|-----------------------------|
| MPEG2 (DVD quality; 3-5 mbps) | 9 |
| FLASH (FLV) | 5 |
| MPEG2 IMG (DVD QUALITY; 8 mbps) | 2 |
| AVI (unspecified details) | 1 |
| QUICKTIME (unspecified details) | 1 |
| QUICKTIME (1 mbps) | 1 |
| QUICKTIME (H.264; 400 kbps) | 1 |
| QUICKTIME (H.264/1.5 mbps) | 1 |
| MOV (unspecified details) | 1 |
| MPEG4 (H.264/1 mbps) | 1 |
| MPEG4 (H.264/300 kbps) | 1 |
| MPEG4 (unspecified details) | 1 |
| WMV | 1 |

Audio preservation file formats

In total, 15 of the 21 archives surveyed created digital audio files. These archives were clearly comfortable with digitizing audio for preservation purposes. The technical parameters of 96 kHz/24-bit were used for preservation in 10 out of the 15 digitizing archives, and all have settled on the use of the WAV format and the closely related BWF (Broadcast WAV format). Archives interviewed in the case studies noted that the International Association of Sound and Audiovisual Archives (IASA) technical recommendations influenced their decisions on file format and technical parameters.⁴⁹ These archives believed that there are established standards for audio digital preservation, whereas none yet exist for moving image digital preservation.

TABLE 9 File Formats Used for Audio Preservation

| AUDIO FILE FORMATS FOR PRESERVATION | NUMBER OF ARCHIVES THAT USE |
|-------------------------------------|-----------------------------|
| WAV (96 kHz/24-bit) | 7 |
| BWF (96 kHz/24-bit) | 3 |
| BWF (variable bitrates) | 1 |
| WAV (48 kHz/24-bit) | 1 |
| WAV (44.1 kHz/16-bit) | 1 |
| MP3 (128 kbps) | 1 |
| AIFF (48 kHz/24-bit) | 1 |
| SD2 (48 kHz/24-bit) | 1 |

Audio access file formats

All 15 of the surveyed archives that created audio digital files also created access files. One archive made only access files (no preservation files). The availability of online access versus

physical media-only access was similar to moving image access files: archives with a more sophisticated technical infrastructure provided online access, and those without provided CD-only access. The table below lists the digital audio formats used for access files, ranked by total number of archives using each format:

TABLE 10 File Formats for Audio Access Files

| AUDIO FILE FORMATS FOR ACCESS | NUMBER OF ARCHIVES THAT USE |
|-----------------------------------|-----------------------------|
| CD-R (44.1 kHz/16-bit) | 8 |
| WAV (44.1 kHz/16-bit) | 2 |
| MP3 (128 kbps) | 2 |
| “STREAMING” (unspecified details) | 2 |
| BWF (variable bitrates) | 1 |
| MP3 (160 kbps) | 1 |
| MP3 (320 kbps) | 1 |
| MP3 (“standard”) | 1 |
| MPEG4 (100 kbps) | 1 |
| AIFF (44.1 kHz/16-bit) | 1 |

Data storage

As stated previously, file size is one factor that determines how archives choose to store their digital preservation files. Cost and technical support requirements are two others. Larger archives, or archives that are part of a larger institution, generally have more internal financial support than smaller, stand-alone archives. If the larger archives do not use their parent institution’s IT infrastructure for data storage, they generally have the financial resources to purchase and operate their own enterprise storage systems and data tape drives. By contrast, archives with limited resources or no parent institution must find affordable means to store their preservation files. Surveyed archives with limited resources stated a preference for using inexpensive portable storage devices, such as external hard drives or recordable optical media, which they believed could be as easily stored and managed as the analog media in their archives.

From a digital preservation perspective, it can be more convenient to store digital files on fully managed enterprise storage systems equipped with data tape drives than on physical carriers such as portable hard drives or recordable optical media. Storing files on disparate media types, such as consumer-grade portable hard drives, digital tape, and independent computer workstations or servers, requires archives to perform different digital preservation actions for each media type and system. This is extremely labor-intensive and increases the likelihood of human error. Physical carriers also degrade over time. Hard drives must be regularly powered up to distribute internal lubrication and perform error detection operations; leaving a hard drive in a powered-down state for an extended period increases its risk of malfunction and may reduce its operational lifetime.

Surveyed archives were asked to provide their current and projected digital storage requirements, which are shown in Table 11. While continuing increases in the storage capacity and price/performance of digital storage technology will likely offset some of the additional hardware requirements, the projected 1,500 percent growth in archives’ cumulative storage requirements between 2009 and

2014 will still force the archives to purchase new storage systems and implement comprehensive data management practices to be able to handle the sheer number and types of files.

TABLE 11 Cumulative Digital Storage Requirements (Current and Projected)

| | CURRENT (2009) IN TB | FUTURE (2014) IN TB |
|------------------------------------|----------------------|---------------------|
| TOTAL DIGITAL STORAGE REQUIREMENTS | 182.5 | 2,709.5 |

The surveyed archives that rely on physical carriers clearly wanted fully managed enterprise storage systems, but they lacked the necessary funding and technical expertise. Their comments articulated their conundrum:

“LTO^{ix} with fast RAID^x. Impeded by lack of funds, institutional priorities.”

“A system of RAID servers. We lack funds and technical support to do this.”

“Don’t know what system. Funding, funding, funding and technical expertise.”

“I would like to use LTO3 or 4. Lack of personnel, funds and an existing system impede us from implementing a new system.”

“Would prefer more low-cost redundant disk forms (e.g., racked SUN thumpers, or MAID devices like Copan^{xi}). Factors = cost + enterprise support issues.”

Organizational impediments were also described:

“Obviously, the current digital storage arrangement for digital time-based media files is insufficient for the burgeoning needs of a world-class university library. We hope to be depositing files in an archive maintained by [the university’s] Information Technology and Communication division.... The thing holding us back from this is the slow grind of academic bureaucracy, really. Processes and workflows must be determined before anything is stored properly.”

With respect to capacity, 11 of the surveyed archives had current storage requirements of less than 20 terabytes, and 4 others ranged between 21 and 40 terabytes each. Seven of the archives did not have enterprise storage systems and only used portable hard drives and/or data tape. On average, the surveyed archives expected their storage needs to increase 14-fold over the next five years as a result of continued reformatting activities and incoming digital collections.

Metadata

As discussed earlier in this report, metadata is essential to describe, locate and preserve digital files. Technical, descriptive and administrative metadata fully describe digital files, and technical metadata

^{ix} LTO is the acronym for Linear Tape-Open, an open standard for digital data tape. The numerical suffix indicates the revision of the format, which is updated approximately every two years. <http://www.lto-technology.com/index.html>.

^x RAID is the acronym for Redundant Array of Independent Disks, which is a technique for connecting together several individual hard disk drives for increased capacity, reliability and/or data transfer rates.

^{xi} Sun Microsystems, Inc. (acquired by Oracle Corporation in 2010) and Copan manufacture and sell high-performance digital storage systems. MAID is the acronym for Massive Array of Idle Disks, which is a strategy to reduce the power consumption of digital storage systems.

is essential for proper playback of digital media files. Preservation metadata enables digital preservation by maintaining information such as file validity, access history and migration status.

Archives were asked whether they tracked technical and preservation metadata, and if they did, where it was tracked and which standards were used. Twelve archives tracked metadata to varying degrees (shown in Table 12 below). The extent to which they captured and maintained metadata varied widely – for most archives, it did not go beyond capturing filenames and storage locations, e.g., identifying the computer server, portable hard drive or other physical media on which the file was stored. This represents a small subset of the metadata necessary to fully manage digital assets for preservation purposes.

Since the application of metadata is highly dependent on individual workflows and business practices, archives were asked to list standards from which they selected technical and preservation metadata fields (they could list more than one), as well as whether the definitions of their metadata fields were specific to their organization.

TABLE 12 Technical Metadata Standards/Resources Used

| TECHNICAL DATA STANDARD/RESOURCE USED | NUMBER OF ARCHIVES |
|---|--------------------|
| INTERNAL | 5 |
| PBCore | 4 |
| AES | 4 |
| SMPTE | 3 |
| PREMIS | 3 |
| OTHER: INTERNET ARCHIVE (host) | 1 |
| OTHER: MAVIS (cataloging system) | 1 |
| OTHER: HARVARD (audio technical data) | 1 |
| OTHER: LIBRARY OF CONGRESS (audio technical data) | 1 |

It is interesting to note that the metadata source listed most often was “Internal,” that is, surveyed archives primarily used technical data fields they created on their own. This was followed by PBCore, AES (for audio content), SMPTE and PREMIS, which are the most widely known metadata standards and schema for audiovisual content.

Archives were also asked whether they stored their technical metadata in independent databases, embedded in the digital file, or in digital file “wrappers” such as MXF and METS. Eleven of the 12 archives that tracked technical metadata were using separate databases. At least some of the time, the archives were also beginning to track the technical metadata in more than one location. Seven of the archives that used a separate database also embedded metadata in the file itself, and two wrapped their files in MXF and/or METS.

That many of the surveyed archives embedded metadata in the file as well as stored it in a database indicates that they believed doing so aids digital preservation actions. Resource constraints typically kept the amount of embedded metadata at a minimal level, but as one archivist explained, the handling of metadata is evolving:

“Whether or not the metadata is recorded in database systems outside the file itself depends on available resources for a given project. All files ingested thus far into our preservation repository have extensive metadata wrapped in METS, but we are beginning to rethink this approach, as it tends to be resource-intensive and portends to not scale well.”

Software tools

Tools to manage the creation of digital files, metadata and preservation actions are essential for any preservation program. Several archives wrote in their surveys that even though they were digitally preserving analog source materials, they did not consider these efforts a formal digital preservation program because they had neither the proper storage infrastructure nor the means to manage and preserve the digital files.

The surveyed archives tracked their digital content in different ways; very few had a digital asset management system that held both the metadata and the digital media files. It is interesting to note that only one surveyed archive had tools specifically created for digital asset management and some level of digital preservation (Artesia and Ex Libris’s DigiTool). Interestingly, this archive also reported that it had not yet established digital preservation policies.

Less than half (8) of the 18 archives that handle digital files were using some form of database or DAMS to track their digital file actions. Four of these archives used off-the-shelf database management software such as FileMaker Pro and Microsoft Access. The rest used a mix of open source digital repository software (Fedora Commons), a “home-grown” database, a traditional archive catalog system (MAVIS), and as mentioned earlier, a combination of two commercial DAMS products.

In general, the surveyed archives have taken a low-cost database approach to managing the data that describes their digital objects. They believed that it was important to manage this data, regardless of which software was used.

Process – data backup

Six of the surveyed archives stored their digital files on an enterprise storage system and relied on their organization’s IT department to backup the files on digital tape. Another three archives stored and managed their digital files on their own systems. Those not utilizing tape backup were finding other ways to create redundancy. For example, some were duplicating files on portable hard drives. A few were creating only one copy of their moving image preservation files, a practice they justified by having insufficient resources to fully manage the characteristically large moving image files.

All the surveyed archives creating digital audio preservation files saved redundant copies, a reflection of the relative ease of saving multiple copies of smaller files.

The archival principle of geographic dispersal, i.e., distributing copies to different buildings or other remote locations to avoid catastrophic loss, was not widely practiced. Only four of the surveyed archives indicated that they practice geographic dispersal.

Process – fixity checks and file validation

When asked which digital preservation actions they performed, the surveyed archives most often reported checksum calculations (a mathematical procedure run on digital files as part of the process of data verification and error detection) and file validation. Performing these actions is not without its challenges:

“MD5 checksums are run on all files. The checksum data is stored within the FileMaker database along with the other technical metadata that is extracted from the files. And not to complicate things, but the checksums have come up recently as an issue that we haven’t quite worked through in terms of when to run. They tend to slow down our process a lot, and we need to take that into account. So our process may actually change.”

Eight of the 18 archives that stored digital files performed fixity checks via checksums, although none stated that they scheduled the checksum calculations more than once. Three of the archives performed file format validations, but did not necessarily repeat validations on a defined schedule.

It is important to note that because digital files are always subject to corruption mechanisms, file format validations and fixity checks must be performed regularly for the life of the files.

Issues and Challenges

General

The archivists interviewed for the case studies were asked to identify what they thought were the biggest challenges facing archives that intend to preserve digital audiovisual files for hundreds of years:

“Paying attention. Can you stay abreast of changes when they happen so rapidly? Will staff forget about it [the files], and wait too long? There’s no down time.”

“Keeping up with technology. [We] need money to move content forward as technology changes, and appropriate staffing with a strong knowledge base. A preservation/migration plan must be in place.... How much really needs to be digitized? Do we have to do everything, or can we make curatorial decisions?”

“Rapid changing of technology. Equipment, file formats, software. Resources – [we] need people, servers, people who know how to manage the servers.”

“One of the biggest challenges of preservation will be keeping pace with technical changes. I believe that it will be harder for the individual collector to preserve digital materials. As such, there comes a need to ensure that archivists develop strong institutional links that support preservation in order to sustain the mechanism and diligence required to maintain scheduled migration strategies.”

Despite these challenges, the vast majority of the surveyed archives (18 of 21) were digitally reformatting analog originals for preservation or access. Older organizations with analog workflows and institutionalized practices reported that they found it difficult to gain internal support for moving from an analog environment to a comprehensive digital infrastructure. They discovered that the shift involved major operational changes and expense to retrofit legacy workflows, staff practices and mindset.

Relationship with IT Departments

Sixteen of the 21 surveyed archives were based at institutions that have enterprise storage systems, and most of these depended on the institution's IT infrastructure to store their digital files. The benefit of such a relationship is that by following traditional IT backup practices, the digital files will at minimum have some level of redundancy. But whether the archives will be allowed to establish and perform preservation actions is another question, as discussed below.

Seven archives were not using their parent institution's IT infrastructure for digital file storage and backup. As one archivist noted:

“We do not have a satisfactory digital storage system at the moment. An appropriate digital storage system/repository for audiovisual materials would have to be implemented and supported by our institution. It would have to be a true DAMS, which would preserve, authenticate, and migrate as needed our digital audio/video assets, and also allow for future streaming of such materials, whether in-house or on the Web.”

