ECONOMIC BENEFITS FROM CULTURAL ASSETS

The Digitisation Programs and Standards
of Collecting Institutions
and the Scope for Collaboration
with the Creative Industries

Final Report
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content strategies

Executive Summary

Collecting institutions are the guardians of rich repositories of Australian cultural history, and increasingly also of its cultural present. They are well aware of the benefits of digitisation of their holdings, and are doing what they can to make much more of their collections much more readily accessible. They are constrained by many impediments, not the least of which is the absence of designated sources of funding to support conversion into digital form as well as the cataloguing and management of the digital collections. This is in contrast with other nations in Australia's reference group. Some of those countries are already reaping the economic benefits of their investment in reaching a critical mass of digital resources.

A number of collecting institutions have made great inroads into the creation of digital images of their collections. Yet others have not even been able to marshal the resources to finish computerising their catalogues. And many are only now gaining momentum in relation to the digitisation of the most important objects in their collections. Only the most specialised and sophisticated institutions have made any headway in relation to the more complex and challenging forms of digitisation, that is to say of musical scores, musical sound, human speech, animation and video.

Considerable challenges confront the exploitation of digitised versions of cultural objects by business enterprises in the creative industries. The right kinds of objects need to be available. They need to be managed and stored on IT systems very different from traditional Collection or Library Management systems. They need to be readily discoverable by the creative people who want them. The copyright owners also need to be readily discoverable, and negotiations need to be able to be conducted quickly and efficiently. Collecting institutions need to be able to supply the high quality formats and resolutions that the creative industry wants to work with. To achieve all this, collecting institutions and creative companies need to appreciate one another, and build long-term relationships.

At present, however, a gulf exists between them, and there are few signs of the gulf being bridged. The cultural sector has a primary responsibility to preserve cultural objects, and to prevent them from being ravaged by natural disasters, warfare and civil disturbance. It has a second important responsibility: to provide access. But for very good reasons, the focus has been, and continues to be, on general, public access not commercial re-use.

Major corporations, although prepared to sponsor specific events, show little interest in long-term relationships with collecting institutions. In any case, the creative industries are characterised by dynamic, adaptive and above all small companies. Their life-cycle is short, and so is their span of attention. They build relationships quickly, and discard them just as fast. They are unlikely long-term partners with necessarily staid institutions that are required to devote most of their resources to long-term and troublesome assets from the past that the busy present calls 'legacy'.

The building of clusters will be feasible, and collecting institutions will become capable of being important participants in them. But considerable groundwork is necessary first, to enable institutions to accelerate their digitisation programs, and to lay the foundations for common understanding among the future partners in creative industry clusters.

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1. Introduction

1.1 The Creative Industries Cluster Study

This Report arises from a consultancy assignment undertaken on behalf of the Film and Digital Content Branch of the Commonwealth Department of Communications, Information Technology and the Arts (DCITA). It is part of Phase 3 of the Creative Industries Cluster Study, which was commenced in August 2001, and is now in its third and final phase.

The overall purpose of the Creative Industries Cluster Study is to examine digital content and applications within the creative industries, and encourage industrial growth and expansion. This is envisaged as involving the development of comprehensive policies, the refining of policy-settings, coordination activities, and perhaps intervention strategies.

The Phase 1 Report, of May 2002, noted the relatively small scale of digital content and associated applications development activity in Australia, the fragmentation of the industry, and the embryonic and patchy state of cluster development. It concluded that companies here risked being marginalised on the world stage. It called for an economic development agenda additional to the existing cultural agenda.

The Phase 2 Report, 'Producing Digital Content' dated September 2002, sought a detailed understanding of current production and commercial arrangements. It resulted from a study of four industry segments, and identified features of individual firms and of industry value chains. In the games segment, collaboration was significant laterally, as a result of the strong focus on export. In the interactive multimedia area, there was considerable lateral collaboration, but in the context of a more mature segment that was currently focusing on consolidation.

The importance was noted of the interface between "traded and non-traded content production, that is between cultural and creative industries" (p. 74), but little evidence was found of much traffic at that interface.

Admittedly that sentence was in an intentionally compressed form; but it appeared to associate the cultural sector solely with non-traded content. It also seemed to contrast 'culture' and 'creativity', associating culture with handouts, and creativity with profit-motivation. That may not be the most constructive starting-point for an effort to achieve a dialogue between the world of cultural content repositories on the one hand, and that of economic value-adding chains on the other. The very last sentence of the Report did, however, refer to not-for-profit organisations providing "inclusive and stimulative meeting-places" (p. 75).

On the basis of the outcomes from the first two Phases of the Study, the need was detected for further information to be gathered in several areas. One of these was the cultural sector, from which the creative industries are expected to draw, and with which enterprises in the creative industries are expected to cluster. That is the subject of the project reported on in this document.

1.2 This Project

To date the Study has focused primarily on the creative industries themselves. Organisations in those sectors (which are primarily for-profit enterprises) draw ideas and materials from a variety of places. One of these is the nation's cultural sector. There is an enormous amount of material stored in collecting institutions of various kinds. Much of this is not yet available in digital form. But some holdings have been digitised already, digitisation programs are in train in many cultural organisations, and an increasing proportion of the new materials being collected by them originated as digital works.

This project accordingly focused on what are referred to in this document as "collecting institutions" within the cultural sector.

More specifically, the purpose of the Project was to undertake an assessment of the current role played by collecting institutions:

- in the creation and availability of high-quality Australian digital content;
- in building creative digital content markets; and
- as potential nuclei for cluster development.

