

MANAGING MULTI-PLATFORM MATERIALS: SELECTED CASE STUDIES

Somaya Langley, Sound, Broadcast and Networked Media, National Film and Sound Archive of Australia, McCoy Circuit, Acton, Canberra, ACT, 2601, Australia
E-mail: <somaya.langley@nfsa.gov.au>.

Trevor Carter, Preservation and Technical Services, National Film and Sound Archive of Australia, McCoy Circuit, Acton, Canberra, ACT, 2601, Australia
E-mail: <trevor.carter@nfsa.gov.au>.

Matthew Davies, Sound, Broadcast and Networked Media, National Film and Sound Archive of Australia, McCoy Circuit, Acton, Canberra, ACT, 2601, Australia
E-mail: <matthew.davies@nfsa.gov.au>.

Ian Gilmour, Preservation and Technical Services, National Film and Sound Archive of Australia, McCoy Circuit, Acton, Canberra, ACT, 2601, Australia
E-mail: <ian.gilmour@nfsa.gov.au>.

Abstract

Mobile devices and Internet usage are now common in most parts of the world. Archives and other cultural agencies are challenged by the increasing amounts, and complexity, of digital content. New strategies are being developed and promoted to enable digital acquisition and preservation. The National Film and Sound Archive of Australia (NFSA) is examining and addressing acquisition and preservation challenges for a range of complex digital content, within available resources. This paper will discuss issues associated with a range of multi-platform content with reference to selected case studies.

Keywords: multi-platform, digital archiving, digital preservation, case studies, complex objects, apps

Introduction

Digital technologies have become ubiquitous, with an ever-increasing number of people creating and using digital content [1]. The NFSA acquires nearly 200 Australian feature films annually. Around 40 of these are digital, each averaging two terabytes [2]. In Australia, collecting institutions typically represent the historical divisions between the various cultural industries and agencies. Archives, libraries, museums and galleries are part of the memory sector, but the roles and business drivers of these organisations differ according to their interests. Australia currently has no national legal deposit legislation for audiovisual materials [3]. The NFSA selectively

archives [4] a representative sample of Australia's audiovisual heritage, spanning feature films, broadcast content, published audiovisual material and multi-platform works [5]. Selection is guided by principles outlined in the NFSA's Collection Policy [6], such as cultural significance [7]. It is important to note that our Collection Policy does not cover all forms of audiovisual practices. A formal Deliverables Deed [8] which mandates archival deposit of funded productions [9] has been negotiated with the federal funding agency Screen Australia and adopted by a number of state agencies [10]. We do not collect games and at present there is no clear mandate for any specific government institution in Australia to do so. Our focus is on works where the "audiovisual experience" is the primary element.

Audiovisual material then and now

Fundamental changes in audiovisual production and delivery challenge traditional archival models. Collecting institutions can no longer wait until a work has been presented and then archive the results. For example, feature films used to arrive on reels of film or video tapes (Fig. 1). Now "films" are delivered on a variety of digital media, ranging from LTO [11] tapes through to USB flash drives (Fig. 2). In the same way that the physical carriers that film arrives on have changed, the way that content is stored on a carrier has also been transformed. Traditionally, analogue film had a base (polyester or nitrate) that contained a sequence of still images and an optical sound track. Feature films are primarily distributed commercially as a

Digital Cinema Package (DCP) [12]: a sequence of separate image and audio files in MXF [13] wrappers plus an asset map, playlist and a volume index in XML [14]. In addition, as our case studies show, feature films are often accompanied by networked media (e.g. websites and apps), delivered via the Internet or FTP [15]. These fundamental changes in the way that audiovisual material is created, delivered and stored means that we need to actively engage with content creators as early in the production process as possible to identify the best preservation approaches for their work. The *ABCDE Model* (Fig. 3) being developed by the NFSA is one response to managing these changes.

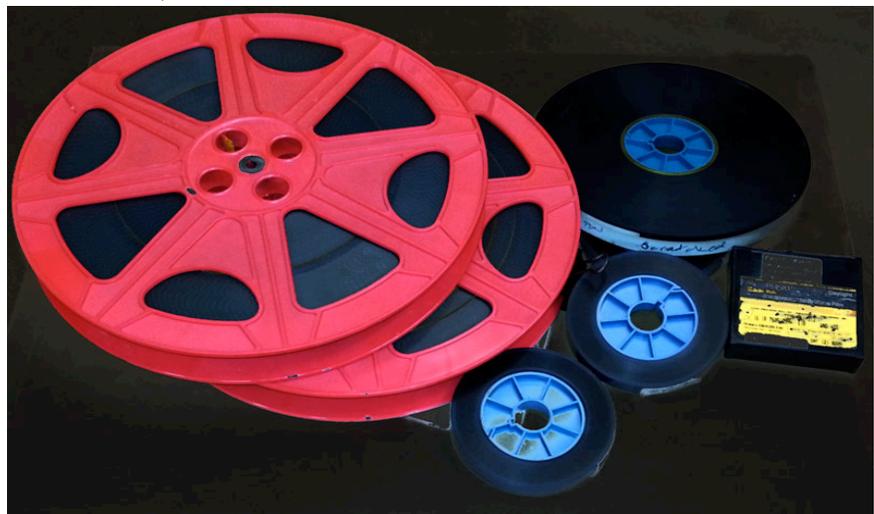
Collecting Networked Media

Networked media is a broad and overarching term. For our purposes, the NFSA defines networked media as:

"...content which is created, distributed and used on mobile devices or networked computers, predominantly via the Internet and wireless services. It is distinguished from traditional one-to-one telecommunications, and from one-to-many broadcast networks, by being a global array of publically accessible many-to-many networks which enables participation and contribution of content." [16]

Archiving networked media builds on our extensive experience in acquiring and preserving complex analogue linear content, and is also made possible by our large-scale digital storage infrastructure (that includes backup and redundancy mechanisms). We predominantly aim to acquire networked media, however we have also archived complex non-

Fig. 1. Analogue film reels. (© National Film and Sound Archive of Australia. Photo © Trevor Carter.)



networked content (such as interactive multimedia CD-ROMs), interactive audiovisual installations and works incorporating data from sensors systems (e.g. Lynette Wallworth's digital work *Coral: Rekindling Venus* [17] for planetarium dome environments). As a partner organisation in the National Library of Australia's (NLA) PANDORA [18] project, the NFSA has been archiving websites related to Australian audiovisual culture since 2001.

Sustainability must be considered as part of any archival selection process. Issues inherent in the preservation of all audiovisual content (such as encryption, proprietary formats and technological redundancy) are ongoing concerns and must also be addressed in the course of digital stewardship [19]. Memory sector organisations must now deal with: ongoing management and active preservation of complex digital content (such as multi-platform works); the lack of scalability of current archival practices; curatorial selection processes in the digital space; and, problems caused by the lack of explicit donor guidelines to support acquisition processes.

Developing Proactive Approaches: The ABCDE Model

Changes in production and delivery technologies have required corresponding changes to the NFSA's approach to archival thinking. The NFSA is developing a Networked Media Strategy to inform the acquisition and preservation of digital material. As part of this strategy



Fig. 2. Physical format digital carriers. (© National Film and Sound Archive of Australia. Photo © Trevor Carter.)

we are reviewing existing models used to address the curation, description, documentation, management and preservation of complex works [20]. We are developing the *ABCDE Model for Curation and Content Management* (Fig. 3) to support curatorial and technical assessments.

Based on the principles and concepts of the three-tiered Fédération Internationale des Archives du Film (FIAF) preservation model [21], our evolving model is both conceptual and technical in nature. It will inform the ongoing management of our collection materials.

The *ABCDE Model* (Fig. 3) is multi-layered; it classifies the inherent and temporal attributes of analogue and digital items [22] into five levels that inform

acquisition and collection management decisions. These decisions must be made regarding various attributes of an audiovisual item: the quality and technology (including complexity); its role in creative development (at all stages of production and reuse); sustainability; and, the delineation of its role and usage in an archive.

The following examples show how a particular item (or format) may be ranked differently against various types of attributes.

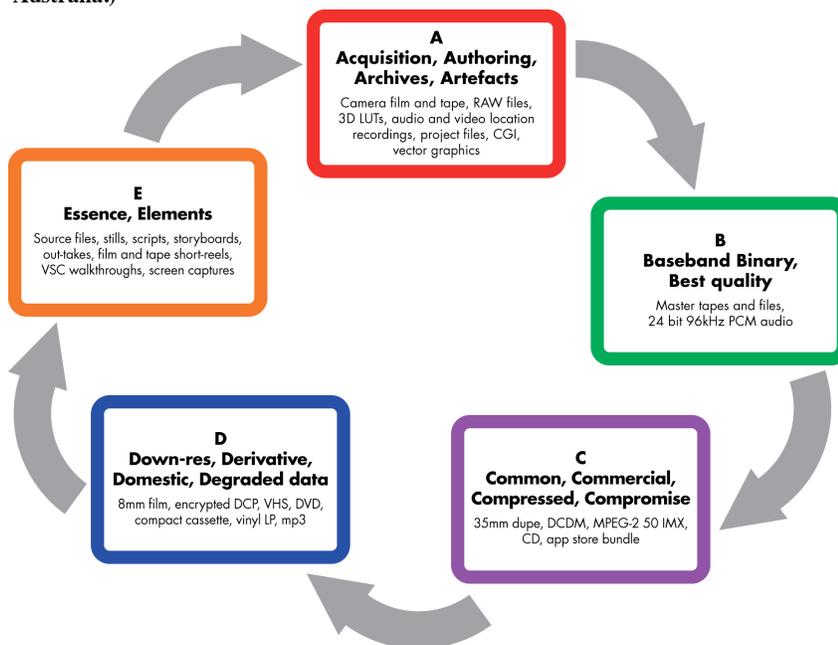
Quality

- Highest: 70mm film, 8k RAW files, 32 bit 384kHz PCM [23] audio
- High: 35mm negative film, 24 bit 96kHz PCM audio
- Medium: MPEG-4 Hi444PP, 16 bit 44.1kHz PCM audio
- Low: DVD, DVB [24], mp3 128 kbs
- Lowest: 384 kbs h.263 video link, low bitrate mp3

Production

- Unconformed and preproduction items: field recordings, camera tapes, P2 cards, scripts, storyboards
- Production items: AVID project files, Digital Multitrack Audio, Music and Effects submasters
- Complete, full-resolution masters: Composite Dupe-Neg, MXF-Op1a
- Items packaged for commercial distribution: film-print, DVD, CD
- Lower quality derivatives: thumbnail image

Fig. 3. The NFSA's evolving ABCDE Model. (© National Film and Sound Archive of Australia.)