The archives that stored files on their parent institution's enterprise storage system had varied levels of influence on preservation and management policies. In survey responses and case studies, the archives that stored files on another department's equipment stated a preference for setting their own archiving policies, but many met resistance when they tried to do so. For example, some archivists favored storing a set of digital backup tapes off-site and migrating the files to a new generation of digital data tape every five years. This conflicted with traditional IT backup practice, which assigns a 30-year life expectancy to the tape stock and does not necessarily recognize the need to re-verify and back up data before the end of the physical media's useful life.

It is important to note that digital data tape manufacturer specifications for a 30-year life expectancy apply to the physical media only. It is currently unknown how long recorded digital data will last with the “store and ignore” approach, but the consensus in the user community is that it will not last anywhere near 30 years. Furthermore, no surveyed archive would consider storing digital data tapes for that length of time, because today's data storage hardware and software reach technology obsolescence every five to seven years, and digital recording media historically become obsolete after two of these replacement cycles.

Surveyed archives stated that they would like to work cooperatively with their IT department and forge a relationship in which each department's strengths would be utilized. In an ideal scenario, the archive would recommend digital preservation actions according to archival principles, and the IT department would recommend how to implement those actions. This was considered a practical challenge, however, as was the determination of cost sharing and operational responsibilities:

Issues and Challenges

“We have little control over the storage of our preservation materials (it may be managed by our IT people). This may be a point of contention in the future. Cost and institutional barriers will be the main factors that impede or slow down our development of a system. Identifying exact responsibilities between units and departments, as well as cost-sharing issues, will be the major problems with our plans going forward.”

One archivist suggested creating reports and documents explaining digital preservation from the archivist’s perspective to help both groups come to a common understanding of digital preservation, as well as to help archivists justify their assertions to IT staff.

Funding

Surveyed archives reported the following on their funding sources:

Table 13 Funding Sources for Digital Preservation Programs

| FUNDING SOURCES | PERCENT REPORTING |
|--------------------------------------|-------------------|
| INTERNAL SUPPORT | 51 |
| GRANTS (federal, state, foundations) | 23 |
| REVENUE | 12 |
| DONORS (individual and Web-based) | 10 |
| OTHER | 4 |

Archives generally reported very tight operating budgets, although audiovisual archives with a financially strong parent institution could benefit from that strength. A 2006 report by the Metropolitan New York Library Council (METRO), a member organization of almost 300 public, higher education and special libraries in the New York City metropolitan area, found that 46 percent of its members received all or partial digitization funding from their parent institution.⁵⁰ In 2008, Primary Research Group, a for-profit company that combines research and business trends forecasting, published a report on collection digitization trends in international libraries and museums. The report found that U.S. libraries received 55 percent of their digitization budgets from their parent institution: “Spending on digitization has graduated out of the grant-dependent category and is now a mainstay in library budgets for many institutions.”⁵¹

While an archive’s digitization budget is often funded by its parent institution, it is defined here as funds allocated to digital preservation activities from the archive’s operating budget. This is separate from funding that covers digital projects for the institution as a whole. For example, a parent institution might pay for the creation of an in-house digitization lab, but the lab’s staff and their activities are supported by the archive’s operating budget.

For more detailed information on selected archives’ funding strategies, see the case studies in the Appendix.

Archivists' Recommendations

All the surveyed archivists expressed some knowledge of what needed to be done to preserve access to their digital files, and understood the basics of storage, redundancy and migration. Many expressed concern that resource, organizational and technical issues would hinder their ability to design and implement comprehensive digital preservation programs. When asked what they thought should or could be done to assist them in developing adequate digital preservation programs for their audiovisual materials, the archivists responded with the following recommendations:

■ **Digital moving image preservation format standards:** The archival community has not reached a consensus on a standard digital preservation file format and associated codec for moving images. In pursuit of such standards, archives and standards-setting bodies should not simply aim for a single format and its related technical details, but consider a range of formats that address archives' varied technical infrastructures. Recognizing that it might be difficult for archives with limited storage and management capabilities to reformat according to one highest-performance standard, the community should take a multi-tiered approach, described in clear language, so each archive could select the formats and codecs that it could best support.

It is worth noting that as of this writing, there are multiple efforts underway that are expected to lead to a set of digital moving image preservation format standards: the Federal Agencies Digitization Guidelines Initiative Audio-Visual Working Group, the Image Interchange Framework project and the Interoperable Master Format project.

■ **Establish in-house or cooperative digital reformatting facilities:** Having sufficient equipment and staff for digitizing in standard file formats helps archives with large collections do a larger volume of digital reformatting for preservation and access. Archives that have established in-house transfer capabilities report lower file-handling costs, which allows them to digitize more content than they would if they outsourced to more expensive digitization services. Those archives without the funding or collection size to justify in-house digitization facilities proposed developing cooperative fee-for-service arrangements with archives that are so equipped.

Several of the surveyed archives also suggested building a digitizing "co-op," where several archives would pool their resources to build a shared facility.

■ **Foster relationships with IT departments:** Archives at institutions with enterprise storage capability should be encouraged to build relationships with the departments that manage their institution's digital storage systems. As IT policies and practices for general business operations do not meet an audiovisual archive's needs, open dialogue among all parties rather than an "us versus them" dynamic will lead to more productive dialogue and collaboration. Through this type of collaboration, archivists could learn more about technology and data management, and IT staff could learn about audiovisual archival practices.

■ **Develop affordable, fee-based digital preservation relationships with neighboring institutions:** Archives without enterprise storage capability must find other means to safely store their digital files. Given the typical size of archives' budgets and the relatively high cost of commercial data

storage services, the surveyed archives suggested forming partnerships with nearby universities and libraries that have appropriate digital storage infrastructures to provide a minimum level of managed data storage at a price they could afford.

- **Practice geographic dispersal:** Archives should store redundant sets of digital files off-site. If they cannot afford off-site storage, they should explore partnerships with other archives in which each participating archive stored copies of another's files. Varying administrative, security and liability policies present significant challenges in this scenario, but however it is achieved, archives should practice geographic dispersal to lower the risk of catastrophic loss.
- **Archive-oriented metadata and file management tools:** Archives recognize that along with managing their digital media files, they also need to create and manage various types of metadata to preserve those files. They would like to see software tools designed specifically for audiovisual archives rather than production-oriented DAMS or systems built from generic database management software. They also want their digitizing software to produce usable metadata in accepted schema such as PBCore and PREMIS.
- **Further education for audiovisual archivists and managers involved in digital preservation:** Many of the surveyed archivists understood the two basic digital preservation concepts: storage and backup. But most did not have the training or knowledge needed to ensure preservation of their digital objects for the long term. Archivists want a deeper understanding of the principles of digital preservation, especially with regard to audiovisual collections; they believe this will help them in fundraising, working with their institution's managers, creating partnerships and building digital preservation programs. Suggested approaches include workshops that go beyond the panel discussions that are typically incorporated into larger, more general archival conferences, with a focus on digital preservation concepts, digital preservation standards (to the extent that they exist), "best" practices and the application of ideal goals and principles to the reality of their individual situations.

The Bibliography of this report contains resources that may be helpful to those who are interested in developing digital preservation education programs for audiovisual archives.

PROGRESS REPORT AND INTERIM OPTIONS

5

Progress Report
Interim Options
The Technology Obsolescence Issue



Collaborations and best practices are insufficient by themselves to resolve the digital dilemma. The underlying technologies must take archival lifetimes into account.

PROGRESS REPORT AND INTERIM OPTIONS

The surveys, interviews and case studies undertaken for this report led to some interesting insights into the way independent filmmakers, documentarians and archivists are adapting to an increasingly digital world. Although the research yielded incrementally new information on the subject of digital preservation, it also highlighted the profound risk of losing independently produced digital motion pictures. Without active digital curation by independent filmmakers and distributors, digital motion picture materials can become inaccessible in as little as a few months, and the risk of loss increases during the considerable time it takes for a typical nonprofit audiovisual archive to acquire a collection that meets its mission. For independent filmmakers and documentarians whose digital content is not protected by a trusted third party, or who do not take on the responsibility of preservation themselves, content loss is all but certain.

Nonprofit audiovisual archives that are receiving or generating digital materials have the same problems that were reported for major studios in *The Digital Dilemma*. However, the archives' problems are compounded by severe resource limitations. This is not to say that the nonprofit community has no significant digital preservation projects in development. For example, the Corporation for Public Broadcasting (CPB) spearheads the American Archive, a comprehensive effort to locate and preserve documentaries and other programs created for public radio and television stations.⁵² It is important to note that the CPB has an operating budget in excess of \$400 million, which while unusual for an organization in the nonprofit audiovisual archive community, makes the CPB well-suited for such a leadership role.⁵³

Progress Report

With this more complete picture of the challenges involved in preserving digital motion picture materials, it is worth reviewing *The Digital Dilemma*'s findings on industry needs as well as its call for near-term and long-term steps toward sustainable preservation of digital motion picture materials. Through such a comparison, progress can be assessed, and notable distinctions that exist for documentarians and nonprofit audiovisual archives can be identified. The corresponding pages in *The Digital Dilemma* are referenced for convenience.

Needs (from *The Digital Dilemma*, p. 49)

- **A replacement for film as an archival medium:** An archival system for digital materials that meets or exceeds the performance characteristics of traditional film archives does not yet exist. While many well-funded organizations have implemented fully managed digital storage systems for audiovisual materials, the critical issue of technology obsolescence has not been resolved. This presents a more serious problem for nonprofit audiovisual archives because of their extremely limited resources.
- **Standardized nomenclature:** As of this report's writing, a unified approach to digital object naming systems had not yet been adopted by the motion picture industry. A few initiatives are underway that may address this problem, such as the International Standard Audiovisual Number (ISAN) and the Entertainment Identifier Registry (EIDR). Standardized nomenclature did not come up as an issue for nonprofit audiovisual archives, most likely because their digital motion picture material management systems have not yet reached a level of sophistication that would make this issue apparent.

Near-Term Steps (from *The Digital Dilemma*, p. 51)

- **Create film separation masters as archival masters:** While all of the major studios report that they are creating film separation masters for their theatrically released motion pictures, the process is simply too expensive for independent filmmakers, documentarians and nonprofit audiovisual archives. There have been some reports of lower-cost approaches that use intermediate and print film stocks, but none have achieved significant market acceptance.
- **Enable the enterprise to develop a rational digital preservation strategy:** The major studios are reportedly reorganizing themselves to manage their digital assets for the long term by improving interdepartmental collaboration and making other structural modifications. Nonprofit audiovisual archives recognize the need to reorganize with digital preservation requirements in mind, but resource constraints, organizational resistance and complexity prevent them from doing so.
- **The industry must work together:** Industry collaboration on digital preservation issues noticeably increased after the publication of *The Digital Dilemma*, and continues as of this writing. This degree of cooperation has been facilitated by the Hollywood community being geographically centralized and sufficiently intertwined from a business perspective. By contrast, the independent filmmaking and nonprofit audiovisual archive universe is far-flung, diverse and loosely coupled. It is consequently difficult to identify exactly which organizations or individuals should be working together – and how they should do so – to generate meaningful results.

Long-Term Initiatives (from *The Digital Dilemma*, p. 54)

■ **Collaborations:** The Library of Congress's National Digital Information Infrastructure and Preservation Program (NDIIPP) is an excellent example of how a diverse group of organizations can be brought together and have their energies focused on a common set of problems. The Library recently published a major report on NDIIPP, which details the program's accomplishments and proposes next steps. One of its more significant new initiatives is the National Digital Stewardship Alliance, which seeks to develop a framework for a national digital collection as well as to strengthen and enable public-private partnerships, among other activities. From the motion picture industry's perspective, NDIIPP provided a context for its own collaboration – namely the Academy's Digital Motion Picture Archive Framework Project – which resulted in productive work on file formats, metadata, open source software and data storage research with contributions from the major studios, manufacturers and the research community. However, the diffuse nature of the independent filmmaking and nonprofit audiovisual archive communities makes it more difficult to create a productive, collaborative environment to address their needs.⁵⁴

■ **Standards Development:** The nonprofit audiovisual archives surveyed for this report expressed a clear desire for digital moving image preservation standards. It is encouraging to report that as of this writing, there is significant energy within SMPTE and the U.S. Government's Federal Agencies Digitization Guidelines Initiative being directed toward image file formats and related technical details. Metadata standardization has still not been achieved, but pre-standards development work is underway at several organizations, including the Academy.

Interim Options

Independent filmmakers face the irreversible loss of their work during the lengthy period between commercial exploitation and acceptance by an archive (neither of which is a guaranteed event). Archives that have not yet developed an approach to preserving digital materials will eventually face a crisis as their digital holdings grow, whether through acquiring new collections or reformatting their aging analog holdings. At some point, they will be unable to access some percentage of their digital files.

The digital preservation needs of the motion picture industry as a whole have not changed. In this regard the needs of independent filmmakers and nonprofit audiovisual archives seem more urgent, given the changing dynamics of theatrical and non-theatrical digital distribution, the duration of copyright protection, the lack of a defined path to an archive and severe resource limitations. It also seems unreasonable to burden nonprofit audiovisual archives with a dilemma they did not create, and unrealistic to expect them to organize themselves to tackle the dilemma without help.

The studies by the Library of Congress mentioned earlier in this report and the final report from the Blue Ribbon Task Force on Sustainable Digital Preservation and Access (see Funding section that follows) all contain calls to action for improved funding mechanisms and collaborative efforts. In effect these studies suggest sharing the burden of devising practical solutions that will enable all community members to maintain access to important cultural, historical and artistic works. Until the underlying operational and technology obsolescence problems are solved, however, a renewed and revised call to action in three key areas seems to be justified:

- **Collaboration:** Identify key stakeholders and representative organizations that can make it their top priority to collaborate on the most pressing unsolved problems facing nonprofit audiovisual archives. As an organized group, they might take on the following initiatives:

Cooperatives and resource sharing: There is a wide range of operational capability, technical infrastructure and financial resources across the archival community and in related fields, and many examples of successful collaborations in which “the whole is greater than the sum of the parts.” The Library of Congress’s NDIIPP effort, the many projects undertaken by program partners, and the Sundance Institute-UCLA Film & Television Archive collaboration that benefits independent filmmakers are good examples. Those interviewed for this report most often mentioned shared digital storage, knowledge transfer and staff training as candidates for cooperative efforts.