The primary requirements of the project related to the creation, accessibility and marketing of digital content by collecting institutions, including collaboration among collecting institutions, and especially collaboration of collecting institutions with downstream enterprises. The use of standards was perceived to be critical to the transmission of digital materials forward from the institutions to the enterprises. From the economic development perspective, considerable emphasis was placed on the concept of 'clustering'.

The primary elements of the assignment were as follows:

- consultation with relevant stakeholders;
- documentation of the digitisation policies, programs and priorities of a selection of major State, national and regional collecting institutions with material of national significance, including:
  - standards, technologies and procedures used;
  - impediments, and means of addressing them;
- documentation of metadata usage, directions and interoperability;
- identification and analysis of instances of collaboration, and impediments to collaboration; and
- recommendations on approaches to collaboration.

Two secondary requirements were defined:

- evaluation of the capacity of existing touring programs to support digital online exhibitions; and
- an assessment of the effectiveness of the collaboration activities conducted in relation to the Le@rning Federation tenders.

2. Background

This section discusses the context within which the project was conducted.

2.1 Collecting Institutions

A first requirement was to define the organisations that were within the scope loosely expressed as “collecting institutions within the cultural sector”. Several lists were consulted, including that at http://amol.org.au/guide/museum_types.asp, and discussions were held with DCITA and collecting practitioners. The following set of categories was used:

- museums;
- art galleries;
- libraries;
- archives;
- herbaria;
- zoos and aquaria;
- other historical and cultural institutions.

2.2 The Diversity of Holdings

There are many different kinds of objects that are held by collecting institutions. Discussions were held with collections practitioners, and factors relevant to the project were identified, resulting in the following list of categories and characteristics:

- physical objects, including:
  - natural objects;
  - artefacts;
- objects that carry content, including:
  - media designed to be read by humans;
  - media designed to be read by machines;
- relatively robust objects;
- objects that are fragile or subject to relatively rapid decay;
- objects that can be treated for at least some purposes as being two-dimensional;
- objects that need to be treated as being three-dimensional.

2.3 Digitisation

Digitisation refers to the expression of an object in a form that uses discrete characters, in particular a set of digits. The digits can be in principle on any numbering base, including the decimal system (e.g. a code-number using only the decimal digits 0 to 9 inclusive is digital). Its primary use in the current context, however, involves the use of binary digits or bits as the basis for the expression. It has become commonplace to use the terms 'digital versus analogue' to mean the same as 'bits versus atoms'.

There are various ways in which bits can be interpreted. For example, each pixel in a black-and-white photographic image can be represented by a single bit, with a 0 meaning white and a 1 meaning black. More commonly, however, bits are grouped together, and rules of some kind are used to associate groups with characteristic of the object being represented. These rules are important elements of what are commonly referred to as media-formats.

There are many kinds of digital formats. They are generally known by acronyms (e.g. PDF stands for Portable Document Format). Terms relating to media formats are explained in Appendix D. The following classification scheme of digital formats was adopted as a working set for the purposes of the project:

- Text-Based Documents
  - Facsimile (e.g. a bit map, a TIFF)
  - Character (e.g. ASCII 7-bit and 8-bit, UCS – UniCode)
  - Structured (e.g. tagged XML book using the DocBook DTD)
  - Music Notation (e.g. Finale)
  - Presentation (e.g. Postscript, RTF, PDF)
- Sound
  - Voice (e.g. PCM/WAV/AIFF)
  - Music (e.g. PCM/WAV/AIFF, MPEG-4, MP3, MPEG-7)
- Image
  - Raster (e.g. gif, JPEG, TIFF, PNG)
  - Vector (e.g. CGM, SVG)
  - 3D (e.g. VRML, QTVR)
- Moving Image
  - Animation (e.g. Flash, Shockwave)
  - Moving Image / Video (e.g. MPEG-1, MPEG-2 (DVD), AVI, MPEG-4)

Some digital formats involve multiple media integrated more or less closely together. For example, video generally has a tightly-coupled audio track; and a musical score may be synchronised with sound reflecting that score.

Digital works can arise in several ways:

- an object may be created in digital form in the first instance, as is the case with documents captured using a word-processor or a digital camera;
- a digital object may be generated as an intermediate step in, or as a by-product of, the creation of a physical object, e.g. a component may be designed using a drafting tool like AutoCAD, and expressed in physical form using a device programmed to fabricate components based on the digital specification; and
- a physical object may be captured into digital form.

In the first two cases, digitisation occurs simply through the act of creation of the object. There may be additional processes involved, however, in converting the object from its original format into one or more that are suitable for storage and access.

In the third case, a capture process is required, to create a new digital object that represents the existing physical object. There is an infinite array of choices to be made when setting the parameters for that capture process. For example, a two-dimensional object may be captured square-on or at an angle to the surface; in colour, grey-scale or black-and-white; at varying resolutions; and under varying lighting conditions. A three-dimensional object may be captured from one perspective, or from several.

Because of the complexity of the exercise, additional processes may be involved to prepare the physical object for capture, to assure the quality of the digital object after it has been captured, and perhaps to post-process the digital object (e.g. to colour-correct it, or to generate additional digital formats for separate purposes).

Cataloguing processes are also necessary, in order to augment the existing metadata for the physical object, and to create metadata to reflect the new digital object. Where multiple digital objects are created from one physical object, a structured set of metadata may be necessary.

2.4 Standards

Very large numbers of standards are relevant to the undertakings reported on in this document. This sub-section commences by reviewing the concept of standards. A matrix is then presented, whose purpose is to provide a basis for structuring discussions about standards in the area.