Sustainability

- Highest: stone tablets and pyramids
- High: BWF [25], PNG [26], TIFF [27]
- Medium: celluloid phonograph cylinders, U-matic video, unencrypted DCPs
- Low: wax phonograph cylinders, 2" Quadruplex video, Pro-Res
- Lowest: iOS apps, encrypted DCPs

Archival Usage

- Level A (acquisition and authoring): camera negative film, RAW files
- Level B (complete, full-resolution masters): D1 video, 1/4" audio tape
- Level C (commercial or compressed): DV AVI [28], CD, vinyl disc
- Level D (lower quality derivatives): DVD, mp3, audio cassette
- Level E (elements): out-takes and items such as text or still images from a webpage

Acquiring a range of items from all levels of the *ABCDE Model* (which is not always possible) maximises opportunities for sustainable access, repurposing and re-presentation. In general, it is easier to preserve Level B [29] items and to use copies to derive or enable subsequent access outcomes. Level D [30] items are typically only acquired when no other options are available. Level C [31], Level A [32] and Level E [33] items should support the long-term preservation and access to archival material. It may also provide context, to enhance opportunities for researchers, producers and content creators to repurpose and re-present their work for future audiences.

Content Creators as Digital Curators

Due to the complexity of contemporary digital works (including multi-platform content), artists and creators can no longer simply submit their works to a collecting institution at the completion of a project. It is increasingly necessary to consider the archiving requirements of the work throughout the entire creation process. The NFSA encourages artists, creators and producers to reference resources including *How To Write a Transmedia Production Bible* [34] and the *Electronic Arts Intermix Resource Guide* [35] as well as using a *Sheer Cu-*

ration approach [36]. The curation of digital data should be embedded into the development phases of the work's lifecycle, ensuring that appropriate metadata and documentation are created along the way.

Where a Deliverables Deed is in place, requested materials include the work plus a range of documentation and information (such as an Electronic Press Kit [EPK] and scripts) [37]. To suitably support archiving a complex digital object, a range of additional materials [38] (documenting and supporting the work itself) are also likely to be required. These include:

Documents and Elements

- Video Screen Captures [39] (VSC)
- Screen captures [40]
- Storyboards [41]
- Wireframes [42]
- Creator statements [43]
- Audience experience documentation [44]

Descriptive and Rights Information

- Credits [45]
- Rights [46]

Functional, Structural and Technical Details

- Structural information [47]
- Structural maps [48]
- System diagrams [49]
- Production workflow diagrams [50]
- Functional specifications [51]
- Technical requirements [52]
- Technical specifications [53]

- Interaction behaviours [54]
- Instructions and guides [55]

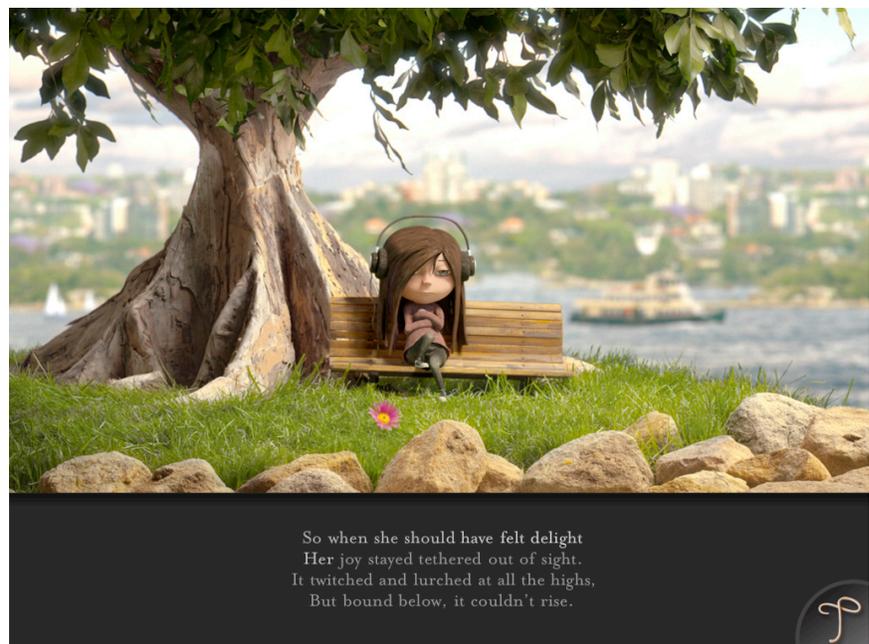
Any additional lists of assets [56], metadata [57] plus checksums [58] are also important. If the work requires external inputs, such as a dataset or if it is sensor-driven, it would also be advisable to include an example dataset or a bit-stream of the raw sensor data. This may enable the work to be re-presented in the future.

As well as content creators becoming citizen curators, archivists need to become more engaged in the creative process. Collecting and archiving digital multi-platform content (such as apps), is a relatively new activity for the NFSA and this content is typically being acquired via a formal Deliverables Deed [59]. We are expanding our expertise in dealing with this material by learning from each new acquisition. The following case studies (acquired via Deliverables Deeds) were selected for the variety of items (and formats) submitted. They demonstrate some of the issues we are facing, and enable us to develop more detailed information to provide to producers; assisting them with submitting complex digital content.