Research and prototyping projects: Many ideas have been put forth by filmmakers and archivists alike, such as revenue-sharing models to support digital preservation, lower-cost approaches to creating film archival masters, implementing “born archival”^{xii} production strategies, and reducing the long-term cost of digital storage through the use of open source software tools or even peer-to-peer networks. Ideas such as these are worth investigating as research and proof-of-concept projects that may lead to viable digital preservation technologies and practices.

- **Funding:** A recurring theme among all surveyed groups was the lack of funding for digital preservation. The final report by the Blue Ribbon Task Force for Sustainable Preservation and Access discusses the funding gap at length and offers concrete suggestions for several archival contexts. Representative organizations in each of the communities covered by this report should review the Task Force’s recommendations, and where appropriate, coordinate their efforts so that their constituents will be able to take advantage of applicable strategies and partnerships.

Documentarian and author Betsy McLane suggests that the only way to assure preservation is to have funding organizations insist that applicants include preservation in their budgets.⁵⁵ This concept is being implemented in the scientific research community by the National Science Foundation (NSF), which now requires that all grant proposals for NSF projects include a data preservation plan if scientific data is generated as part of the project.⁵⁶

- **Education:** As long as independent filmmakers and archivists stay on the “technology treadmill,” they will face the continuous need to refresh and update their knowledge of technologies and practices. The same is true for motion picture producers and executives. Moving image archive programs should offer continuing education classes covering the preservation of digital materials, and archives should require their staff to take them. Industry conferences focused on the content supply chain are good forums for presenting these issues to producers and executives. Likewise, film festivals are excellent venues at which to provide independent filmmakers and distributors with the knowledge to help “keep digital content alive” until the content reaches a suitable archive. Finally, college curricula for aspiring filmmakers and archivists should be updated to cover digital preservation issues so that succeeding generations will be prepared to meet the challenges of long-term preservation of digital materials.

^{xii} “Born archival” is the concept of creating digital files that are immediately able to be archived, i.e., they are formatted for archiving and all necessary metadata is created at the time of file creation.

The Technology Obsolescence Issue

There is no escaping the fact that digital technologies enable independent filmmakers to explore and extend the art form in ways that are simply not possible with motion picture film. The price to be paid for these new capabilities, however, is either the loss of content to digital decay, or accepting the responsibility of working with technology providers to articulate and satisfy industry requirements for the long-term preservation of digital data, achieve satisfactory backwards compatibility and implement standards. Collaborations and best practices are insufficient by themselves to resolve the digital dilemma. The underlying technologies must take archival lifetimes into account.

*Time is and will be the greatest enemy of future access
to digital data.*

CLOSING

6

The Digital Dilemma ended with a call to action for cross-industry efforts to increase cooperation, develop standards and ultimately achieve guaranteed long-term access to digital motion picture materials. From the Academy's perspective, there was and is no bias toward one storage medium or system over another, as long as the replacement for the film archive system meets or exceeds the film archive's performance characteristics.

This report focused on those individuals and organizations with substantially fewer financial and staff resources than the major corporations and institutions covered in *The Digital Dilemma*. Independent filmmakers and documentarians expressed two primary goals: getting their work seen by an audience and moving on to the next project. Having been made aware of the risks to their unmanaged digital materials, they now have a new concern: ensuring that their digitally created work survives long enough for them to accomplish both. For nonprofit audiovisual archives facing the digital dilemma, very little will change until they get adequate funding, staffing and technological support. Key members of the interviewed and surveyed groups generally acknowledged the importance of raising the visibility of these issues at workshops, film schools, film festivals, industry conferences and applicable standards development organizations.

The underlying problems facing the industry are the constant need to monitor the health of digital data and the mandatory, periodic replacement of digital storage systems and data file formats because of their finite operational lifetimes.

A primary sales pitch by digital storage system vendors is that “storage always gets cheaper,” and while that has proven true with respect to storage media, price efficiency is significantly offset by rising energy and labor costs as well as more sophisticated technological support systems and data management policies that such systems require. Increases in data storage density show no signs of abating, but history suggests there is little reason to believe that the already huge (and growing) amount of important digital data will somehow manage itself.

While some claim that following simple data backup procedures can preserve one or even a handful of digital motion pictures, these procedures do not scale for larger collections held at the hundreds of audiovisual archives worldwide. For these archives, the wide variety of incoming data formats and media types, coupled with the archives’ limited financial, technological and staff resources, make it impossible for them to do much more than shelve the material while they wait for the largest and best-funded institutions and organizations across the private and public sectors to solve the problem in a way that might yield trickle-down benefits.

Time is and will be the greatest enemy of future access to digital data. For independent filmmakers, a longer time-to-market as well as an expectation that the Long Tail theory will prove true for much-needed future revenues requires a digital content sustainability plan. Indie filmmakers ignore the limited lifetime of unmanaged digital data at their own peril. For nonprofit audiovisual archives, continued deferment of a comprehensive digital preservation program will result in mission failure.

The interim options presented in this report offer some possibilities for temporarily extending the accessibility of digital content. The authors of this report hope that there will eventually be a standardized, globally adopted solution that will address the technology obsolescence issue. Until that happens, and without immediate mitigating action, our moving image and recorded sound heritage is in danger of beginning to disappear in a few years. Facing this danger begins with answering key questions during the production of economically or culturally valuable digital work:

- Whose responsibility is it to preserve independently created work for future use?
- What would be the economic and cultural impact of losing this work?

But the broader questions remain:

- What will it take to create digital preservation standards and achieve their universal adoption?
- Who will assume the leadership role in solving the digital dilemma for the independent filmmaking and nonprofit audiovisual archive communities?

The time for doing studies and defining problems has passed. The issues are clear. The steps to answering these critical questions are also clear, and they start with you, the reader.

It is the hope of all who worked on *The Digital Dilemma* and *The Digital Dilemma 2* that the next report will be titled *The Digital **Solution***.

APPENDIX: CASE STUDIES

A1. Digital Motion Picture Production Workflows

A2. Archives

Archives of Appalachia,
East Tennessee State University

Film & Media Archive

Franklin Furnace

Walter J. Brown Media Archives and
Peabody Awards Collection



APPENDIX: CASE STUDIES

A1. Digital Motion Picture Production Workflows

Peter Mavromates is a director of post-production who has worked for various studios. He has also worked with director David Fincher, who shot several movies with digital motion picture cameras. Mr. Mavromates was an early advocate of all things digital: image capture, post-production workflows and mastering. In the interview that follows, he describes the decisions made regarding the handling of digital motion picture data of three different feature projects up to the point when the project is turned over to the distributing organization.

Theatrical motion pictures are now regularly shot with digital motion picture cameras, and presently, each production generally designs a custom data management system. The processes described by Mr. Mavromates are examples of how data is managed on a sufficiently resourced production. These processes are substantially more extensive in terms of their emphasis on preserving access to digital motion picture materials than most independent filmmakers surveyed or interviewed for this report are implementing.

The opinions expressed here are Mr. Mavromates' and do not necessarily reflect the opinions of AMPAS or the contributors to this report. They therefore should not necessarily be considered as recommendations for other filmmakers.

Q: Let's start at the beginning. What led you into the "digital realm?"

Peter Mavromates: When I was a young teen, there were three things I wanted when I "grew up": a Trans Am, a darkroom, and a reel-to-reel audio tape recorder. We won't discuss the Trans Am. Let's call it a youthful indiscretion. I still don't have the darkroom and, with the advent of digital photography, I am somewhat conflicted about this. Regarding the reel-to-reel tape recorder, I had this wonderful idea that I would edit together reels with my favorite songs to impress my friends and get rid of the deadwood on many of my record albums. Also, by bumping my records to tape, I would protect the records from the inevitable scratches that would occur from repeated playing. My best preserved albums are, of course, my least favorite albums!

Q: So, how did that lead to your use of electronic media and digital systems?

PM: My vision of utility was spot on. What I missed entirely was that the way we treated media would completely change. I only thought that current technology would simply get better, have more bells and whistles added to it. It never crossed my mind that new technologies would actually supplant old technologies. Now, I fire up my computer and a few key strokes later, I am playing only my favorite songs, and no wear and tear. My fantasy of making "best of" tapes is nothing but a "playlist" today. Same result, but a different way to achieve it. Needless to say, I no longer need or want a reel-to-reel tape recorder.

Q: Director David Fincher was an early adopter of digital image capture and you worked with him on several features. What was the basis for his decision to do this?

PM: As David began to shoot digitally, he would constantly be quizzed about the quality of film versus digital capture. He would avoid that question because that is not how he sees things. He looks at the digital capture paradigm honed on his productions and says, "This is simply a different way to work." As for my own tastes, I find magic in all forms of image capture whether they be chemical or electronic. I have videos shot on a Palm Treo of my kids riding a carousel. The blooming quality of the highlights injects nostalgia into the core of every pixel that wouldn't be the same if captured on 35mm film or High Definition videotape. No doubt, in my later years, these inferior images will pierce my heart with more emotion than any 70mm print.

By the time we began production on "Zodiac," David had already shot five commercials using the Viper FilmStream™ camera. He liked its size. He found the method of capturing on hard drives superior in a number of ways to capturing on videotape. Data capture offered random access and no image data compression. It offered quick start and stop. There was less reloading. On the set he could view the actual files in real time, so there was no doubt what was captured. After a take, he could get his actors back to starting positions and begin his next take in less than 10 seconds, and he could slate digitally, that is, key metadata was burned into the first six frames of every take – and he was into the meat of the action more quickly. This was a way of working that allowed for a tremendous building of momentum that would result in greater focus on the part of actors and crew, and paid off with being able to pack in an extra 45 to 60 minutes of shooting per day relative to shooting film.

Q: We've heard that one of the negative issues is loading the raw captured data into the downstream processing computers and then rendering it out with full frame information in post. What was your experience in this regard with "Zodiac"?

PM: The modern curse is loading and rendering. With all the power we now possess, the more we get done the more insufficient it is. No matter how much we improve processing and storage, somehow it always seems as if it is only half as much as we need. There was always too much to load and not enough time to render.

As dailies flowed in from the set, our pipeline basically broke down into two basic functions: archiving and processing edit media. Footage came from the set on "D.MAGs." These were robust hard drive arrays built by the company S.two Corp. They held about 34 minutes of "footage." We would mount the D.MAG, archive^{xiii} its contents on two LTO3 data tapes, and then begin rendering edit media. Our computers basically worked 24/7 for the entirety of the shoot. When we started shooting "Zodiac," there were only 25 D.MAGs on the planet, all owned by either S.two or The Camera House, our camera rental vendor. Our first week of shooting was out of town in parts north of San Francisco while our edit room and data lab stayed in Los Angeles. This meant that before D.MAGs were shipped, they had to be cloned to backup D.MAGs for safety from loss in transit (something not possible in a film paradigm). We were constantly calculating shipping times, archiving speeds, and render ratios because, in the out-of-town cloning scenario, 25 D.MAGs were on the edge of being insufficient. It was like running the first mile of a marathon uphill. As we squeaked by the out-of-town shoot and the crew headed back to Los Angeles, we knew that we would manage to enjoy some downhill days. Yet, even on the downhill days, loading and rendering was a 24-hour affair.

As we settled into a routine and reflected on our pipeline, what came into view first was what was not there. There were no scratches. If David locked off a camera, there was no weave. There was no dirt (positive or negative), no light leaks, no pressure marks, no water stains, no perf damage, and no roll outs. And, because David would delete takes on the set, there were no takes that the director never wanted to see again. By shooting data, our footage was already pre-clipped and broken down into takes. Also, what we did have was two negatives, geographically separated, and every single VFX (visual effects) plate at our fingertips should we want instant advice on a VFX shot.

There were definitely hiccups here and there. Render errors and lost directories caused the occasional heart attack, but in the end, I can only recall one half-frame error that remains unexplained and one half of one scan line that was unrecoverable but easily reparable. Considering that we shot the equivalent of more than 1.5 million feet of film, I find that failure rate completely within reason.

Q: What file format do you use on your LTO tapes^{xiv}?

PM: We captured DPX^{xv} files on the set. So, DPX files are backed up onto the LTO tapes.

^{xiii} "Archive" in this context means creation of backup protection copies of camera original data.

^{xiv} LTO is the acronym for Linear Tape-Open, a digital data tape recording format.

^{xv} DPX files are digital image files conforming to SMPTE 268M-2003, a standard published by the Society of Motion Picture and Television Engineers.

Q: What kind of hardware was used and how often was it refreshed?

PM: Both “Zodiac” and “The Curious Case of Benjamin Button” were captured on the S.two data recorders. The backup LTOs were done in editorial on an Advanced Digital Information Corporation’s Scalar, a tape library evaluation and integration system.

Q: Who operates all of this equipment?

PM: On both of those movies (“Zodiac” and “Benjamin Button”), Wayne Tidwell was the data capture engineer on the set. On “Benjamin Button,” the entire back up of dailies was handled by an apprentice during production.

Q: Is that an expensive labor cost?

PM: Apprentice scale...about \$1,700 a week with overtime.

Q: And if that person gets hit by a beer truck?

PM: First, we drink the beer, and then call 911. Then, we’d call The Camera House for a recommended replacement. Actually, we would probably call The Camera House first!

Q: How often are the LTOs audited?

PM: Checksum verification^{xvi} is done on every tape. Then we spot check tapes by loading them back on the system in their entirety.

Q: You used an electronic dailies distribution system. What was it, and how did that contribute to the efficiencies of your post workflow?

PM: During shooting, dailies were distributed through a web-based digital dailies system called PIX. A limited number of authorized viewers were issued log-in passwords to view dailies during a limited, predetermined window of time. Aside from being an efficient and secure method to distribute dailies, PIX offered the ability to frame accurately tag notes to dailies and edits posted on the system. In this way, David was able to communicate with the edit room on a level far more sophisticated than the script notes that came from the set. From day one, he was providing notes on best and worst takes with reasons why he liked or disliked certain takes. He digitally “drew” on frames and issued instructions for matte paintings and retouches. The result was that by the time production ended, the editors had a huge amount of highly specific feedback directly from the director. In post-production, this level of feedback spread to visual effects, sound design, and scoring.