2.4.1 The Concept of Standards

During the early years of software applications, for mainframe, mini-computers and then personal computers, each supplier developed their own way of doing things. As the software industry matured, it became apparent which techniques and formats were effective and were widely-used. Some of these came to be standardised, especially those that needed to be implemented in a consistent manner between different suppliers. As networking technologies linked computers together, it became more critical that computer applications communicate data between themselves in consistent formats.

Formal standards are specifications that have been endorsed by a body with some kind of authority or recognition. Standards bodies may be national associations with representatives from various stakeholder groups (such as Standards Australia), international associations with representatives from various countries (such as the International Standards Organisation), professional associations (such as the Institute of Electrical and Electronic Engineers – IEEE) or industry associations (such as the World Wide Web Consortium – W3C). Standards issued or endorsed by such organisations are referred to as de jure standards (but will be referred to in the remainder of this document as 'formal standards').

Some specifications are widely-used but not approved or endorsed by a standards body. These are commonly referred to as de facto standards. They may be published (as is the case with RTF, owned by Microsoft, and Postscript and PDF, owned by Adobe), in which case it is feasible for multiple suppliers to implement applications that handle them reliably. Alternatively, they may remain unpublished i.e. not publicly available (e.g. the many variations of Microsoft Word formats), in which case there is a great deal of difficulty in achieving reliable interchange between applications.

2.4.2 Standards and Digitisation

In the cultural sector, libraries have been using formal standards for centuries. Important examples include the Dewey and Library of Congress subject numbering systems, standard catalogue cards and more recently the MARC specification for sharable records. Museums have long been reliant on standard taxonomies for naming the kingdom, phylum, class, order, family, genus and species of living things.

In the creative industries, formal standards have been agreed and implemented within each market segment. In the digital content production industry, standards are a mixture of dominant applications, common practice and formal standards and de facto standards. But standard ways of sharing information between each of the categories of collecting institutions are only slowly maturing. Even more challenging is the sharing of information between the cultural sector and commercial content developers.

2.4.3 Categories of Standards

A list was formulated of the enormous array of formal (or de jure) and de facto standards that are relevant to this project. Its length demanded that some structure be imposed on it. No existing structured list was found that served the present need.

A matrix was therefore developed to enable meaningful presentation and analysis. The columns and rows of the matrix reflect categories that have proven useful in practice, and that have appeared in relevant frameworks.

On the horizontal axis the matrix is concerned with the subject-matter that the standard is applicable to:

Media Formats	Metadata Framework Elements	Metadata Controlled Vocabularies	Metadata Unique Identifiers	Processes	Protocols
How data is represented	How catalogue data is structured	Rules about the content of metadata in catalogues	How Items and parties are uniquely identified	How particular actions are to be performed	How data is to be communicated
Format Standards for digital objects of various characteristics, e.g. video or images for different types of usages such as presentation or preservation	Metadata "Standards" providing the structure, syntax and grammar for expressions	Metadata "Standards" providing the controlled vocabularies, such as dictionaries and element value thesauri	Unique identifiers providing the consistent linkages within and between physical and digital objects, parties, rights and transactions	Business, work or technical processes that may be implemented by humans or computers	Protocol Standards provide the syntax for the communication of data between computer systems

The vertical axis is concerned with the domain the standard is addressing:

Domain	Explanation
Works	Standards for content or material of various types including Presentation & Discovery formats or metadata, Production & Distribution, Preservation & Administration, Structure & Action, FRBR Lifecycle, Input-ingest
Parties	Definitions of identities or roles, including creators, rightsholders, agents, publishers and users. Parties may be individuals or groups and can be fully identified, anonymous or pseudonymous
Rights	Intellectual property rights including ownership and usage permissions, requirements, conditions and constraints
Transactions	Transactions including trading rights over works between parties and delivering works. Transactions result in change in the status of a work or rights to a work
Management	Reporting, accounting and business management information and policies. This becomes more complex as collecting institutions the degree of interaction with commercial content producers and content publishers increases

The complete standards matrix is shown below including a few examples of standards within each cell. A more complete, but by no means exhaustive, list of over 50 relevant standards is in Appendix D. It should be noted that this categorisation is based on the consultants best efforts and cannot be definitive. It is an aid to seeing the patterns in "what fits where" although this is made difficult as many standards fulfil functions described by multiple cells. For instance, MARC includes information about the parties by having a field for the Authors name. It also supports some very basic rights information, e.g. "author rights" and "publisher rights" are implied by naming the parties. To further complicate categorisation some standards included protocols as well as metadata controlled vocabularies.

Creative Industries Cluster Standards: Matrix of the Range of Standards applicable to Collecting Institutions and Content Developers