Case Study 1: A Cautionary Tail

A Cautionary Tail [60] featuring Cate Blanchett, David Wenham and Barry Otto, was originally conceived as an animated short film [61], which premiered at the 2013 Flickerfest in Sydney. Images were created from digitally-

Fig. 4. *A Cautionary Tail*, iPad app still, 2013. (© RAWR Media.)



tracked stop motion animation of a min- annotated storyboard image stills (Fig. user experience and interaction behav-



Fig. 5. A *Cautionary Tail*, iPad app storyboard still describing interaction behaviours, 2013. (© RAWR Media.)

ature set with 3D characters rendered in AutoDesk software. This was subsequently developed into an interactive children’s story iPad app (Fig. 4.).

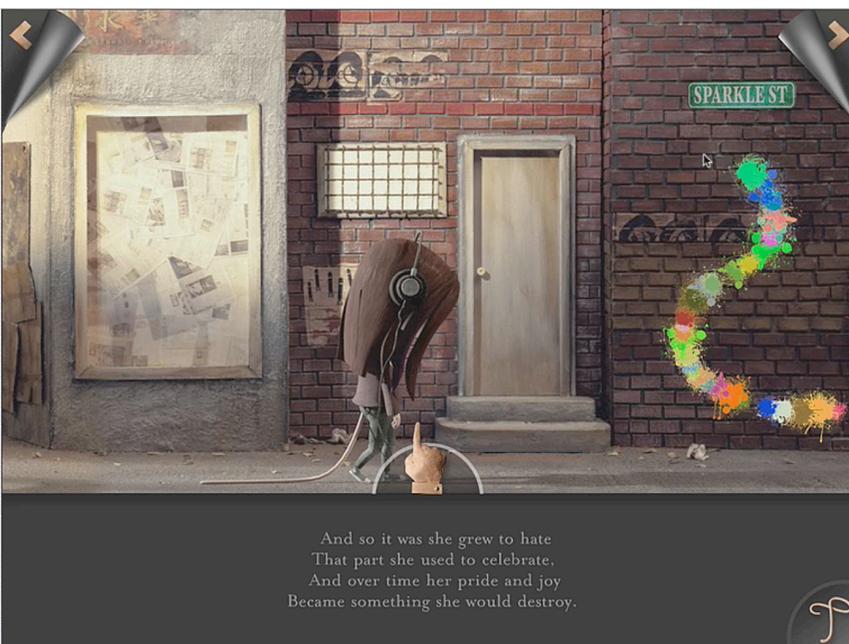
In addition to the short film, multi-platform files received by the NFSA included: a VSC; audiovisual elements,

5.); and text files indicating various interactive behaviours. The NFSA did not receive the binary iPad app, technical specifications (e.g. production workflow documents) or details of the platforms and versions the app was developed for. The VSC (Fig. 6.), which displays the

aviours, was created during the testing phase of the (final) beta app. It demonstrates some of the interaction aspects of the app and provides a reasonable representation of the work.

Although a Digital Picture Exchange (DPX) sequence was not created as part of the original production chain, the producers created and supplied DPX files to the NFSA, based on their understanding of the NFSA’s Deliverables Deed. This created additional, unnecessary work for the production company and highlights the need for greater communication at an earlier stage in the process. Through consultation we were able to obtain a range of required digital items. However in order to fully understand the work, a personally purchased copy of the app allowed us to gain valuable insight. Due to the NFSA’s close working relationship with the producer, it is anticipated that we will be able to obtain additional materials (e.g. technical information documents, the binary app file and the fully resolved website).

Fig. 6. A *Cautionary Tail*, iPad app video screen capture still, 2013. (© RAWR Media.)



Case Study 2: The Gradual Demise of Phillipa Finch

The Gradual Demise of Phillipa Finch [62] is a 17-part multi-platform 2D animation created by Emma Magenta (that first aired on ABC Television in 2011). In addition to the animation, other multi-platform components included: an iPhone game app; two websites; *The Waking Heart* (a hybrid interactive installation); and, an iPhone app enabling users to interact with the installation. The second website specifically associated with *The Waking Heart* installation is no longer available online.

Files received by the NFSA included: the binary iOS app; a VSC walkthrough of the iOS game app; selected audiovisual and image elements (some in proprietary formats such as Adobe Illustrator [Fig. 7.]); a zipped file (ZIP) of the website (including hidden system files and code subversion files [SVN]) plus additional documentation (including a high-level website storyboard [Fig. 8.]).

This is one of the earliest examples of a multi-platform work acquired by the NFSA [63] and it was submitted with limited supporting documents. For us to facilitate the ongoing management and long-term preservation of this type of multi-platform work (other than maintaining access to the VSC), we may need to obtain further technical specifications.



Fig. 7. *The Gradual Demise of Phillipa Finch*, website character element, 2011. (© Emma Magenta, Based on Birds.)

Case Study 3: The Sapphires Soul Sync App

The Sapphires Soul Sync [64] app is an interactive iOS app (produced by Digital Arts Network Sydney) that accompanies the 2012 release of the award winning Australian feature film *The Sapphires*. The NFSA received: a short promotional video about the app and how to use it (Fig. 9.); screen captures of the app (Fig. 10.); and, server-side and client-side code. We did not receive the binary iOS

app, a VSC (representing the interaction behaviours or the user experience) or technical documentation. Without technical documentation, it is difficult to confirm whether the various code files that were submitted could be recompiled into the app.

The app is dependent on functionalities only available on certain models of Apple mobile devices. For example, it requires a front-facing camera and stores photos in the Photo Album on the client device. Downloading and using the free

Fig. 8. *The Gradual Demise of Phillipa Finch*, website storyboard, 2011. (© Emma Magenta, Based on Birds.)