^{xvi} “Checksum verification” is a process for verifying digital data integrity.

“Zodiac” was edited on Final Cut Pro by Angus Wall, our editor and owner of Rock Paper Scissors (RPS). Angus later pulled in Kirk Baxter, another Final Cut devotee. Also from RPS came the brain team of Joe Wolcott and Andreas Wacker. In general terms, Joe concentrated largely on hardware while Andreas handled software issues. Put another way, Joe made sure cameras and audio recorders talked to hard drives which talked to edit systems – think “timecode, timecode, timecode.” Andreas made sure that the immense volume of data could be tracked and organized, safely archived, and restored for our “digital neg cut.” With guidance from these two, our edit team delivered VFX plates directly from the edit room, integrated VFX finals, and conformed reels sent to the DI house. Among the advantages here are no negative shipping, no charges for film scanning, and instantaneous delivery of VFX plates.

Q: Moving on to your next major project with David Fincher, “Benjamin Button,” were you able to use what you had developed and learned on “Zodiac”? Did you improve on it?

PM: So, what could be made better than what we did on “Zodiac”? To be sure, “Zodiac” was far from nirvana. It was a hard uphill slog that required constant vigilance from Joe, Andreas, and the edit team. A large part of this vigilance was due to the newness of the paradigm. There was an unspoken fear about whether the data was really there and whether it would really come back. It was a fear, I must add, that was more prevalent in the older crew members than the younger ones. Older crew members lived with memories of lost data and accidentally kicked-out computer plugs in other aspects of their lives. The younger crew, raised on bits and LCDs, thought there was nothing more natural than pushing data around. Yet, beyond wanting faster processing and more storage there were a few things to improve on.

One area to improve was to develop the ability to scrub metadata. On “Zodiac,” as drives moved from set to post, we inherited typos in the metadata entered on the set. Scene numbers or camera rolls would be incorrectly entered on the set, and then would move through post as “broken” data. You can imagine that, with a director picking up momentum on the set and literally allowing about 10 seconds between takes, the pressure on the data capture person was immense. Just as on film, where slates have incorrect information, our data – digital slates – also had errors. We wanted a way to fix those errors before they entered our pipeline. Another related problem was that we wanted less or no processing time to create our edit media.^{xvii} S.two rose to the occasion and designed a “deck” they called the “i.DOCK,” for ingest and recording data. It did two things for us. It offered the opportunity for an assistant editor to review and repair the metadata before ingest, and it provided real-time edit media creation upon ingest. It basically worked like a tape deck. This provided the single biggest improvement in our pipeline compared to the one on “Zodiac.” The irony was that, in a way, this was a step backward. Ultimately, the “Zodiac” edit media creation is conceptually correct, that is, render the edit media, but it was simply taking too long, an issue that we knew would disappear over time as processing speeds continued to improve.

As we fine-tuned the dailies flow on “Benjamin Button,” we tried to improve other parts of our digital lives. PIX became more entrenched in our workflow and was used more deeply in casting, location scouting, visual effects, publicity, and even publishing a book which contains over 170 pages of imagery from the movie itself as well as from the making of the movie. Throughout post-

^{xvii} “Edit media” is a low-resolution copy of the master material recorded on-set for use by the editor on a digital editing system.

production, PIX, an Internet-based project information exchange, became a quick and simple way to share edits of scenes with a wide range of people such as the sound designer, composer, publicity department, VFX companies, and title houses. Gone were DVDs and videotapes.

Q: One of the issues with complicated projects such as “Benjamin Button” was the concern about coordinating visual effects from different vendors. How did your team handle that?

PM: In the later stages of VFX, David, his producer Ceán Chaffin and I started to visit the local VFX facilities twice a week, on Tuesdays and Fridays. By working digitally, we were able to review a large volume of shots in a short period of time. At its peak, the review sessions covered more than 150 shots at four companies within a four-hour period. At these sessions, notes were given which were often executed and uploaded to PIX that afternoon. David would write additional comments on PIX and would see responses to those comments the following day. So, instead of seeing something on Tuesday and then coming back Friday for the next iteration, by using PIX, Friday’s screenings were sometimes five or six iterations beyond Tuesday’s work. This is an example of the level of involvement by the director and the momentum built in post-production. In a two-year period, PIX handled over 300,000 assets covering about 873GB used by more than 300 users on three continents. We had photo and publicity approvals coming from as far away as Australia and France, and VFX shots coming from as far away as San Francisco and Mexico City. All of this was largely managed by the three of us from a building in Hollywood.

Q: The digital intermediate, or “DI,” is the modern mastering process for a digital feature. It is also expensive and time-consuming. How did you handle that part of the post workflow?

PM: With the advent of the digital intermediate, finishing a modern motion picture has already made the transition to a digital life cycle. We did not have to reinvent mastering a movie. Think of doing a DI without the scanning. That was us. I ran into a colorist^{xviii} I knew who bragged that he was on a project that was developing their negative and then scanning 100% of the shot negative at 2K. I smiled wickedly and said, “We are scanning our negative on the set!”

We showed up at the DI facility with conformed files ready to work. We had no erroneous key codes, no dust busting, no negative cutting, and no moving 800 boxes of negative. Beyond that, the DI went as normally as is now the case on all projects. Most of my frustrations in the DI do not revolve around resolution as one might expect from the “is digital as good as film” debate in which people argue about whether a film frame is 3K or 4K. In digital, as in film, if there is a resolution issue, the first place to look is the lens. Beyond that, I would trade resolution for color depth. That is where the pitfalls are. And this is true in the DI whether acquisition is film or digital. For all the selling of competing digital cameras with exposure latitudes of 10 and 12 and 14 stops, in digital, as in film, there is nothing like a properly exposed negative! Just ask any colorist.

Q: Is there a film-out at the end from the finished digital master files?

^{xviii} A “colorist” adjusts image colors in post-production for scene matching and artistic reasons.

PM: The film-out is done only of the final edited, color-corrected DI master files.

Q: If this is an interim solution – what do you do over the long term with the digital files?

PM: If you're asking is the film-out an interim solution – no. It is a delivery requirement and although the film-out is certainly an archival element, we consider the DI files the mother lode. For both now and later, the solution is data migration.

Q: Moving on to the third project, “Iron Man 2,” this was a sequel and you weren't involved in the first feature. So, were the systems already in place and could you introduce what you and David had learned from your past collaborations?

PM: I joined Marvel Studios one week before the beginning of principal photography of “Iron Man 2.” Already in place was a pipeline in which all negative shot would be scanned at EFilm^{xix} using their CinemaScan process, in which film is scanned at 3K and captured at 2K^{xx}. The files would be used to create edit media, and could be used for the DI unless it was decided to re-scan at a larger file size. After we started shooting, I was called by an executive who asked, “If the negative were lost or destroyed, could we still finish the movie?” This was an insurance question. The answer was, “Yes.” So, now there exists a pipeline – “Iron Man” is not the first movie using this process – in which a film-based production creates a second “negative” of all of their material. One immediate advantage of this pipeline is that the publicity department can create trailers without ever touching the negative.

Q: We hear so much about lost digital data and various other problems – what “safety net” did you use?

PM: When audio went digital, I realized that my fear of losing the audio, before completion of production, evaporated. I knew that a good production mixer would maintain a backup. Also, digital files were fed to the edit room each day. Once that happened I knew that there were two copies of equal quality and geographically separated. At the end of the shoot, I would purchase the mixer's hard drive, clone it, and then send it to the sound editing facility. Now there were three digital copies, not counting the digital files in the edit systems. At that point, it was difficult to lose the audio.

It is now likewise with digital picture. As explained earlier, when hard drives were delivered from the set, two LTO backups of each drive were made and geographically separated. This is the first safety net. Then, at the end of shooting, the editor's assembly was used as a guide to begin reloading digital files from the LTO backup tapes (in our case, DPX files). Once the media required for the assembly was loaded, an LTO backup was made and moved out of the edit room. Although not a 100% safety net, it was probably at least 75%, a partial second safety net. Next, when the film was locked, and the DI files conformed, the conformed reels were backed up to LTO, a third safety net. The conformed files were then sent to the DI house and loaded on to their system, a fourth safety

^{xix} EFilm Digital Laboratories is a post-production facility in Hollywood, California.

^{xx} “3K” and “2K” are abbreviations for digital image pixel counts of approximately 3072 x 2120 and 2048 x 1080, respectively.

net. Once that happened, there were three existing conformed negatives: one on LTOs made in the edit room, one on the edit room edit system, and one on the DI company's server. So, as in sound, at this point, it becomes pretty hard to lose the movie.

Q: The rendered DI, the digital master that is the result of all your hard work, must obviously be protected. How do you insure that?

PM: When a movie is completed, assuming it is finished as a digital intermediate, it becomes standard operating procedure for us to make the following:

- LTOs of the final rendered DI files – at least two sets
- Negative made directly from the DI files – sometimes as many as six
- Interpositives – often as many as four
- Dupe negatives – many
- Digital Cinema Package master
- High Definition video master
- Digital YCM 35mm separations

From the above elements are made:

- Hundreds, if not thousands, of 35mm prints
- Hundreds, if not thousands, of Digital Cinema Package files, although these are erased at the end of a theatrical run
- Many thousands of DVDs and Blu-ray discs
- Dozens, if not hundreds, of TV broadcast masters in Hi Def and Standard Def

The point is that in our modern media-addicted world, it becomes nearly impossible to wipe a movie's existence off the face of the earth.

Q: In this new world, what is the physical archival media required to protect this asset, the final movie?

PM: From our perspective on “Zodiac” and “Benjamin Button,” it is the final rendered DI file. This file most closely represents the intent of the filmmaker. Furthermore, the digital representation of this file most closely expresses David's intent in his digital movies.

Although David is widely regarded as a master at moving the camera, he is equally adept at not moving it. One specific example of this is in “Zodiac” in the incident at Lake Berryessa in which the Zodiac killer stabs a couple on a quiet, sunny afternoon, killing Cecilia Shepard and seriously wounding Bryan Hartnell. In a digital screening, this scene is horrifying in its omniscience. Although subtle, I feel that in a film screening, the film weave lets the audience off the hook. They get to feel a process between the event and themselves, therefore experiencing a slight amount of protection from the horror. In the digital screening, it is like Alex having his head strapped down in “A Clockwork Orange” and being forced to watch violent films. The rendered DI is the Holy Grail. It is the asset most closely tied to this filmmaker's intent. When the DI was completed on “Benjamin Button,” the DI house ran two sets of LTO tapes as archival backups. In a DI facility, these backups cost between \$12K and \$15K. In addition, in our own edit room, we made two additional sets. Our

sets cost about \$400 per set. The studio also ran a set of digital seps, that is, 35mm YCM archival separations shot from the rendered final DI files. These cost between \$70K and \$90K. The argument is that the YCM is a passive backup that requires little attention other than professional storage, while the LTOs require active data migration. In discussions I have had with colleagues, data migration is looked upon with the same enthusiasm one has for cleaning hair out of a drain. In actuality, I believe it is not that bad, and it is something we have been doing already in other parts of the industry like television production.

Q: Can you go through the budgeting process and give us an idea of the various costs of the various “master” elements?

PM: Consider that the current market rate for data migration for a standard set of LTOs is about \$15K for two migrations within the next five years and then about \$8K every five years after that. Assuming a YCM costs \$90K and would last the proverbial “100 years,” that same \$90K would buy about 50 years of migration. That is based on the assumption that the migration price would stay the same as opposed to dropping, which I believe is the likely scenario, and assumes that the five-year migration span would not expand to longer stable periods, which, I believe, it likely would. Also, over time, loading DI files for migration becomes simpler as more facilities and manufacturers shift from an acetate-based distribution paradigm to a digitally based one, at least that’s what I think.

On the YCM side of things, the first thing that happens is that the image suffers a loss in quality, first, in a loss of resolution and second, with the introduction of film-based artifacts not present in a digitally acquired project – weave, dirt, chemical stains, and registration anomalies. The last thing that happens is a recombine which is a sophisticated, expensive process. Over time, say the proverbial “100 years,” as the world learns to spin data on its pinky, the expertise and technology required for recombining separations becomes more scarce, and, therefore, more expensive. Again, that’s my considered opinion.

Q: What is the role of the post-production houses that have invested considerable money in the new technologies?

PM: The very idea of a lab in our post processes today has been turned on its head. EFilm has its CinemaScan process and facilities like Plaster City and nextLAB^{xxi} cater to the growing digital acquisition market. And there is even the in-house digital lab as done with “Zodiac” and “Benjamin Button.” Although our experiences on “Zodiac” and “Benjamin Button” were successful, many producers are not comfortable with that responsibility. As such, a market has arisen with companies and people expert in digital workflow solutions. It is certainly intimidating. In the course of the projects discussed in this article, I have dealt with the Viper, F23, SI2K, RED, Phantom, DALSA, Canon 5D, XDCAM, F900, and Weisscam. There are still the F35 and the ARRI digital cameras for me to experience and, no doubt, a number of new ones in the pipeline. It is no wonder that producers want to work with facilities that bring expertise to the table.

Q: Finally, to put the three features in perspective, please lay out the pipelines in simple, broad strokes.

^{xxi} nextLAB Mobile is a portable production workflow system offered by FotoKem Industries, Inc.

A1. Digital Motion Picture Production Workflows

PM: I have tended to deal with the primary medium of capture. For clarification, here are the details: “Zodiac” was shot with the Viper except for five shots done on film and used for slo-motion VFX. “Benjamin Button” was shot primarily on the Viper, with specific scenes shot on F23, and a healthy amount shot on Super 35mm 4-perf and 3-perf. “Iron Man 2” was shot primarily on Super 35mm 4-perf, but also used 16mm, VistaVision, F900, RED, SI2K, Canon 5D, XDCAM, and Phantom.

One of the charms of the DI suite is that it is where all the different formats can be stitched together. It can be a real playground for those inclined to experiment.

A2. Archives

Four archives generously participated in case studies for this report:

Archives of Appalachia, East Tennessee State University
 Film & Media Archive, Washington University in St. Louis
 Franklin Furnace
 Walter J. Brown Media Archives and Peabody Awards Collection, University of Georgia

Archivists with primary responsibility for their collections were interviewed and asked questions that delved behind the statistics they had already provided in their surveys. They all digitally reformat content for preservation, and are at different stages of developing digital preservation programs. The interviews were initially conducted in mid-2009 with a follow-up review in mid-2011.