Domain	Sub-Domain	Media Formats	Metadata			Processes	Protocols
			Framework Elements	Controlled Vocabularies	Identification		
Works	Presentation & Discovery	Object Presentation eg PNG, PDF, XHTML, MP3, QuickTime	Object Description eg DCMI, TEI, MARC, FGDC, AGLS, IMS LOM, BBC SMEF	Object Description eg EDNA , MPEG 7	Unique Object Identifiers eg ISBN, URI, DOI	Object Personalisation/ protection process eg Watermark	Discovery and Search eg Z39.50, XML Query, SRW, UDDI
	Production & Distribution	Object Production eg EPSF, TIFF, D1 Video, XML, WAV, Pro_MPEG MXF	Object Description eg DCMI, TEI, MARC, FGDC, AGLS, IMS LOM, BBC SMEF	Object Description & Dictionary eg Getty AAT, LCSH, ProMPEG		Object Identification Process eg	Object Location Resolution eg DOI/Handle
	Preservation & Administration	Object Preservation eg SGML, XML, PDF, Digital Betacam	Administrative Content eg MARC, MODS, ISO 15489	Administrative Content Dictionary eg AGIFT, KAAA		Object Preservation Process eg Archive	Harvesting eg OAI,SOAP
	Structure & Action	Object Structure (MarkUp) eg TEI DTD, CALS, DocBook, SVG, OpenEBook	Object Structure eg METS, IMS CP, SMIL			Object Structure (MarkUp) Process eg EAD Guidelines	
	LifeCycle Integration		Information Model eg IFLA's FRBR			Media Asset Management Process	
	Input	Object Capture (Digitisation) eg TIFF, PDF, Unicode, JPEG2000				Object Capture Process (Digitisation) eg METS, SIP	
Parties			Party Metadata Framework eg vCARD, MARC	Party/Roles Dictionary eg LC Relators, ONIX	Unique Party Identifers	Party Identification Process	Unique Party query protocols eg LDAP
						Party Authentication Process	Party Authentication Protocol eg Liberty, SAML
						Party Authorisation Process	Party Authorisation Protocol eg Liberty
Rights		Encrypted Package eg SealedMedia	Object Usage Rights Offers eg ODRL, XrML	Rights Dictionaries eg ODRL, XrML, <indecs>	Unique rightsholding identifiers	Provenance Validation Process	Works/Rights/Parties Directory Query Protocol
			Object Usage Rights Agreements eg ODRL, XrML				
Transactions		Object Presentation Standards	Acquisition Agreement Metadata		Unique Agreement Identifiers	Object Acquisition Process (discover, preview, acquire) eg ONIX	Object Delivery Standards
		Object Packaging Standard eg IMS, METS DIP	Commercial Settlement Record			Rights Acquisition Process (Offer to agreement) eg BBC Guidelines	Commercial Settlement Protocols eg SOAP, WebServices
			Embedded/ Attached Unique Agreement Metadata eg COLIS IMS/ODRL Agreements			Transacted Object Personalisation, identification & protection process eg	
Management			Party/Works/License Reporting Framework eg ODRL/eBXML	Party/Works/License Reporting Dictionaries eg ?/eBXML		Return on Investment Analysis eg PHM 4 step process	

For all its limitations we suggest that this matrix could be useful to many parties both in collecting institutions and in the creative industries. Its potential uses include as a reference point, as a professional development tool, and as a means of coordination and communication. We accordingly suggest that it could be refined, published and maintained in an online form by a national body that is not of a specific domain, but which co-ordinates expert input from the relevant sectors.

In order to be of greatest value, it should be further developed. One additional layer would provide links to the specification, to tutorials, and to case studies. A further layer would display the standards in each cell that are relevant to each particular category of collecting institutions (i.e. a set for museums, a set for libraries, etc.). Cross-referencing could be provided showing which organisations have applied a standard in a particular context.

A comprehensive, up to date online standards matrix covering the whole of collection institutions sector including content production standards would enable more rapid take up and coherence in standards and practices.

2.5 Users of Materials

There are many ways in which users of digital materials can be distinguished; but one particular distinction is especially important:

- use for "passive" consumption. This is often the use to which members of the public ('consumers') put content, as do students. But a great deal of use by companies and government agencies is also of this kind; and
- use as a factor of production. This re-use is generally by value-adding organisations, such as business enterprises in the creative industries.

In the digital era, however, content is easily adapted by anyone. As a result, adaptation of content is not limited to business enterprises. More than ever before, "consumers" are re-cycling content, and using networks and digital media to re-publish the adapted works (often with little concern for the constraints imposed by copyright law).

2.6 The Emergent Marketplace

The previous reports prepared during the course of the Study have focused on the creative industries, including interactive games, interactive multimedia, advertising and digital content in education. The industry models in those reports did not provide an appropriate basis for the analysis to be undertaken in this project. It was necessary to develop a model that showed the relationships between the cultural sector and the creative industries, including intermediaries and support organisations, and also including the various categories of users of digital objects.

This sub-section builds up that model through a series of partial diagrams. The model primarily uses a left-to-right flow from collecting institutions via channels to consumers. Collecting Institutions have made efforts over the past five years to provide the general public with online access to their catalogues and to many of their exhibits that have been digitised. This material is commonly supplied in low-resolution 'presentation' formats and with copyright restrictions to personal passive usage only.

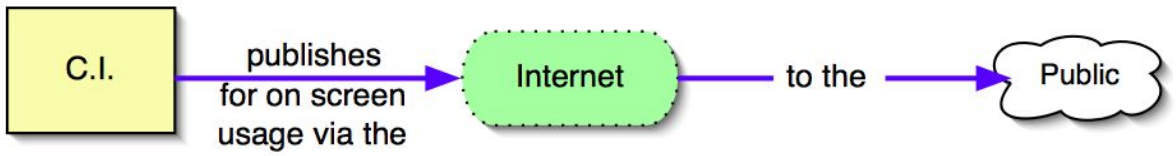

Figure 2.6.1

Many collecting institutions have also developed tailored presentations or course modules on specific topics, often at the request of the relevant State education system.