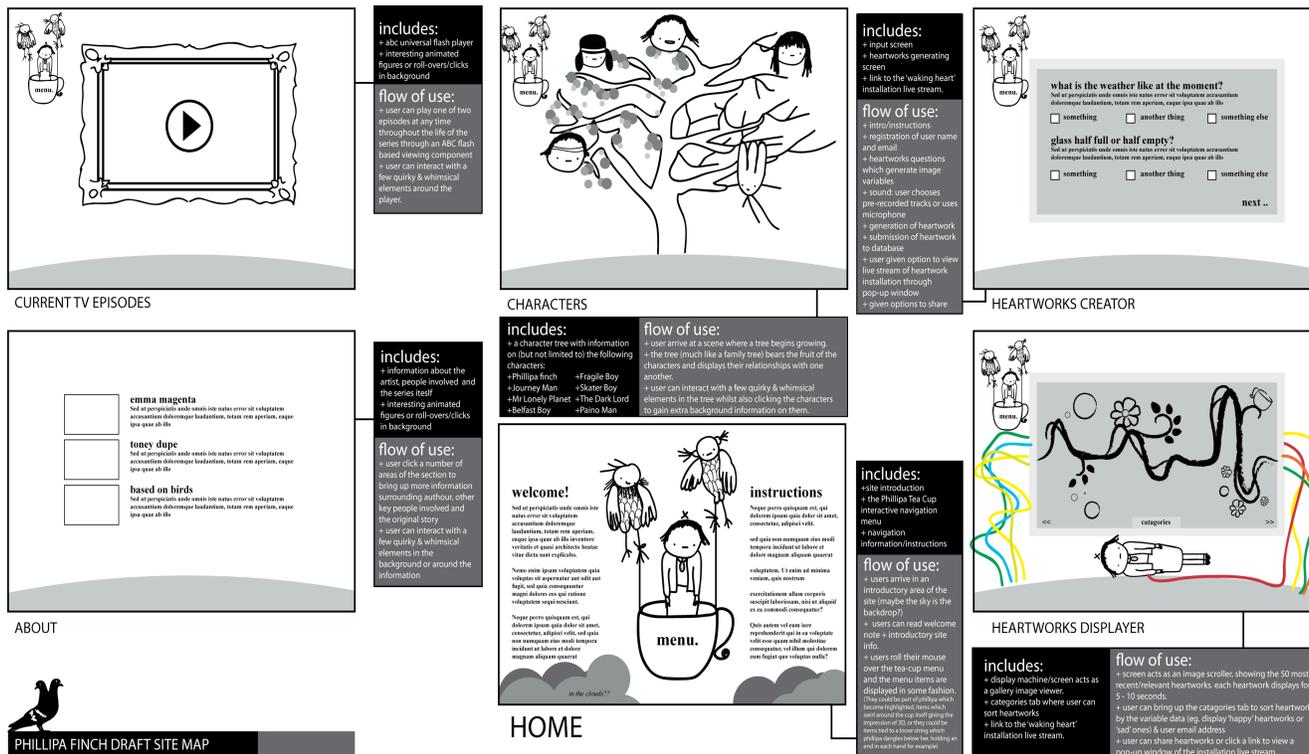




Fig. 9. *The Sapphires Soul Sync*, iOS app promotional video, 2012. (© Digital Arts Network Sydney, Goalpost Pictures.)

app was the only way to discover these limitations. As technical information (describing these dependencies) was not supplied, this app may be difficult to support in the future.

Case Study 4: Storm Surfers 3D

Storm Surfers 3D [65], a film about surfers seeking out and riding gigantic waves, premiered as a 3D movie in 2012. A series of webisodes, a website, an eBook and a mobile game (for iOS and Android) were also created [66]. This was the first stereoscopic movie we have received, and it raised issues of sustainability. We archived the Digital Cinema Distribution Master (DCDM) as

TIFF images for the left and right eye [67] to allow the film's stereoscopic effects to be recreated in future formats.

Storm Surfers was delivered to cinemas as a DCP; a complex digital object. For archival purposes, it is important to understand the stages of a DCP production chain. A DCP consists of a series of separate image and audio files in MXF wrappers plus an asset map, playlist and volume index in XML. To produce a DCP, a Digital Intermediate (DI) is created (made up of a series of high-res uncompressed images and a collection of audio files). From the DI a DCDM is produced; usually a series of TIFF files in the XYZ colour space, with accompanying audio files. The DCDM is used to

produce the DCP — the moving images ultimately seen on the cinema screen. These files are often encrypted. Due to the difficulties presented by preserving encrypted material the NFSA does not currently collect encrypted files.

Storm Surfers' DCDM contained approximately 270,000 TIFF images (approximately five terabytes of data), which stretched the hardware and storage capacities of the NFSA's ingest systems. In addition, the image files, the website, webisodes and television episodes all arrived on the same eight terabyte hard drive. The NFSA has a number of separate (specialised) sections based on traditional production chains (film, sound etc.). With all the material arriving on one large hard drive, ingest had to be handled by one area (the film section). This challenged our traditional (section-based) approach to archiving, providing an opportunity to examine the ways in which communication can be improved across areas.

Conclusion

Collecting institutions and cultural industries are constantly adapting to new modes of production, advances in digital content creation and technological innovation. These case studies have taught us that while we are making progress in archiving multi-platform content, there is still a considerable way to go. Archivists and curators must continue to develop emerging models, create standards and processes (based on established principles), and take into account the increasing complexity and continued evolution of media technologies. Likewise, creators and producers must build an awareness of digital archiving requirements. Good communication between creators and archivists is key.