All archives have some in-house digital transfer capability. Each one can create digital preservation files for some audio formats, and two can create preservation files for common analog video formats. Three of the archives are in larger institutions with enterprise storage capability managed by an IT department, and are in discussions to build a cooperative arrangement allowing the archive to use the IT storage.

Archives of Appalachia

East Tennessee State University, Johnson City

<http://www.etsu.edu/cass/Archives/>

1. Organizational Overview

Organizational Type: Unit within a research center at a university.

The Archives of Appalachia is a unit of the Center for Appalachian Studies and Services (CASS) at East Tennessee State University. The Archives collects content relating to the people of Appalachia, and is the repository for the East Tennessee State University Archives. The other CASS unit is the Reece Museum, which holds physical objects related to the history of Appalachia. An administrative office coordinates the study and research programs with campus academic departments.

The Archives was founded in 1978, and began digitizing analog media in 2002. It is the only campus department that preserves audiovisual items. While it has a large paper and photograph collection, it does not have a trained conservator on staff, so it does minimal paper conservation work. Instead, it has chosen to develop expertise in audiovisual preservation given the content strengths in its sound and moving image collections.

Collections Content Types

Not surprisingly for an archive that focuses on the history of a people, the vast majority of content held in the Archives are oral histories, interviews and field recordings.

A2. *Archives: Archives of Appalachia*

Audio content includes: oral histories/interviews (40%), field recordings (35%), radio entertainment broadcasts (5%), performance documentation (10%), radio documentaries/essays (6%), nonfiction source material (raw news) (2%) and literary readings (2%).

Moving image content includes: oral histories/interviews (20%), field recordings (20%), outtakes (documentaries/nonfiction) (20%), home movies (10%), documentaries (1923 -) (10%), performance documentation (10%), television broadcasting (includes aired news programming) (6%), news source material (newsreels, newsfilm and raw news footage, or B roll) (1%), industrials/educational (1%), literary readings (0.5%), animation (0.5%), experimental film (0.5%) and children's programming (0.5%).

Collections Media and Formats

The majority of the audiovisual collection is sound recordings. The Archives holds approximately 15 million manuscripts, a large photographic collection containing nearly a quarter of a million images, a music and folklore collection of over 25,000 sound recordings, and 6,000 films or video recordings.

Born Digital Content

The Archives began receiving born digital audio and video field recordings in 2000. Files were provided on DAT, CDs, MiniDV videotapes, and DVDs. They have also received digital photographs in JPEG format, and digital manuscripts and transcripts. Databases containing scientific data were rejected by the Archives, because it did not have the software applications required to manage and run the databases.

2. Digitization for Preservation and Access

Preservation Priorities

The Archives has focused on preserving audio material because it has an in-house facility to create preservation-quality audio transfers. It has prioritized transferring reel-to-reel tape first because of condition concerns (mold, warping and “sticky shed syndrome”). Vinyl LP audio discs are not a concern, as the staff believes the discs will outlast tape and the discs can be easily played. However, they intend to digitize the LPs whenever requested for access so that the original discs will not be played more than one time, thus extending the life of the originals.

The majority of the Archives' audio holdings consists of field recordings and oral histories/interviews (80% of its total archival sound collection). These recordings tend to hold unique content, so they have been preserved first among the reel-to-reel tapes.

Some film titles have undergone photochemical preservation with funding from the National Film Preservation Foundation. Otherwise, the Archives has not created digital preservation copies of video or film content, only access copies.

Preservation and Copyright

The Archives follows the guidelines under Section 108 of the Copyright Act. It does not feel restricted by copyright in preserving its collections, and preserves copyrighted works as long as it does not distribute the preserved works without permission. Staff tracks rights research and information in an accession database that includes any restrictions on a collection, with supporting documentation on rights in a case file.

Digitization as a Preservation Action

The Archives has established an in-house transfer facility where it can make preservation digital files for audio content, and transfer video formats to Betacam SP videotape for preservation. Given the Archives' limited budget and the large amount of audio content in its holdings, its independence has enabled it to digitally preserve 14,000 audio items.

The Archives keeps old playback equipment for parts (1/4" audio tape recorders, variable speed turntables, cassette decks, videotape recorders for 3/4" U-matic, PAL, Betacam SP, 1/2" helical scan open reel, and VHS formats). It also has digital conversion equipment for 8mm and 16mm film. The Archives' facility has the capability to transfer 1/4" reel-to-reel tapes, audiocassettes, and disc recordings (LPs, 45s, 78s, and acetate field recording discs). For extremely rare and damaged recordings, the Archives makes two audio preservation masters: one digital, and the other analog on reel-to-reel tape. Staff feels that analog-to-analog transfer is true preservation. They state more confidence in analog, as they know how long tapes will last, and what must be done to preserve them. They know how to inspect the physical media. In contrast, "digital files can disappear without warning." That is, the physical carrier can fail, and technology can change so quickly that digital file formats can become obsolete, rendering the digital files essentially unplayable. Once the Archives' remaining tape stock supplies are depleted, it will discontinue parallel analog-to-analog transfers because the tape stock is no longer manufactured.

For digital audio preservation, the Archives creates WAV files at 24-bit/96kHz. Archives staff selected this format and resolution after researching audio file format standards and practices described in professional documents, and reviewing advice from other archivists. They also spoke with the University's Broadcasting and Academic Technology Support departments to be sure that the Archives' selected file formats were compatible with those used or supported by campus entities with which the Archives might work in the future.

Film and 2" videotape holdings must be sent to off-site facilities for preservation. Film is preserved photochemically as film; video formats other than 2" are copied to Betacam SP and digitally transferred to gold DVDs in-house. The Archives does not yet have the digital storage capacity or infrastructure to create uncompressed digital video files.

The Archives has not migrated born digital files to next-generation formats.

A2. *Archives: Archives of Appalachia*

Digitization for Access

The Archives considers its primary service to be providing access to content, which necessitates creating digital access copies. It is using iTunesU (<http://www.etsu.edu/itunesu/>) to provide access for audio recordings, and a Facebook page to provide access to photographs as well as to communicate with users beyond the campus. However, it is selective about what has been released on the Internet because of copyright concerns. Staff perceives an attitude shift from a world where archives are open 9:30 - 5 for on-site research, to 24/7 digital access.

At the time of its interview in July 2009, the Archives' iTunesU site had been live for five weeks. In week four, its site had 480 downloads. The following week there were 1,066 downloads. Archives staff tracks usage statistics to demonstrate the value of the collections and services to the University administration in support of its argument for increased financial support.

The Archives creates access-only copies in two scenarios. It creates access copies as it processes new collections. It also creates access copies on demand when a user requests an item that has not already been digitized as part of a larger project.

Only access copies are made of film and video originals. If a film has been photochemically preserved, the Archive will create a DVD access copy. The Archives' in-house transfer facility can transfer 16mm film, 8mm, $\frac{3}{4}$ " U-matic, and VHS as MPEG-2 digital files on DVD and/or AVI files. The Archives recently acquired Adobe Master Suite for creating moving image files, and will work with Academic Technology Support staff to learn how to use it. Transfers of 35mm film, Super 8, 1" videotape, and 2" videotape must be outsourced.

Staffing and Workflow

At the time of the case study interview, processing, digitization, and preservation of the Archives' audiovisual content was performed by a small staff, student workers, and volunteer retired engineers. Besides the Archives Director, there are two full-time archivists who process collections among other duties, and two full-time support staff positions. One support staff member manages the reading room and provides secretarial and financial management support. The other is a media specialist who spends all of his time digitizing and preserving sound, video and film recordings, and scanning photographs. A volunteer retired engineer helps the Archives to keep the vintage equipment in working order. Ten students each work 5 - 10 hours per week to assist in processing collections and digitizing photographs.

When a collection is processed, staff separates and arranges the audiovisual items. The collection is inventoried at the item level and assigned accession numbers, and the inventory list is included in the collection finding aid. Once the items are described, digital access files are created. If the original objects are sound recordings, preservation files are also simultaneously created.

Born digital items are processed in the same way: they are assigned accession numbers, and listed in the inventory. Archives staff makes copies of the born digital files, and stores them on external hard drives, CDs, and DVDs.

Both the Reece Museum (the other collecting unit in the Center) and the Archives use PastPerfect for cataloging collections and physical objects. The collection finding aid is encoded in EAD using Archon (an open source finding aid-EAD creation tool) and placed on the Archives' website, where it is keyword searchable. Neither of these two systems notes whether an object has been digitized, although the Archives will begin including a note on what items have been digitized in the collection finding aid. The Archives maintains an internal spreadsheet to track digitized items.

3. Preserving Digital Files

Physical Carriers

The preservation digital files are stored on a set of external hard drives and kept on the premises; there is no geographic dispersal. Two 1 TB hard drives are used. As of July 2009, each was filled to 20% capacity. Access copies are stored on DVDs and CDs, and also stored on the premises. The University's Academic Technology department, which supports the website and faculty use of technology, has offered to store the preservation files on its own servers. This will be part of a digital preservation program plan that the Archives is currently creating.

Digital Asset Management

The Academic Technology department will only store the Archives' digital files, and not manage or track them. The Archives does not have a digital asset management system. The Library Systems Librarian and the Archives wrote an internal grant proposal to develop a digital asset management system (DAMS), but their proposal was not awarded funding.

The Library has purchased CONTENTdm to provide online access to digital objects, and the Archives could make its content and associated metadata available through the Library's database. However, CONTENTdm is used for access files only; the Archives still must find a way to manage their preservation files.

Technical and Digital Preservation Metadata

The Archives does not capture any technical or preservation metadata when it creates digital files.

Technical Infrastructure

While the Archives is well-situated to create digital files in its in-house facility, it does not have the internal technical infrastructure to store, manage, or preserve the digital files it creates or receives. It stores the preservation files on external hard drives and tracks the files through multiple systems, as they are in a transitional stage. First, the media specialist maintains a spreadsheet of digitized items tracked by accession number and item number in the collection. This includes information on the date of digital conversion. For storage, the Archives uses separate hard drives for photographs, audio recordings, and moving image recordings. Digital files stored on the hard drive are stored within folders labeled by accession number. Once a collection is digitized, the material is copied onto a DVD or CD that is labeled with the accession number and item numbers. The discs are

A2. *Archives: Archives of Appalachia*

boxed and stored in the media storage room. The location is tracked both in a manual paper system and in ARCHON or the Archives' accession database. The total preservation file storage to date is not large – 400 GB that is duplicated on other media – but there are over 14,000 preservation and access files stored on CDs and DVDs that must be managed. Even if the Academic Technology department stores the preservation files on its servers, it will only do traditional IT-level tape backups of the data. There will not be checksums, file validations and verifications, or technical or preservation metadata created. Therefore the Archives must develop means to manage its own digital preservation actions.

4. Creating a Digital Preservation Program

The Archives prefers developing a cooperative digital preservation program with other campus departments, to which each department contributes its own particular expertise. The Archives does not anticipate financial support to create an independent digital preservation program, nor does it have technical staff trained in managing servers. Ideally, the Archives would establish all requirements for the program and manage its files and digital preservation actions. The Library could provide a digital asset management system, and the Academic Technology department could store the digital files. It appears that there is support from the other departments for this goal; what is needed is the funding to make it happen.

More involvement in campus-wide digital preservation issues is also desired by the Archives. Previously, there was a records management working group that created paper and digital records retention schedules. The Office of Information Technology is maintaining digital records created by the University. As the only department on campus with trained archival staff, the Archives believes it should be more involved in overall digital preservation planning.

5. Funding Strategies

Funding for the Archives' digital preservation work comes largely from the unit's own budget. The Archives' budget is created from University/State funding (55%), a Tennessee Higher Education Center of Excellence grant/State funding (40%), 3% from foundations, and 2% from revenue generated by educational duplication requests, and licensing footage and stills to documentary productions and other publications. The Archives Director allocates a portion of that budget to preservation activities.

In the past, federal and foundation support paid for large content-based reformatting projects: "We have been able to digitize a good portion of our large collections of field recordings or oral history recordings through the help of three large grants from NEH and NHPRC and several smaller grants from the Grammy Foundation and the National Film Preservation Foundation." However, they have not applied for grants in the past few years due to other demands on the Director's time.

Staff believes that any grant funding for building a digital preservation program would require that the Archives guarantee sustainability of the program, which reinforces the need for a cooperative digital preservation program plan.

Film & Media Archive **Washington University in St. Louis, Missouri**

<http://library.wustl.edu/units/spec/filmandmedia/>

1. Organizational Overview

Organizational Type: Unit within a special collections department at a university library.

The Film & Media Archive is one of five collecting units in the Department of Special Collections at the Washington University Library. It specializes in collecting and preserving documentary film and other media “which chronicle America’s great political and social movements with a particular emphasis on the African-American experience.” Other collecting units within Special Collections are: Manuscripts, Rare Books, the Modern Graphic History Library and the University Archives. The University Archives has film, video, and audio in its holdings, and looks to the Film & Media Archive for guidance on caring for those media types.

The Archive opened to the public in 2002, and its initial acquisition was the Henry Hampton Collection (Henry Hampton was a 1961 graduate of Washington University). It began outsourcing digitization of analog media in 2004. The University Library has shown strong support for its new Special Collections unit, and has funded cold storage, staff, a research area, and an in-house digitization facility. The Archive is currently working with other Special Collections units that digitize holdings to develop a digital preservation plan that will be integrated into the Library’s general digital preservation program.

Collections Content Types

The Archive’s cornerstone collection is the Henry Hampton Collection, consisting of footage shot and collected for Hampton’s production company, Blackside, Inc., notably the acclaimed series “Eyes on the Prize.” The collection includes outtakes, archival footage and interviews, as well as scripts and paper research. The collection’s prestige attracted donations, including production elements from documentary filmmaker William Miles. Because the Archive focuses on documentary production, much of its collections are raw elements created or acquired to include in such films.

Moving image content includes: news source material (newsreels, newsfilm and raw news footage) (35%), oral histories/interviews (35%), outtakes (documentaries/nonfiction) (15%), television broadcasting (including aired news programming) (5%), documentaries (1923 -) (5%) and industrials/educational (5%).