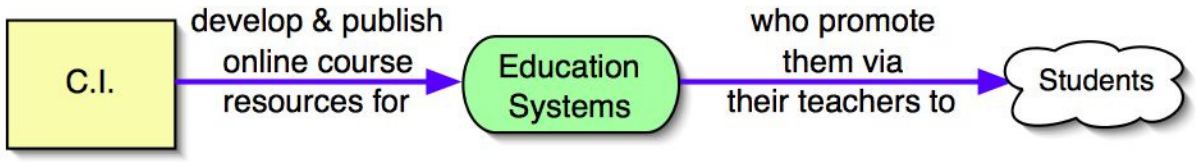

Figure 2.6.2

The next level of complexity to be added distinguishes the various categories of collecting institution. It also recognises that there are in many cases multiple collections within an institution, and that institutions may comprise multiple sub-organisations, e.g. the science, humanities and law libraries within a university. Many of the larger Libraries and Museums also have collaborative projects with others within their sector such as regional NSW Museums working with the Powerhouse Museum. As well there is collaboration across each sector e.g. between Libraries and ScreenSound as in the Music Australia project.

The loop-back line around the box representing Museums, Libraries etc. reflects the fact that the digitisation of an existing collection results in a new collection which has to be managed in conjunction with the current collection.

The diagram also shows additional delivery channels such as discrete media (CD ROMs) and TV Networks.

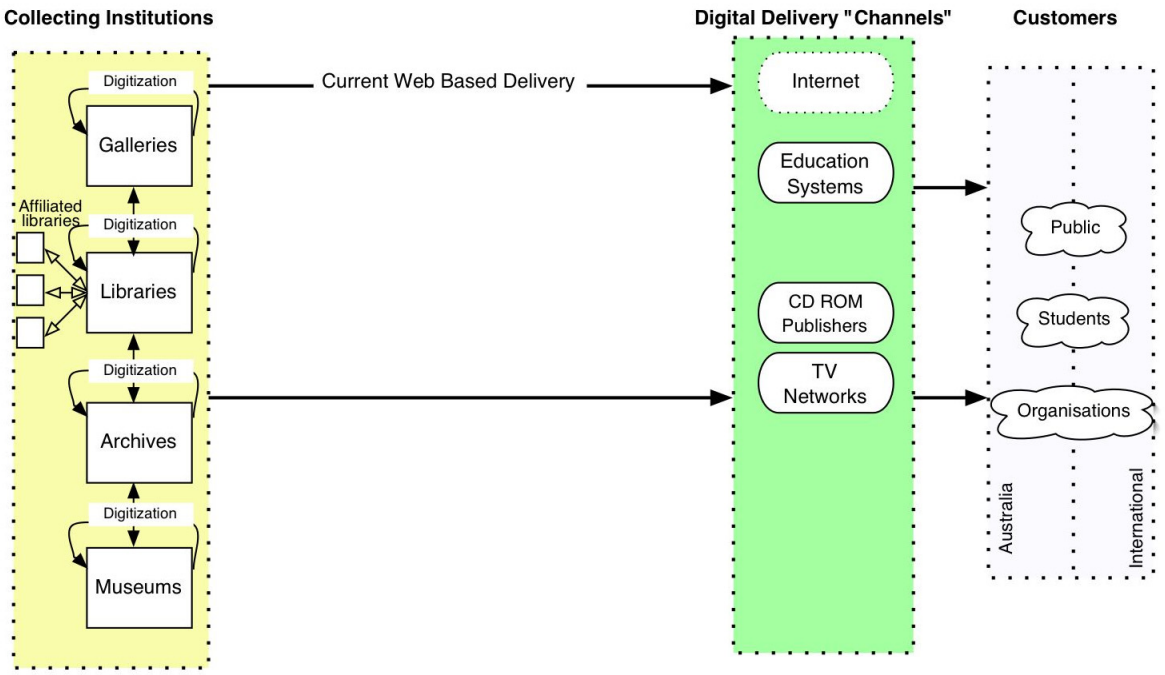

Figure 2.6.3

The elements of the diagram that were introduced above are concerned with use for consumption. The next segment reflects use of content as a factor of production. It involves intermediaries, and additional delivery channels. The diagram below models flows associated with a single, specialist collecting institution.

A number of collecting institutions, and ScreenSound in particular, supply digital resources from their collections, in high resolution production or distribution formats, to a variety of producers who incorporate it with their material into documentaries, TV or radio news programs and occasionally films and educational programs.

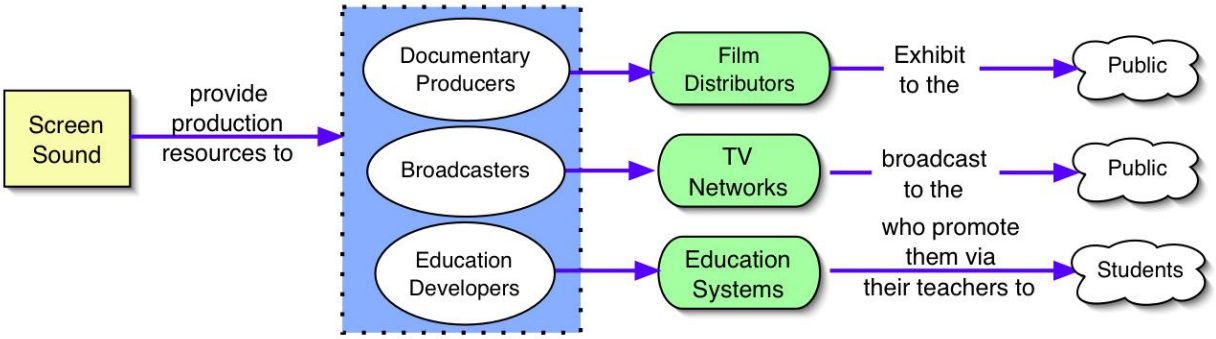

Figure 2.6.4

Collecting institutions can reach many more marketplaces with the content in their collections, by making them available to independent production organisations which in turn work with small and medium specialist suppliers. The channels to these current and emergent markets include Education systems, Book and Reference publishers, CD ROM & DVD publishers, TV and Radio networks, interactive TV and broadband network providers, games console software publishers and mobile networks.