Our hope is that this paper will inform and encourage creative producers to contact collecting institutions, like the NFSA, early in the production process. As cultural custodians, collecting institutions need to work in partnership with artists and creators, exchanging knowledge and experience in order to achieve the best outcomes for long-term sustainability of digital content.

Acknowledgements

The authors would like to thank NFSA staff and colleagues who have contributed. Edited by Pam Carter.

A Cautionary Tail
Courtesy of RAWR Media

Fig. 10. *The Sapphires Soul Sync*, iOS app screen capture, 2012. (© Digital Arts Network Sydney, Goalpost Pictures.)



Director: Simon Rippingale
Producer: Pauline Piper
Writer: Erica Harrison
Funding: Screen Australia and Screen NSW

The Gradual Demise of Phillipa Finch

Writer/director/character design: Emma Magenta
Interactive game design and build: The Project Factory
Website and digital strategy: Based on Birds
Producer: Rachel Okine
Broadcaster and distributor: ABC
Funding: ABC, Screen Australia, Screen NSW and Hidden Agenda

The Sapphires Soul Sync

App: Digital Arts Network Sydney
Film production: Goalpost Pictures
Funding: Screen Australia and Screen NSW

Storm Surfers 3D

6ixty Foot Productions in association with Firelight Productions
Funding: Screen Australia

References and Notes

1. YouTube states that "... 100 hours of video are uploaded... every minute" and over six billion YouTube videos are viewed per month. More than 25 percent of views are via mobile devices. YouTube (2013), <<http://www.youtube.com/yt/press/statistics.html>>, accessed 5 July 2013.

2. National Film and Sound Archive of Australia, *Annual Report 2011-12* (2012), <http://www.nfsa.gov.au/site_media/uploads/file/2011/02/NFSA_Annual_report_2012_webversion.pdf>, p. 29, accessed 18 July 2013.

3. As of 2013, while there is no legal deposit legislation for audiovisual material or for electronic publications at the federal level, several states in Australia have legal deposit for electronic publications and some for audiovisual materials or recordings. Legal deposit legislation at the state level differs from state to state. To summarise: Queensland, the Northern Territory, South Australia, Tasmania and Western Australia have legal deposit for audiovisual recordings. Queensland, the Northern Territory, Tasmania, Western Australia also have legal deposit for electronic publications. National Library of Australia, *Legal Deposit requirements Australia wide* (2012), <<http://www.nla.gov.au/legal-deposit/requirements-australia-wide>>, accessed 7 July 2013.

4. The NFSA's approach to selective archiving is such that "... the collection of Australian works will be comprehensive in those fundamental areas that are a formal record of Australian audiovisual production, such as annual feature films, government-funded television drama, and commercial recording releases. The collection will selectively represent the more expansive fields of television and radio broadcast as well as online media." National Film and Sound Archive of Australia, "Acquisition Policy" in *Collection Policy* (2011), <http://www.nfsa.gov.au/site_media/uploads/file/2011/06/20/NFSA_Collection_Policy_May_2011_Webready.pdf>, p. 9, accessed 6 July 2013.

5. As of 2013, the collection comprises over two million works.

6. National Film and Sound Archive of Australia, *Collection Policy* (2011), <http://www.nfsa.gov.au/site_media/uploads/file/2011/06/20/NFSA_Collection_Policy_May_2011_Webready.pdf>, accessed 6 July 2013.

7. The NFSA's significance assessment includes: aesthetic, technical/scientific/research, cultural/social/spiritual, historical, provenance, completeness/condition/intactness, representativeness, rarity and interpretive potential. National Film and Sound Archive of Australia, "Appendix C: Statement of Significance" in *Collection Policy* (2011), <http://www.nfsa.gov.au/site_media/uploads/file/2011/06/20/NFSA_Collection_Policy_May_2011_Webready.pdf>, p. 53, accessed 6 July 2013.

8. National Film and Sound Archive of Australia, *Information for Delivery Materials of Funded Productions* (2011), <http://www.nfsa.gov.au/site_media/uploads/file/2011/08/04/NFSA_Deliverables_Listing_for_NFSA_website_Aug_2011.pdf>, accessed 6 July 2013.

9. This includes film, television, documentary and some multi-platform productions.

10. Screen NSW and Film Victoria have implemented the Deed with other states expected to follow.

11. Linear Tape-Open.

12. For preservation purposes, the NFSA acquires earlier production elements such as the Digital Source Master (DSM), Digital Intermediate (DI) or Digital Cinema Distribution Master (DCDM). A DCP is not a preferred preservation format.

13. P. Ferreira, *MXF – A Technical Overview* (EBU Technical Review, 2010), <http://tech.ebu.ch/docs/techreview/trev_2010-Q3_MXF-2.pdf>, accessed 19 July 2013. The outline of Material eXchange Format (MXF) sustainability and use in archives can be found in the Library of Congress, *Sustainability of Digital Formats* (2013), <<http://www.digitalpreservation.gov/formats/fdd/fdd000013.shtml>>, accessed 8 July 2013.

14. Library of Congress, *XML (Extensible Markup Language)* (2009), <<http://www.digitalpreservation.gov/formats/fdd/fdd000075.shtml>>, accessed 8 July 2013.

15. File Transfer Protocol.

16. National Film and Sound Archive of Australia, *Networked Media* (2013), <<http://www.nfsa.gov.au/collection/networked-media/>>, accessed 6 July 2013.