Audio content includes: oral histories/interviews (85%), nonfiction source material (raw news) (5%), radio outtakes (5%) and performance documentation (music and theatre) (5%).

Collections Media and Formats

The Archive has over 75,000 items that include paper materials (scripts, photographs, research, etc.) and audiovisual materials. Moving image formats include 16mm film (prints as well as

A2. Archives: *Film & Media Archive*

production elements such as negatives and workprint), some 35mm film, and many video formats (2", 1", 1/2" open reel, U-matic, Betacam SP, VHS, 8mm, MiniDV, DVCam, D1, and D3). Audio formats include 1/4" open reel audio tape, cassettes, CDs, DAT, and LPs.

Born Digital Content

The Archive has received a small amount of born digital content. These are primarily oral histories and interviews from Blackside captured on DV and DVCam digital videotape formats, as well as data files on a variety of disk formats.

2. Digitization for Preservation and Access

Preservation Priorities

The Archive's strategy in prioritizing materials for preservation is based on a number of factors: 1) uniqueness (the material is a "one of a kind" or an only copy); 2) condition of the material (i.e., obsolete format, disintegrating); 3) importance of the content (i.e., well-known or historical figure or event) and 4) demand (frequent requests to access the material). The Archive is currently focusing preservation efforts on raw material such as oral histories and interviews produced for the "Eyes on the Prize" series. This series is the most requested content from the Archive, and the Archive also believes in "the series' prestige and potential for driving new scholarship and research." However, film preservation must be completed before film materials may be digitized. The Archive recently received a \$550,000 grant from the Andrew W. Mellon Foundation to complete a 4-year-long project to preserve the series' A and B rolls and interview outtakes. Once preservation is underway, the Archive will seek funding for phase 2 of the project, digitization.

The Archive will add user requests to the preservation queue. In one case, a donor who was interested in documentation of affordable housing issues supported the preservation of audio interviews in its holdings from a production about poverty.

Preservation priorities are only negatively impacted when content is on a format that must be outsourced for reformatting. For example, 1" videotape (a format that is not supported by their in-house facility) must be sent to a vendor for transfer. The costs associated with this inhibit extensive preservation of this format.

Preservation and Copyright

When Washington University acquired the Hampton Collection, it was given rights to the original materials (interviews, research and photographs). Blackside owns the rights to the completed programs. This arrangement has enabled the Archive to not only preserve materials that are not on obsolete formats or deteriorating (two requirements for preservation copying under Section 108), but more importantly, also provide online access without fear of legal action. For the collections to which the University does not own rights, the Archive makes preservation copies and offers on-site access. It also provides viewing copies of materials for which it does not hold copyright for research purposes only. Users sign a form acknowledging appropriate research use of the copy. The copy has a visible watermark, and a copyright disclaimer is added when the copy is made.

The Archive licenses the content it owns, thus creating a very small revenue stream to support its operations. The Archive will waive its fees if a user needs to pay for preservation costs in order to access footage, because the Archive receives an access copy.

Digitization as a Preservation Action

As a new archive that was founded during the “digital era,” the Archive has not experienced the analog-to-digital preservation paradigm shift that many other archives are facing. The Archive knew from the beginning that it would use digitization techniques for preservation, although it prefers photochemical preservation for film originals. In the Archive’s first few years, it copied small amounts of content onto Betacam SP videotape, and then changed to DigiBeta videotape. They now only preserve to digital files.

From the time of its founding in 2002 until 2008, all digitization work was outsourced. In 2009, the Archive installed an Apple Mac Pro-based workstation equipped with an AJA Kona LHe video card. The workstation can digitize various videotape formats such as U-matic, Betacam SP, VHS, and S-VHS, as well as audiocassettes and 1/4” audio tape. Because these are the primary audiovisual formats in the collection (excepting film), the Archive is able to do most of its digital preservation work in-house. Film and other formats not supported by its facility are outsourced. As of July 2009, the Archive has digitized for preservation 10 films, 10 videos and 300 sound recordings.

Three types of digital files are created: preservation, mezzanine, and access. Preservation files are created as uncompressed 10-bit 4:2:2 in the QuickTime container. The Archive tested several mezzanine file formats, comparing file sizes and image quality, ultimately choosing the DVCPRO50 codec as its mezzanine format.

Broadcast quality audio is captured as 24-bit/96kHz WAV files. Other reference audio is captured as 16-bit/48kHz WAV. The Archive does not create mezzanine files for audiocassette recordings of meetings or phone interviews; for these content types, it creates only preservation and access files.

Born digital content presents new challenges, as the Archive does not have equipment to read all digital formats. In 2010, it purchased a Sony J-30SDI compact player to enable the playback of Digital Betacam. More recently, it acquired a Tascam digital audio tape deck to handle its growing collection of DATs.

Digitization for Access

As a general policy, the Archive does not digitize originals purely for access. If it has multiple copies of content (for example, an interview shot on 16mm film with a video copy), it will create an access file from the video copy in-house, as outsourcing film is too expensive. In taking this step to access, the Archive does not consider this footage as “preserved.”

Video access files are multiplexed MPEG-2 program streams, which can be burned to DVD when needed. Audio access files are MP3 at 128 kbps (Stereo) and 64 kbps (Mono).

Staffing and Workflow

The Archive has six full-time staff: Film & Media Archivist (the unit head), Cataloging and Preservation Archivist, Digital Archivist, and three Archive Assistants.

A2. Archives: Film & Media Archive

Staff hold monthly meetings to discuss all aspects of the Archive's functions. Generally, they discuss progress, problems, and future needs. Digital projects tend not to be "one-offs" but part of larger projects that can take weeks or months to complete. If a user requests an item, that takes priority.

All items pulled for digitization are tracked through MAVIS, which is the cataloging database used by the Archive. MAVIS has the capability to track workflow as well as descriptive and technical data. The Film Archive is the only department that uses MAVIS.

The Digital Archivist creates the digital files. A file naming convention has been developed for digital assets: the root unique identifier for file names is based on the unique identifier assigned by MAVIS. The files are then moved from the workstation to servers maintained by the Library IT department. Preservation, mezzanine and access files are moved to the Special Collections department servers, which the IT department manages but the Archive can directly access. The Archive uses mezzanine files for transcoding to various access files based on user requests, so it must have control of and unfettered access to those files.

The Cataloger and the Digital Archivist create content records in MAVIS. The Digital Archivist adds information stating that the analog originals were digitized, the file names, technical metadata, and the files' locations. Staff can run reports from MAVIS to track what has been digitized.

3. Preserving Digital Files

Physical Carriers

Files are stored on servers, and external hard drives are used to some extent. Audio files created during a past audio reformatting project are stored on gold CDs, but those files have been copied to a server, so the CDs act as backups.

Preservation files are stored on the Special Collections server maintained by the IT department. IT backs up those servers to LTO4 data tape as part of its traditional tape backup process.

Digital Asset Management

MAVIS is used to track digital asset production. Because the Archive does not currently control or manage its preservation files, it does not have a digital asset management system. However, it is investigating open source options. It does not have a system to validate file formats or schedule format migrations.

Technical and Digital Preservation Metadata

MAVIS incorporates some technical metadata fields in its out-of-the-box digital workflow module. These technical metadata fields include: tape stock, brand names, batch numbers, capture devices, settings, compression, sampling structure, aspect ratio, bit rate, frame rate, timecode type, color space, height, width, sound field and sound sample rate. Archive staff intends to automatically import technical data from digital files into MAVIS, but has not yet implemented this process.

Technical Infrastructure

The three file types (preservation, mezzanine and access) are stored on a Xiotech Emprise 7000 Production Mirror. Files are backed up incrementally each business day and more completely on a biweekly, monthly, semiannual and annual basis. Preservation files are stored on slower units that “spin up” on demand. Mezzanine and access files are maintained at higher availability.

As described, the three file types are stored on different servers according to their intended use. The IT department makes LTO4 tape backups from all servers, but the Archive has no input on how often that takes place, nor are its files separated from other files stored on the entire storage area network (SAN). The files are mirrored on other servers. Backup tapes are stored in the Library, the same building as the IT department’s servers.

In the system currently in place, the files are mirrored on other servers. There are daily partial backups of the SAN and weekly backups of the entire SAN, and the tapes are stored for the long term.

The Archive has been actively digitizing content in-house since January 2009. As of July 2011, the Archive’s preservation files total 8.4 TB. Mezzanine and access files take up 4.5 TB. The Archive anticipates its preservation storage will increase at 3 - 5 TB per year. It does not currently pay for the storage, which is provided by the Library. However, if the Archive receives a grant for a reformatting project in the future, funding for servers or other storage will be incorporated into the project budget.

4. Creating a Digital Preservation Program

The Archive’s immediate goal is to put a system in place with clear policies, procedures, and workflows so that its digitization efforts are moving forward in earnest. Once established, mass digitization efforts will start. While the Archive can set its own reformatting policies and workflows, creating a digital preservation program that includes storage, backups, file verifications, redundancies, and forward migration requires working with IT and other departments in the Library.

A collaborative effort to develop a digital preservation program is underway between the Department of Special Collections and other Library departments. Preliminary meetings with IT about available storage space are branching out to other Library units, and include discussions on what steps beyond simple storage and backup must be incorporated into a thoughtful digital preservation program. The Library’s new Digital Library Services (DLS) could potentially create a “dark archive” where preservation files would be stored and managed. Even if DLS manages preservation files (including file verifications and migrations), the Archive wants to be an active partner and be notified of when and what actions were performed.

Archive staff found that the IT staff was more responsive when IT was informed of technological needs in advance and involved in the decision making. They did not tell IT “you have to do this.” Instead, they used a diplomatic approach, explaining their requirements and asking how they could work together. Communication between IT and the Archive is essential to ensure that the Archive’s preservation storage requirements do not quickly outgrow the Library’s existing SAN and backup infrastructure.

A2. Archives: Film & Media Archive

Persistent communication and quarterly meetings between the Archive and IT have helped the IT department understand the Archive's digital preservation requirements. In addition, the Archive has become aware of the challenges that digital preservation presents to the IT department. Most importantly, the Archive has learned that it must express clear and concrete needs in order to receive increased support. Time must be allocated for IT to order necessary equipment and integrate that equipment into the current infrastructure. Archive staff now believes that they are all working toward the same goal: to create a digital preservation program with clear procedures and workflows. There is still a limit on the Archives staff's reformatting workload: with only one Digital Archivist, there is only so much work that can be done in-house.

5. Funding Strategies

The Washington University Library has been generous in building the Film & Media Archive, and purchasing equipment for an in-house digitizing facility that allows an economical means to preserve and provide access to the collections. The Archive's operations largely fall within the Library's annual budget (overhead, staff, supplies, etc.). Digitization costs also fall into this category with the exception of outsourcing. As such, 85% of annual digital reformatting costs are covered in-house, 10% covered by users (paying to digitize for access) and 5% from other sources (including any earned income from licensing). Occasionally, projects are funded by Special Collections, grants, or donors. Because these are sporadic and do not happen every year, they have not been included in the percentages. A very small percentage of the budget is funded by revenue from licensing footage and photos.

Providing online access to important and high-visibility materials is a fundraising tool as well as part of the Library's mission. The Dean of Libraries can promote the Archive to the University as an example of good work and request more funding for Special Collections. As the Archivist notes:

"As more and more library resources become available online (books, journals, etc.) what distinguishes us from any other library are our special collections...those unique materials that do not exist anywhere else. We have benefited directly from the value now placed on our collections, which has allowed us to do so much. Special Collections is one of the largest draws for donor money and other financial contributions to the Library. Donors to the Film Archive are familiar with "Eyes on the Prize," and it can be used as a fundraising tool. Similarly, the collections are often used as a recruitment tool for potential faculty. Prospective faculty candidates are often given a tour of the Film & Media Archive if their research focuses on the civil rights movement, 20th century American history, film studies, or other areas of our collections."

Even with the history of strong support from the University, the Archive anticipates that internal funds for outsourcing digital preservation work will be limited. External funds will be raised for those activities. Fortunately, support should remain consistent for storage and backup needs.

The Archive is actively involved in fundraising beyond grants. It created an Advisory Board, which raised enough funds to motivate the University to set up an endowment. The endowment has a line item for digital preservation, which the Archive can draw upon to support its digitization activities.

Franklin Furnace **Brooklyn, New York**

<http://www.franklinfurnace.org/>

1. Organizational Overview

Organizational Type: Independent nonprofit arts organization.

Franklin Furnace was founded in 1976 as a bookstore for artists' books in New York City, and quickly evolved into a performance and installation art space. Performances, readings, and installations were documented on videotape, audiotape, and still photography, resulting in an important archive of variable media (artworks that can change with each instantiation). Since 1997 it has no longer operated as a performance venue, but continues to sponsor artists' work and archives documentation of the sponsored art. Since 2006 the organization has been actively preserving its unique archive as part of its "Unwritten History Project" to make all of its archival event records accessible online.

Franklin Furnace began digitizing analog content in 2005.

Collections Content Types

Franklin Furnace's archive consists almost entirely of performance and installation documentation.

Collections Media and Formats

The majority of the collection is still images (slides, photographic prints, programs, flyers, etc.). There are almost 800 video recordings in formats ranging from 1/2" open reel video, 3/4" U-matic, VHS, Betamax, Hi8, MiniDV, CD, and DVD. Their audio collection consists of approximately 63 items: 54 audio cassette tapes, two 7" vinyl discs, one 1/4" reel-to-reel tape, and five CDs.

Born Digital Content

Franklin Furnace began receiving video born digital content from artists whose work it sponsored in 2000. No born digital audio has been contributed. Digital files are delivered on DVD or off-loaded from external hard drives. Artists have contributed QuickTime, MPEG2, and .vob^{xxii} files.

2. Digitization for Preservation and Access

Preservation Priorities

The collection contains 339 videos that directly document Franklin Furnace-funded performances and installations. There are an additional 433 videos that are cataloged but are only loosely related to the collection. These are mostly tapes of additional artworks sent by artists who once performed

^{xxii} "vob" is an abbreviation for "Video Object File," which is the data file format for DVD-Video discs.