The following version of the model provides a fuller representation of this internal structure of the digital content industry. It also combines the direct-to-consumer and the value-adding chains into a single diagram. The far right of the diagram also indicates that the eventual marketplaces for C.I. material are both within Australia and overseas.

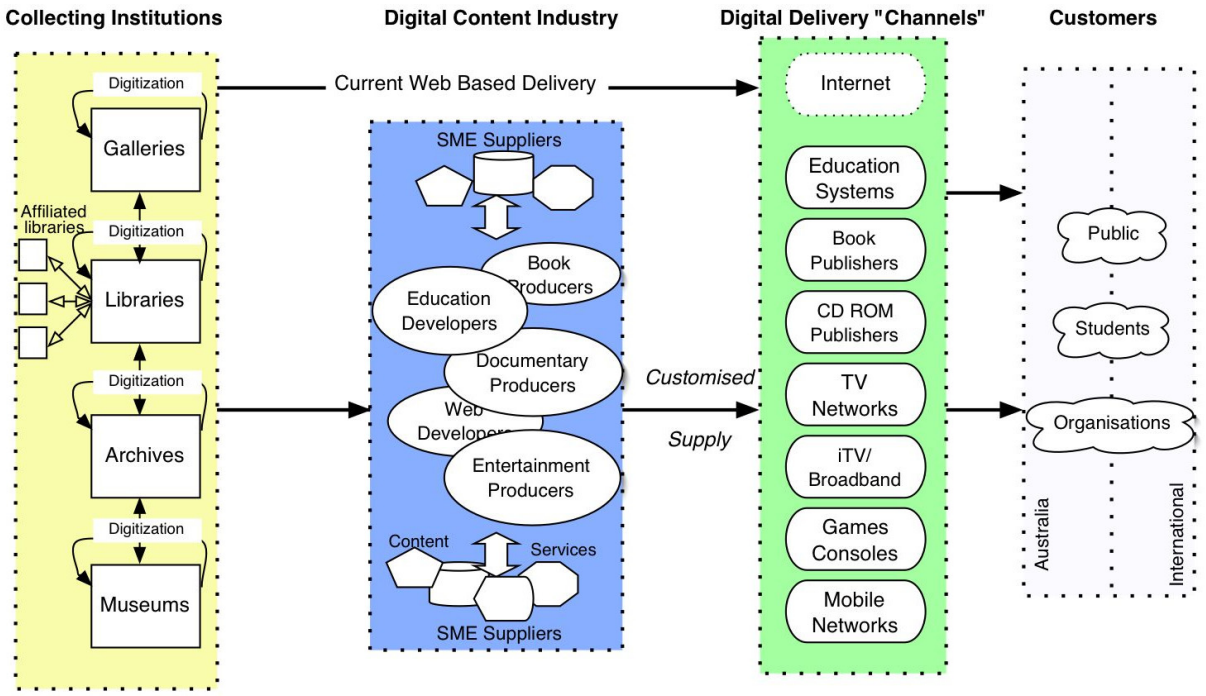

Figure 2.6.5

Value-added re-use of content is dependent on the commissioning of a project to consolidate and enhance existing materials and make them applicable and attractive to a specific market segment. The project commissioner can be the channel publisher or a distribution outlet. It is also possible for a collecting institution to be a Commissioner if funding allows, but it is more likely that a commissioner would be able to assess market demand and have access to channels to the market. Commissioning a production without having publishing and distribution resources in place is often problematic. A Commissioner will most often also be the publisher and the rights-owner.

The Learning Federation (TLF) is an excellent example of a Commissioner, having being charged to define, source and deliver content to the school systems in every State. To achieve this they developed a deep understanding of the market as well as current and future technical requirements. The TLF initiative is discussed later in this document.

The following diagram shows the role of the Commissioner in the industry model.