17. Lynette Wallworth, *Coral: Rekindling Venus* (2012), <<http://coralrekindlingvenus.com/>>, accessed 6 July 2013.

18. Preserving and Accessing Networked Documentary Resources of Australia (PANDORA) <<http://pandora.nla.gov.au/>>, accessed 6 July 2013.

19. As part of the *National Digital Information Infrastructure and Preservation Program* (NDIIPP), The Library of Congress (LOC) has outlined several important factors in the sustainability of digital formats. These include: adoption, transparency, self-documentation, external dependencies, the impact of patents and Technological Protection Mechanisms (TPMs). Library of Congress, *Sustainability of Digital Formats* (2013), <<http://www.digitalpreservation.gov/formats/sustainability/sustain.shtml>>, accessed 5 July 2013.

20. In particular, the NFSA has been examining: the *DOCAM Documentation Model* <<http://www.docam.ca/en/documentation-model.html>>; the *Media Arts Notation System* (MANS) <<http://www.bampfa.berkeley.edu/about/formalnotation.pdf>>; the *Variable Media Questionnaire* <<http://variablemediaquestionnaire.net/>>; and,

FRBRoo (Functional Requirements for Bibliographic Records - object oriented) <http://www.cidoc-crm.org/frbr_inro.html>, which is a joint model developed by harmonising the *CIDOC Conceptual Reference Model* (CRM) <<http://www.cidoc-crm.org/>> and the *Functional Requirements for Bibliographic Records* (FRBR) <<http://www.ifla.org/publications/functional-requirements-for-bibliographic-records>>.

21. *A Handbook for Film Archives*, E. Bowser and J. Kuiper, eds. (Brussels: International Federation of Film Archives, 1991), p. 28.

22. For our purposes, the NFSA considers an item to be a single unit that may be a part of a component of a larger work: a discrete artefact that contributes to the reproduction of a work. It should be noted that relationship between "item" and "component" is the opposite to that of the *DOCAM Documentation Model* [17].

23. Pulse-code modulation.

24. Digital Video Broadcasting.

25. Broadcast Wave Format.

26. Library of Congress, *PNG, Portable Network Graphics* (2012), <<http://www.digitalpreservation.gov/formats/fdd/fdd000153.shtml>>, accessed 8 July 2013.

27. Library of Congress, *Tagged Image File Format. TIFF, Revision 6.0* (2013) <<http://www.digitalpreservation.gov/formats/fdd/fdd000022.shtml>>, accessed 8 July 2013.

28. Library of Congress, *Audio Video Interleaved. AVI* (2013), <<http://www.digitalpreservation.gov/formats/fdd/fdd000059.shtml>>, accessed 8 July 2013.

29. Level B is essentially, a final edited master, the most complete version of a work, ideally on a sustainable, high-quality format. For 35mm film, a spliced negative would be retained and preserved as an interpositive. Nowadays, RAW files are graded, using 3D lookup tables (LUTs), then edited into Digital Intermediates (DIs), before compositing with audio and other elements into a Digital Cinema Distribution Master (DCDM). In analogue audio, multitrack studio sessions were mixed-down into 1/4" or 1/2" master tape, whereas current practice is based upon 24 bit, 96kHz PCM audio (and higher resolution) recordings, captured on portable recorders or studio workstations, and finished in Broadcast Wave Format (BWF). Uncompressed video tape formats such as D-1, D-2, D-3 and D-5 are now relegated to Level A, due to sustainability issues.

30. Level D content is considered domestic and lower quality, such as cassette tapes, mp3 audio files, MPEG-4 video and DVDs.

31. Level C includes common, commercial formats that often represent a compromise between cost, size and quality. Earlier examples include 16mm film, U-matic video, succeeded by lossy compressed video, including Digital Betacam, DVC-Pro, MPEG-2 IMX and HD-Cam. Audio Compact Discs are included in Level C, as they are second-tier, lower bit rate and uncompressed, even though they are also a domestic format; they were used in sound effects and music libraries.

32. Level A includes camera film, RAW files, location recordings on tape or disc and P2 cards, used for acquisition and capture of audio, images and data; as well as authentic, original artefacts such as sets, props and costumes. Level A also includes project files, 3D lookup tables (LUTs), computer generated imagery (CGI), vector graphics, texture maps, music and effects, edit decision lists (EDLs) and fader automation used in authoring, production, and archives.

33. Level E encompasses the elements or component parts which are assembled to reconstitute an instantiation of a work: the audio, video, images and data essence are embodied in reels of film, tape

or files that contain stems, music and effects, voice-overs, still and moving image sequences, composited in the correct order and structure, as determined by a structural map.

34. Gary P Hayes, *How to Write a Transmedia Production Bible: A template for multi-platform producers* (Screen Australia, 2011), <http://www.screenaustralia.gov.au/about_us/pub_transmedia_bible.aspx>, accessed 11 October 2013.

35. Electronic Arts Intermix, *EAI Online Resource Guide for Exhibiting, Collecting and Preserving Media Art* (2013), <<http://www.eai.org/resourceguide/>>, accessed 6 July 2013.

36. Alistair Miles created this term during the *ImageStore* project where he intended it to mean that curation of digital data and other activities is almost imperceptibly embedded into the content creation phases. Wikipedia (2013), <http://en.wikipedia.org/wiki/Digital_curation#Sheer_curation>, accessed 9 July 2013.

37. National Film and Sound Archive of Australia [8].

38. Additional materials will be collected where they are available, and negotiation between creators and NFSA archivists or curators will determine other documentation or technical information that needs to be created to support the archiving of a work.