A2. Archives: Franklin Furnace

at Franklin Furnace. These tapes will become part of the permanent collection eventually, but the organization will not take steps toward preserving them until the primary collection is processed. Given the small size of the collection, Franklin Furnace intends to preserve all sound and video archival originals. This will be a slow and ongoing process, as preservation activities are entirely funded by grants. Its preservation priorities are loosely chronological, beginning with the oldest tapes and further refining based on tape obsolescence and condition. Franklin Furnace purposely does not rate preservation priorities on the external perceived “importance” of the artist, believing instead that all artists’ work has equal cultural value. Grant funding in 2006 - 2008 provided the opportunity to preserve 20 videos on ½” open reel from the organization’s first ten years (1976 - 1986). Previously, the ½” open reels were transferred to VHS; MiniDV copies were made from the VHS tapes as an interim preservation strategy. With the grant funds, Franklin Furnace is creating Betacam SP videotapes and 10-bit uncompressed digital files from the original ½” open reel videotapes.

It is important to note that Franklin Furnace does not view preservation as object-based (the specific video or audio recording), but as event-based. This is the heart of the Variable Media concept, which proposes that an artist’s performance or installation be preserved rather than “just” a video. Thus its preservation priorities tend to be focused on preserving all items related to an event (stills, video, flyers and invitations) as a means to preserve that specific occurrence of the performance. A performance could have variations based on location or other variables.

Preservation and Copyright

Franklin Furnace’s copyright situation is complex. Copyright does not affect its preservation policy; it only affects whether the preserved material is published on the website. To provide online access to documentation, Franklin Furnace must secure permission from the videographer or photographer who shot the documentation, as well as from the artist whose work is represented in the documentation.

Different permission policies were practiced over the years. In the past, Franklin Furnace was most concerned with obtaining permission from videographers to stream their work on their website. Franklin Furnace is now revisiting its policy for artists whose works are represented in its legacy collection (works performed prior to 2000). Franklin Furnace does not seek permission from an artist prior to preserving documentation of their work, but will ask permission before publishing the work on their website. Only two or three artists have denied permission to publish stills or video on the website.

2000 - (9 born digital) 3% of collection

Franklin Furnace has signed permissions from artists and videographers to provide access to the recent born digital documentation.

1990s - 2000s videos (272 VHS) 80% of collection

Approximately 80 to 90% of these videos were created by one videographer who shot everything on Hi8. He gave Franklin Furnace VHS copies and kept the originals. Franklin Furnace has release forms for all his work. Approximately 50 tapes shot by other videographers require release forms, and permissions have not been obtained from artists whose work was documented during this period. Beginning in approximately 2000, the rights situation reversed: Franklin Furnace acquired rights permissions from artists they have presented, but not from the videographers.

1980s videos (38 U-matics) 11% of collection

Franklin Furnace considers this subset of the collection to be its main copyright problem. During this time, individual artists paid for their own videographers, so either the videographers or the artists own the rights to the documentation. In a few instances, Franklin Furnace did hire videographers. To provide access to the tapes not produced by Franklin Furnace, the organization would need to find the videographers and obtain release forms. However, it will nonetheless preserve these tapes while working to acquire releases.

1970s videos (20 open reel tapes) 6% of collection

In the mid-1970s, the New York State Council on the Arts was concerned that avant-garde art activity was not being documented. It created a “Media Bureau,” which videotaped various art activities and gave the tapes to the arts organization presenting them. The presenting organizations own the rights to the videos themselves. The video equipment was stored at The Kitchen, an alternative performance space in New York City. Organizations made appointments with The Kitchen to document their events. New York State paid the videographers. All of Franklin Furnace’s ½” open reel videos were created through this program.

Since 2009, Franklin Furnace has included explicit language in the contracts with their sponsored artists and their videographers and/or photographers to give permission to provide online access to their documentation. Franklin Furnace would prefer documenting sponsored artists’ performances as it did in the past rather than receive work from artists, but this is primarily because of quality control concerns rather than rights. However, there is no current funding to produce the documentation.

Digitization as a Preservation Action

Video digitization for preservation work is outsourced to vendors. Franklin Furnace performs most audio digitization in-house. Franklin Furnace can transfer VHS to MiniDV in-house, but considers that a stop-gap measure until funding is received to do full preservation of the tapes.

Sound recordings are encoded as WAV files at 16-bit/44.1kHz. MP3 access files are created as well. 34 of its 63 items have been digitized thus far. Partial audio digitization was done in 2006. Franklin Furnace follows a two-tiered track in preserving video: it creates an analog Betacam SP preservation master as well as a 10-bit uncompressed digital file. Factors that influenced this decision were partly philosophical, and partly economic.

Philosophically, staff believes that it is still essential to convert archival originals to analog formats as well as to digital. They believe that more information can be extracted from analog copies later than from digital files. They find that the quality of the image is different in digital formats; it “looks too sharp,” especially for low-end quality originals as are found in their collection. As one staff member said, “Low-end tapes shouldn’t look so good. We could always process the files to make it look like the original, but that’s processing – which isn’t preservation.” Staff said that by the time analog tape stock is completely discontinued, digitizing techniques should be improved so that the image is truly equivalent to the original.

Franklin Furnace also had to consider the costs in its ability to support and use a particular format. It originally planned to create uncompressed digital files, a DigiBeta videotape, a Betacam SP

A2. Archives: *Franklin Furnace*

videotape, and a DVD. Its vendor quoted \$100 to make a DigiBeta copy, \$30 for a Betacam SP copy, \$150 to create a one-hour uncompressed digital video file. Franklin Furnace chose not to make DigiBeta copies because it would not be able to use that format without purchasing or renting a DigiBeta deck.

Franklin Furnace discussed its preservation format options with art museums that have similar content in their collections. It learned that museums are creating either Betacam SP videotape or 10-bit uncompressed digital files, so the organization believes its preservation actions are in line with museum best practices for variable media works.

Franklin Furnace has not transcoded (reformatted) born digital files for preservation. However, it has transcoded RealPlayer files to QuickTime for access.

Digitization for Access

Currently, researchers primarily access audiovisual content on-site at Franklin Furnace's Brooklyn office, where they can view access files (QuickTime, DVDs, and MP3) or original tapes if those tapes have not been transcoded. Future primary access will be provided through Franklin Furnace's website.

Just over 20 video clips currently stream online on the website's Video Directory section. Streaming services are provided by Streaming Culture, a project of the City University of New York to help nonprofit cultural organizations stream rich media. Franklin Furnace provides artists' VHS tapes and other media to Streaming Culture, and the service creates QuickTime files. The access files are stored on Streaming Culture's servers; no preservation file is made.

Franklin Furnace digitizes for access only (no preservation files are made) in two situations: 1) when there is not enough funding to create preservation masters, but access to the content is critical for a project, or 2) the work is recent so does not require preservation, and Franklin Furnace wants to stream the content on its website.

Staffing and Workflow

Three staff members are involved in preservation activities. The Executive Director decides which group of tapes is to be preserved. The Senior Archivist selects and pulls the individual tapes and creates catalog records for each tape before sending them to the vendor for encoding and transfer to Betacam SP videotape. Uncompressed and QuickTime digital files are returned on a portable hard drive, and .vob files are returned on a set of two DVDs. When the tapes and files are returned to Franklin Furnace, the archivist copies the files to another hard drive. He sends the archival original tapes, Betacam SP, and one hard drive to off-site storage. The duplicate hard drive and DVDs are stored in Franklin Furnace's office.

Franklin Furnace creates audio preservation files in-house and copies them to a server in its office. Copies on CDs are stored off-site.

The Cataloger adds the hard drive number for a video's uncompressed file to its catalog record in

Franklin Furnace's FileMaker Pro database. The hard drive shipping box also has a printed list of file names stored on the hard drive taped to the outside. Digital audio information has not yet been added to the audio database records, but Franklin Furnace will follow the same procedure as with the video database. It will embed a small MP3 file directly into the FileMaker database record for access and include the path and file name for the preservation copy into the catalog record. There are only 34 artists who have audio work that is digitized. Franklin Furnace finds that the files are easy to find due to their limited quantity, so a database reference is not needed at this time.

3. Preserving Digital Files

Physical Carriers

Preservation files for video are stored on a set of hard drives, with one copy stored off-site and one at Franklin Furnace. Audio preservation files are stored on Franklin Furnace's office server, and backed up on CDs. The server is backed up daily and has a regularly rotated copy stored off-site.

Access files are stored on CDs and DVDs, with some video files stored on Streaming Media's servers.

Digital Asset Management

Franklin Furnace does not have a digital asset management system. It uses several FileMaker Pro databases based on media type (still images, video, and audio) to catalog and track its collections. All digital files follow a strict file naming convention that includes an event-unique identifier, which enables linking all objects related to an event (performance or installation). Database records for still images and video note the physical location of digital files, so staff knows on which hard drive, CD, or server directory they may find the digital files. The audio files are arranged in a directory structure based on the artists' names.

Technical and Digital Preservation Metadata

No technical or preservation data is tracked, with the exception of adding the external hard drive number for a digital video file to its database record.

Technical Infrastructure

Franklin Furnace does not have a capacity to create an in-house robust technical infrastructure, and primarily uses external hard drives for digital file storage and backup. It does not use servers with tape backups or RAID arrays, nor does it have staff trained in managing servers. It performs daily server backups on external hard drives, and rotates the hard drives to off-site storage.

As of July 2009, the preservation video files total approximately 1 TB. Preservation audio files total 8 GB. Franklin Furnace estimates that its total preservation file storage will total 17 TB for legacy content, and its artist-funded work will increase by 2.5 TB every five years. For now, it feels that storing files on redundant hard drives and optical media (CDs and DVDs) is sufficient for its budget and requirements.

4. Creating a Digital Preservation Program

Franklin Furnace does not believe that it needs a planned digital preservation program given its small collection and digital storage requirements, preference to include analog-to-analog video preservation, and limited budget. It notes that it is difficult for small nonprofits to conform to digital technology changes. Will staff forget about the digital files and the need to migrate them to next-generation formats? What if a nonprofit organization must curtail its services due to funding shortfalls, and its collection is stored in a basement for 10 years? The digital collection could just as well be lost due to file format changes and physical carrier failure as the archival original tapes.

5. Funding Strategies

Funding for Franklin Furnace's preservation activities is completely supported by grants on a project basis. A grant from the National Endowment for the Humanities in 2006 - 2008 supported digitizing and making accessible records of performances, installations, exhibits, and other events produced by the organization during its first ten years.

The organization anticipates that grant-funded preservation will continue, and is considering strategies to help its grant proposals succeed. It considers its website to be a key access and marketing tool. Providing online access to content is an incentive to digitize, as the public face will convince funders that Franklin Furnace's content is unique and important.

Franklin Furnace is considering producing and distributing a DVD of performance art highlights, but it is doubtful that the resulting revenue would be allocated to digital preservation.

Cooperative arrangements with artists whose works are represented in Franklin Furnace's collections are also being explored. Franklin Furnace could digitize an artist's work in exchange for making the work accessible on Franklin Furnace's website. The artists would receive a digital copy and their original tape would be returned. The artists would not be paid, as the digitization would be performed as an in-kind service. It is hoped that funders would be interested in supporting this arrangement, because it would help preserve and provide access to work that would otherwise not be available.

Walter J. Brown Media Archives and Peabody Awards Collection **University of Georgia, Athens**

<http://www.libs.uga.edu/media/>

1. Organizational Overview

Organizational Type: Special collections department at a university library.

The Walter J. Brown Media Archives and Peabody Awards Collection is one of three separate special collections departments at the University of Georgia Libraries. It specializes in broadcasting collections (both television and radio), and audiovisual records documenting Georgia and the South. The other special collections are the Hargrett Rare Books and Manuscript Library, which also manages the University of Georgia Archives and the University of Georgia Records Management Program; and the Richard B. Russell Library for Political Research and Studies. The Russell Library collects audiovisual content as well, and creates audio and video oral histories of Georgia politicians.

The Archives was founded in 1995, and began digitizing analog media in 2006. While other campus units collect audiovisual content (for example, the Journalism School and the Athletics Department), only it and the Russell Library have staff trained and dedicated to audiovisual preservation. Audiovisual preservation is well integrated into the University Libraries' goals and priorities, and to preserve and make accessible the Archives' collections is one of its major mandates.

Collections Content Types

The Media Archives has three large broadcasting collections: the Peabody Awards Collection (all radio and television entries to the Awards since they began in 1940), the WSB Newsfilm Collection (5 million feet of newsfilm from this Atlanta station dating from 1949 - 1981), and the WALB Newsfilm Collection (newsfilm from this Albany, Georgia, station dating 1961 - 1978). Additional collections have been added over time, especially in the area of Georgia and regional history, but the collection focus is broadcasting.

Moving image content includes: television broadcasting (aired programs) (70%), news source material (outtakes, newsfilm, etc.) (20%), oral histories/interviews (4%), educational/industrial (2%), field recordings (1%), documentaries (1%), home movies (1%), literary readings (0.5%) and music videos (0.5%).

Audio content includes: radio news broadcasts (20%), radio entertainment broadcasts (20%), radio documentaries/audio essays (20%), oral histories/interviews (10%), field recordings (10%), performance documentation (10%) and children's programming (10%).

Collections Media and Formats

The Archives has over 300,000 titles on analog formats including radio transcription discs, 1/4"

A2. Archives: Walter J. Brown Media Archives and Peabody Awards Collection

audio reels, 16mm film, 2" video, 1" video, ¾" U-matic, ½" open reel video, VHS, Betacam SP and DigiBeta videotape.

Born Digital Content

Born digital content is received as part of the Peabody Awards entries, but the Archives receives only access copies submitted on DVDs and CDs. Since the 2009 Peabody Awards entry process the Archives has been accepting digital files along with analog video formats. Entrants can submit digital files as uncompressed MOV files at the highest resolution the entrant can deliver on Blu-ray disc, USB flash drive, or external hard drives. If the entrants submit files on hard drives, the hard drive must be formatted for Apple Macintosh computers. For master audio content the Archive is requesting BWF files (submitted on CD or DVD) or MP3 files on CD.