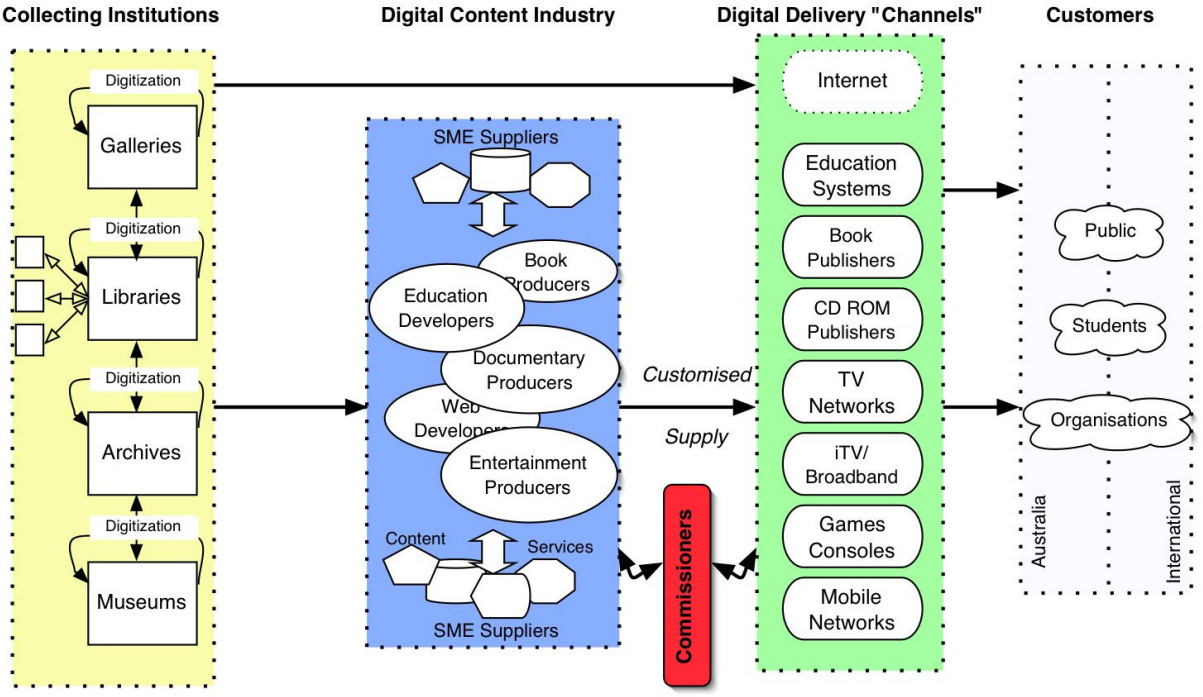

Figure 2.6.6

The next version adds in a line looping back from the Digital Content Industry to Collecting Institutions. New works are created based on aggregations and transformations of existing work and other new contributions. This new work exists in its own right and therefore should be included in the holdings of the appropriate Collecting Institution.

There are two methods for this:

1/ Acquisition by collecting institutions of “born digital” works that they identify, seek out and acquire for their collections.

2/ Reliance on digital copies of works that have been submitted by producers or publishers under Compulsory Deposit schemes.

Although it was not within the scope of this assignment, it was observed that there is some concern regarding the limited scope of the current physical Compulsory Deposit arrangements given so much material is now in digital formats and not necessarily subject to them. As well some physical material is not covered. For instance ScreenSound does not currently have a Compulsory Deposit role in respect of audio and video productions, and yet is relied on to be the primary archive of the nation’s film productions. “Digital Deposit” of audio and video productions including advertisements would be helpful.

A further flow loops back from Customers to Collecting Institutions. This shows where adaptation of works has been undertaken by consumers (with or without authority) and then re-collected by institutions. This has always occurred (as graffiti and satirical cartoons, for example), but is increasingly prevalent in the digital era.

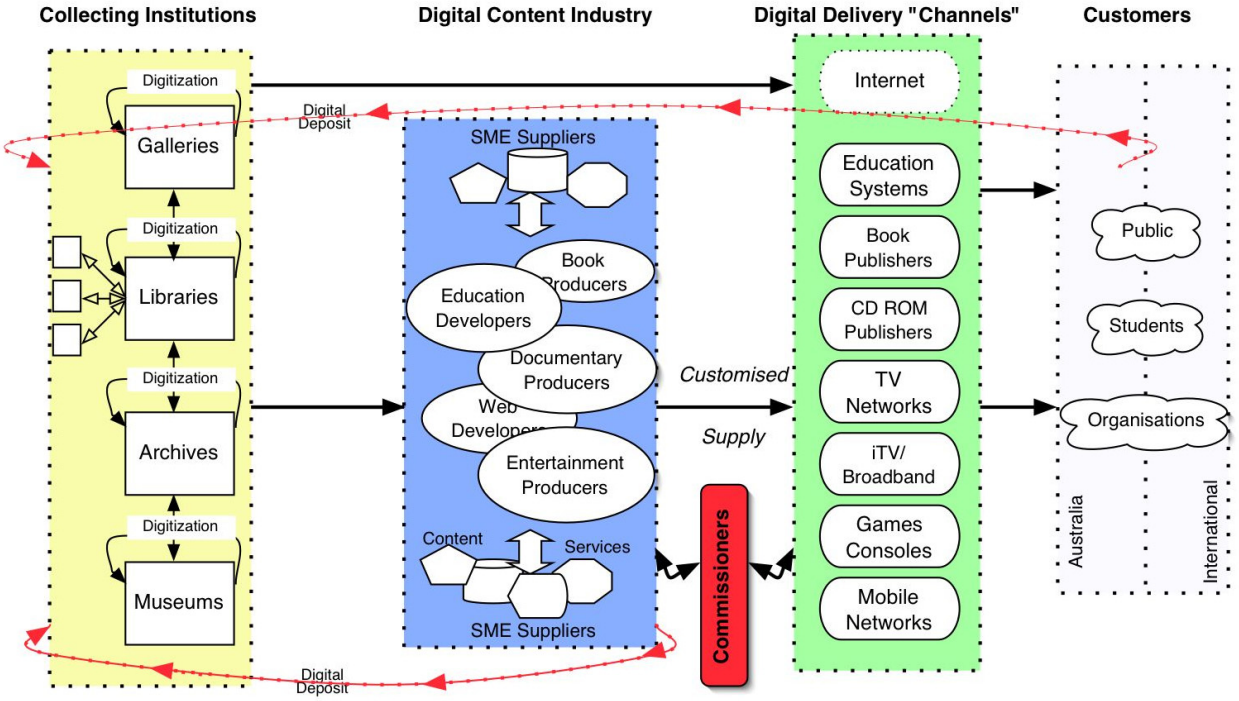

Figure 2.6.7

The fully articulated model adds into the diagram some observations on the kind of standards used within the various segments of the marketplace.