39. A linear walkthrough of an interactive environment, captured as a digital audiovisual recording of the output of a computer screen. Also known as a screencast.

40. A still image capture of the content displayed on a computer screen. Also known as screenshot, screen grab or screen dump.

41. Hayes [34] p. 10.

42. Hayes [34] p. 11.

43. These may include written or oral history audio or audiovisual recordings with artists, creators, collaborators, producers or other individuals involved with the creation, development or presentation of a work, describing the ideas, intent and other important details of the work. Also known as an Artist Interview or Artist Intent.

44. Interviews with audience members describing their experience of an artwork, particularly an interactive work. Lizzie Muller, *Towards an Oral History of New Media Art* (2008), <<http://www.fondation-langlois.org/html/e/page.php?NumPage=2096>>, accessed 7 July 2013.

45. Provide a detailed list of all credits, including all companies and individuals involved in the creation of the multi-platform work, funding agencies and sponsors. Include contact information for all relevant parties.

46. Provide complete rights information including details on Intellectual Property (IP), licencing information and any underlying third-party rights. Include contact information for all relevant parties.

47. Information about the structure of a complex work. This may come in the form of a directory listing or directory dump in XML. Alternatively, the *Media Arts Notation System* (MANS) could be used. Richard Rinehart, *A Formal Notation for Scoring Works of Digital and Variable Media Art* (2004), <<http://www.bampfa.berkeley.edu/about/formalnotation.pdf>>, accessed 5 July 2013.

48. The structural map forms the major component of a METS document, outlining a hierarchical structure for a digital library object. METS: An Overview and Tutorial: Metadata Encoding and Transmission Standard (METS) Official Web Site (2011), <<http://www.loc.gov/standards/mets/METSOverview.v2.html>>, accessed 6 July 2013.

49. This should illustrate the relationships between different components of the system for a complex digital (or hybrid) object, in order to be able to represent the work in the future. Include all schematic diagrams.

50. For linear production workflows, a diagram displaying the order of creation of the various items will enable an archive to ascertain as part of the acquisition process which items were generated or derived from specific master files.

51. Include the “service build overview” describing of each of the “channels” of a multi-platform work as well as the “user journey” between these channels. Hayes [34] pp. 7-8.

52. The framework around the work such as the specific hardware, operating system(s), peripherals (including dongles, sensors, custom-constructed hardware), details of dependencies (including access passwords, external systems – external databases, local databases, Application Programming Interfaces (APIs), server software etc.) and details of the overall system architecture, all of which is necessary in order for the work to operate so that it is possible for it to be re-presented in the future. Ensure that all version information is included. This may also be known as system requirements.

53. Specifications about the work, such as details of version of the work, limitations, list of all parts or components including the function of each. Include details of the “service build infrastructure”. Ensure that all version information for the various components of the work and other services are included.

54. Information providing details about the interaction behaviours, this could appear as a diagram as an annotated storyboard, in text or XML, or as a form of notation.

55. Often interactive art installations and sometimes, complex digital objects (such as interactive works) have instructions or guides. These are typically created in order to assist gallery invigilators in managing the exhibition of a work, for example starting, shutting down or restarting if an issue is encountered.

56. Hayes [34] p. 12.

57. Including, but not limited to, administrative, descriptive, rights, structural, technical, financial, provenance and relationship metadata. (If metadata is unable to be embedded in file headers or as a file wrapper, a spread sheet detailing the metadata should be provided.) Somaya Langley, *Archives in the Digital Era, Scoping Study Report* (Australia Council for the Arts, 2012), <<http://www.australiacouncil.gov.au/digitalarchives>>, p. 133, accessed 5 July 2013.

58. Checksums, cryptographic hash functions (hashes) and cyclic redundancy checks (CRCs), which in the international digital preservation community are sometimes referred to as fixity, are unique alphanumeric or numeric codes generated from algorithms that are used to ensure data integrity. Common checksums in use by the international digital preservation community include MD5, SHA1 or SHA256. Checksums are more easily generated for smaller files. Tools for creating checksums do not handle large files well (for example, files over 4GB in size).

59. National Film and Sound Archive of Australia [8].

60. *A Cautionary Tail* (2012), <<http://www.acautionarytail.com/>>, accessed 6 July 2013.

61. The animation, which received initial funding for the production from Screen NSW, was also substantially crowdfunded (via Kickstarter).

62. *The Gradual Demise of Phillipa Finch* (2011), <<http://www.abc.net.au/tv/phillipafinch/>>, accessed 6 July 2013.

63. The NFSA typically doesn't collect materials produced by government (such as audiovisual content created by Australian national broadcasters: the ABC <<http://www.abc.net.au/>> and SBS <<http://www.sbs.com.au/>>). As the ABC was the broadcaster and distributor (and partially funded the production), the 17 animations were not acquired by the NFSA. These should typically be archived in the ABC Archives and the National Archives of Australia. As the various components of multi-platform works tends to fall into the collecting responsibilities of several cultural agencies, this often creates collecting responsibility “grey areas”.

64. *The Sapphires Soul Sync app* (2012), <<http://work.wtbwa.com.au/gpp/sapphires/>>, accessed 6 July 2013.

65. *Storm Surfers 3D* (2012), <<http://www.stormsurfers.com.au/>>, accessed 6 July 2013.

66. The NFSA did not receive the eBook, mobile game app or the soundtrack.

67. The left and right TIFF sequences were included as part of the submission.