2. Digitization for Preservation and Access

Preservation Priorities

While the Archives would like to preserve all items in the collection, its preservation budget is limited. In setting priorities, the Archives weighs the uniqueness of the content, and whether the media format can be transferred in the in-house facility, as this is the most cost-effective transfer action. It is also the most cost-effective preservation action for videotape. Uniqueness of content is determined after research, and is based on the Archives' experience in working with content types over the years. The Archives has found that most local television and radio stations with entries in the Peabody Awards did not save their programming before 1990, so it is concentrating on preserving this content, as the Archives likely has the only copy.

Within this subset of content, the Archives is transferring U-matics and all audio formats because it can transfer these formats in-house. This is a slow process for a collection that has tens of thousands of U-matics, and it would prefer outsourcing because of the volume of material. It preserves 2" video when funding is available, as that work must be outsourced. Archives staff notes that the 2" video is holding up well, and they are more concerned about the condition and longevity of the U-matics. They are, however, always concerned about the future availability of playback units for both 2" video and U-matics.

Preservation and Copyright

Copyright does not influence the Archives' preservation priorities, as it feels that under Section 108, it can preserve items so long as they are only accessible on campus, whether in the Archives or as temporary streams to researchers. It does influence how access is provided to those preserved works still under copyright. In 2009 - 2010, the Archives, in conjunction with the Peabody Awards office, will revise the Peabody Awards entry forms so that the Archives has permission to stream content online. It is also contacting local stations that produced content in its legacy collections, listing the programs the Archives would like to stream and requesting permission to do so. The Archives uses researcher requests as another means to receive permission to stream content. Researchers requesting copies of programs must get written permission from the rights holder. After permission has been obtained, the Archives writes to the researcher's contact and asks for

permission to stream the content. Archives staff notes that there has been a positive response to their requests.

Digitization as a Preservation Action

The Archives has established an in-house reformatting facility where it can make preservation-quality files from audio and video formats, and access files from 16mm film. In general, film is preserved photochemically (this work is outsourced), but some film originals were preserved digitally. For the Civil Rights Digital Library, 10 hours of 16mm film were digitized to high resolution AVI files as specified by the Institute of Museum and Library Services (IMLS), the funder for that project. The AVI files were transcoded into three separate streaming formats for access. An additional 90 hours of film have been digitized in-house to QuickTime ProRes 422. As of July 2011, the Archives has created preservation digital files for 100 hours of film (10 to AVI, 90 to ProRes 422), 4,000 videotapes, and 350 sound recordings. The Archives keeps old equipment for both use and parts.

Three file formats are used as digital preservation files for moving image content: JPEG 2000 wrapped in MXF, ProRes 422 (HQ), and 10-bit QuickTime in MOV files. The facility uses two SAMMA Solo systems to encode U-matic tapes and create JPEG 2000 (50 mbps) preservation files. For a grant project, it created a second analog preservation master on Betacam SP videotape. Once its Betacam SP stock is depleted, it will no longer make analog preservation masters and will only create digital files. The Archives also use Final Cut Pro on four Apple workstations to create QuickTime (10-bit, 230 mbps) and ProRes 422 (73 mbps) files. ProRes 422 files are preferred over 10-bit QuickTime files because of file storage limitations, although the Archives will create 10-bit files on request (for example, when working with producers who are licensing footage or have permission to copy a Peabody program).

Analog audio formats (transcription discs, 1/4" audio reels, DAT) are encoded as BWAV files at 24-bit/96kHz. Audio preservation file formats are well established; the Archives referred to the IASA-TC04 standard and best practices it found in researching the topic. The Archives hired an audio technician in late 2010 to do audio transfer and preservation work.

The Archives selected its preservation file formats based on formats the vendors' hardware supported, asking colleagues, reading the Association of Moving Image Archivists' ListServ (AMIA-L) and researching what formats had the widest support across institutions, vendors, and broadcasters. The SAMMA Solo system creates JPEG 2000 files, and after research the Archives decided to use that format as its primary preservation file format. QuickTime ProRes 422 files are created for digital film transfers. The preservation files are maintained on a dedicated Apple Xserve with a redundant RAID digital storage system by the Libraries' IT department, although IT does not normally support Apple hardware or software.

JPEG 2000 files are only stored on LTO3 tape. Two copies are made, with one copy stored in the Archives and the other off-site. No JPEG 2000 files are stored on servers.

Born digital content received as Peabody Awards entries is currently received on CDs and DVDs, but this changed somewhat with the 2009 entries. Audio files on the CDs are copied to MP4 for streaming from the Peabody Awards database locally to the campus community. Approximately

A2. Archives: *Walter J. Brown Media Archives and Peabody Awards Collection*

500 programs have been transferred. If the Archives receives a dye-based optical disc (e.g., CD-R or DVD-R) it is transferred immediately to a digital file for eventual migration to LTO tape. Entrants submit two copies of DVDs or a videotape; one copy is placed in the Archives, and the other is used as an access copy.

Digitization for Access

The Archives digitizes 16mm film for access and uses photochemical processes for preservation. Film content digitized for access includes home movies and newsfilm. Otherwise, all audio and video that are digitized in-house have access files created simultaneously with the preservation files. As mentioned above, radio content received on CDs is transcoded to MPEG4 files, and attached to its cataloging record for local campus access.

Staffing and Workflow

The Archives has a staff of 5.5: Director, Media Archivist, Peabody Archivist (who also catalogs Peabody items), Moving Image Digital Conversion Manager, Audio Technician and one half-time Cataloger who works on non-Peabody content. It also employs student assistants.

Content to be digitized is selected by the Director, or upon user request. A shared spreadsheet used to track the digitization process is stored on Google Docs. Staff uses Google Docs rather than sharing documents on a networked server because Archives' documents are created on an Apple computing platform, and the IT department does not support Apple documents. Archives staff inspects and cleans the archival original prior to encoding.

U-matics are digitized to JPEG 2000 files using the SAMMA Solo systems; 16mm film and all other formats are encoded to QuickTime ProRes 422 using the Apple workstations. Derivative files are created as needed: 400 kbps 360x240 Flash, and a 1 mbps 720x480 QuickTime streaming file. The streaming formats F4V and MOV use the H.264 codec.

A newsfilm reel can contain several unrelated outtakes or clips that are spliced together into a 2,000 foot reel. When a newsfilm reel is digitized, the digital outtakes are broken into individual files with their own file names based on the unique identifier for the archival original clip. Derivatives are given to the Cataloger to attach to the catalog record. The catalog record notes the original reel from which the clip originated, so it would be possible to locate the original source reel or even digitally re-create the reel if necessary. There is not enough staff to catalog all content that is digitized, so many of the non-Peabody items have minimal metadata.

The Archives has a two-tiered approach to digital storage. While their approach is described more fully in the "Technical Infrastructure" section below, it is noted here because the Archives backs up preservation files to LTO3 tape itself as part of the workflow. The two SAMMA Solos are an early model with an LTO3 tape drive internal to the machines, so the Archives can copy the JPEG 2000 files to LTO3 tape within its own department. All other files are stored on dedicated servers to be eventually migrated to LTO. The Archives will soon be attaching an LTO5 drive to the Xserve and eliminating the LTO3 drives installed in the SAMMA Solos.

3. Preserving Digital Files

Physical Carriers

JPEG 2000 preservation files are stored on two copies of LTO3 tape; all other preservation files are stored on servers maintained and backed up by the Libraries' IT department. Audio preservation files are also stored on gold CDs as well as transcoded and copied to the server. Peabody Awards television entries received on DVDs are left as DVDs unless they are dye-based (e.g., DVD-R); files are not copied to servers.

Digital Asset Management

The Archives currently does not use an integrated digital asset management system, though this is coming in the near future as the number of digital files increases. The Archives has recently purchased an Apple Final Cut Server for the Xserve storage system, which assists in managing its digital assets. It manages digital production workflow through Excel spreadsheets. In addition, access files are attached to cataloging records for streaming. The Peabody cataloging record with a connected instantiation database lists the digital file formats, file names, and where they are located (names of servers and LTO tape number). Technical data created by the SAMMA Solos during the encoding process is stored separately in an XML file.

Technical and Digital Preservation Metadata

Technical and digital preservation metadata is limited to file names and storage locations, and technical metadata created by the SAMMA system during encoding. The XML file created by SAMMA (see the "Technical Infrastructure" section below) adds technical data about the JPEG 2000 and derivatives creation; this data is saved in the XML file and not exported to a database at this time.

As the Archives further develops a digital preservation program, it intends to use PREMIS for digital preservation metadata.

Technical Infrastructure

As mentioned previously, the Archives operates in a hybrid technical environment. It is responsible for copying large preservation files (JPEG 2000 and ProRes 422) to LTO3 tape with a migration to LTO5 beginning in 2012 within its department, while the Libraries' IT department stores all other files on servers it manages and backs up.

IT creates the server directory structure for the Archives. The Archives asks for more directories and space as collections are digitized, as it can monitor its storage usage itself. The Archives pays for the storage; as of July 2009, 60 TB is allocated for its use. The storage servers are not shared with any other Library's department, although the streaming server is shared with another department. The servers are duplicated by the IT department for backup in a mirrored RAID system. The Archives Director, in consultation with the Moving Image Digital Conversion Manager, decides when and which files are migrated to LTO tape when server space needs to be freed up.

A2. Archives: Walter J. Brown Media Archives and Peabody Awards Collection

ProRes 422 files are stored on the server, although at times they are copied to LTO. This decision depends on the collection, and how the Archives intends to use the files after capture. Files are only copied to LTO when a group or a directory of files total 400 GB of storage (the storage capacity of the LTO3 tape they use). In these circumstances, the preservation files are transferred to the SAMMA Solo workstations, then written to LTO. (SAMMA LTO drives are networked to the Archives' dedicated servers.)

The Archives' LTO3 tape drives are part of their SAMMA Solos. The University was a beta tester for SAMMA, and the early models produced by the company installed LTO drives into their systems. Front Porch Digital, the company that has since purchased the SAMMA product line, no longer includes LTO drives. The Archives has also encountered some software issues related to LTO use with the SAMMA system, and will soon replace the LTO drives with an LTO5 attached to the Xserve. This will enable them to move the SAMMA files to the Xserve and back up files to LTO5.

The SAMMA Solos produce an MXF file that contains the JPEG 2000 file. The MXF file is read and validated through the SAMMA systems. Digital Rapids software then produces three derivatives, two QuickTime and one Flash. If there is an error in the MXF file, there will be an error in all derivatives, and therefore validation of the MXF files is critical. Technical data on the analog transfer is written to XML files.

4. Creating a Digital Preservation Program

The Archives was able to begin developing a digital preservation program due to two grants received by the University of Georgia Libraries. An NEH Save America's Treasures grant for \$300,000 helped digitize ¾" U-matic tapes in the Peabody Awards Collection, and an IMLS grant for \$780,000 was used, with other partners, to create a Civil Rights Digital Library. The IMLS grant was used to digitally preserve 16mm newsfilm in the collection. Both projects paid for equipment, and the IMLS grant also supported a staff person to make the in-house derivative work possible. The Archives Director notes, *"Without these grants we would never have gotten this far with digitizing."*

Grants supported initial encoding efforts, and the Archives is ready for a full digital preservation program. It intends to track the dates of when an original backup was created, revisit file formats so it can plan transcoding operations in the future, and acquire appropriate equipment. The Archives questions how long it would take to do a migration of all data that has been created, and the needed staff to do the work. The process is *"expensive and daunting – not just a 'store and ignore' exercise."*

Key to the Archives' planning is developing a close relationship with the Libraries' IT department, which would out of necessity help in the process of managing the Archives' digital files. *"IT staff is aware of the seriousness of what storage means in our current infrastructure. We are moving to a new building in the fall of 2012 and we know we need Fibre Channel throughout the building to do what we need to do more efficiently. We have pushed the IT department to consider the massiveness of moving image archiving in the digital world. This has been a learning process on both sides. The University Librarian is behind us 100% and this has made our job easier."* Some in the IT department say that LTO tapes can last 10 years; they are thinking of object-based preservation, rather than preserving the files. In contrast, the Archives prefers migrating files to a next-generation LTO within a five-year cycle while the previous generation

LTO tapes can still be read on new tape decks. The Archives Director believes that external studies and research papers help support the archivists' concerns to IT staff. The two departments need to work together: one has technology, the other has archival knowledge. If a common understanding cannot be reached, *"It's the collections that pay, not us."*

5. Funding Strategies

The Archives' digital preservation efforts to date have been funded 75% by grants; 20% is allocated from the department's budget, and 5% comes from revenue earned from licensing footage. The Archives does not anticipate that these percentages will shift, but it needs more staff and infrastructure support. Planning for a new special collections building has taken up time that could have been devoted to fundraising, and once the building is completed the Archives Director will focus on grant writing. At the moment, the Archives is only receiving small grants for preservation work that is outsourced.

The Archives Director believes that in order to raise funds to preserve content, an archive needs to know what it has in its collections. Funders are "captured" by content. The Archives Director also considers it an irresponsible practice to digitize items merely to discover its content, although sometimes that is the only option. Physical materials must first be processed, noting media format and creating basic content descriptions using written information on the item and from other documentation. A funding priority is for more processing and cataloging staff; all digital preservation actions will follow once content is identified. Hiring additional staff for digitizing, especially when it is time to refresh the data, will also become a priority.

As the Archives Director notes, *"Broadcasters have gone down this [digital] path so there is no turning back. Digital file creation requires another level of commitment for archives that involves leadership, IT assistance, digital storage, money, metadata creation, file management, file migration, and the people to keep it going. The ease of access is fantastic but it comes with a fairly steep price tag for small institutions."*



ONLINE APPENDIX

The complete set of survey data used in the creation of this report is available at:

www.oscars.org/tdd2





END NOTES

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About the Science and Technology Council

The mission of the Science and Technology Council of the Academy of Motion Picture Arts and Sciences is:

To advance the science of motion pictures and foster cooperation for technological progress in support of the art

To sponsor publications and foster educational activities that facilitate understanding of historical and new developments both within the industry and for the wider public audience

To preserve the history of the science and technology of motion pictures

To provide a forum and common meeting ground for the exchange of information and to promote cooperation among divergent technological interests, with the objective of increasing the quality of the theatrical motion picture experience

For more information on the Science and Technology Council, visit **www.oscars.org/council**



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