1/ the Collecting Institutions have their own sector specific standards which have developed over many years of practice and are now being extended for the online environment.

2/ Digital Content Industry producers on the other hand are agnostic. They are driven by reducing costs, satisfying their immediate and potential customers and generating revenue. They will apply metadata, format, process and protocol standards if these help achieve these objective. They need to be able to discover the appropriate content, preview it, acquire it in the appropriate production format and acquire the appropriate rights. They will use whatever tools and services are available today to efficiently achieve this.

3/ Producers in turn provide the produced content in the specific formats, with appropriate (if any) channel metadata and utilising communication methods and protocols that are specified by the Commissioner to suit the appropriate content delivery channel.

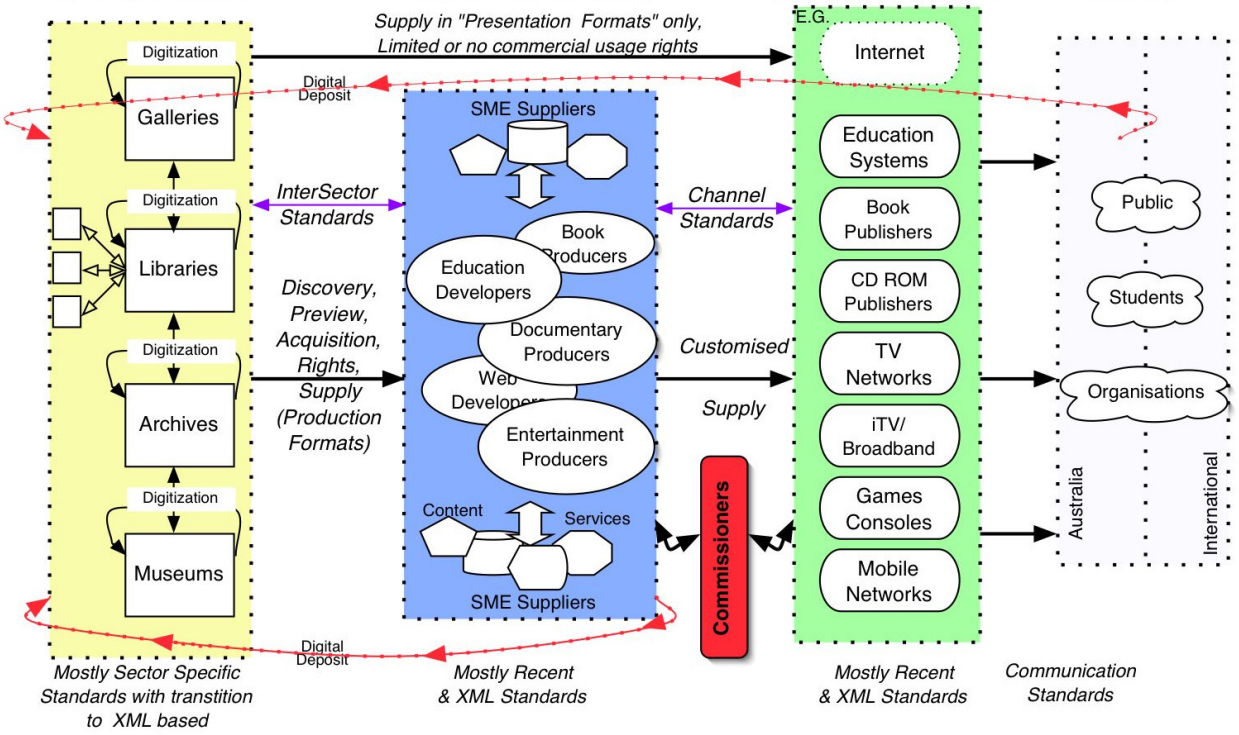
Supply in "Presentation Formats" only,
Limited or no commercial usage rights
E.G.
Internet
Digitization
Galleries
Digitization
Libraries
Digitization
Archives
Digitization
Museums
Digital Deposit
InterSector Standards
Discovery, Preview, Acquisition, Rights, Supply (Production Formats)
SME Suppliers
Book Producers
Education Developers
Documentary Producers
Web Developers
Entertainment Producers
Content
Services
SME Suppliers
Channel Standards
Customised
Supply
Commissioners
Education Systems
Book Publishers
CD ROM Publishers
TV Networks
iTV/ Broadband
Games Consoles
Mobile Networks
Public
Students
Organisations
Australia
International
Digital Deposit
Mostly Sector Specific Standards with transtition to XML based
Mostly Recent & XML Standards
Mostly Recent & XML Standards
Communication Standards

Figure 2.6.8

3. The Conduct of the Project

This section describes key aspects of the manner in which the project was conducted.

The Project Team comprised Roger Clarke of Xamax Consultancy Pty Ltd. and Peter L. Higgs of Content Strategies, supervised by Christabel Wright and Stephen Cassidy of DCITA's Film and Digital Content Branch.

The project commenced with a Launch Workshop. This involved all members of both the Xamax/ Content Strategies and DCITA teams, together with invitees Adrian Cunningham (from National Archives of Australia) and Debbie Campbell (of the National Library of Australia). They were (correctly) judged to be able to provide a broader perspective and valuable contributions to the initial meeting. Objectives and constraints were clarified, and key terms discussed. The names of relevant collecting institutions were canvassed. The task schedule was then agreed, and a Background Paper prepared, for provision to interviewees. This is attached at Appendix C.

Because of time and resource constraints, it was essential that an effective but efficient strategy be adopted for the selection of the organisations to be approached for interview. This is discussed in further detail in the following sub-sections.

3.1 The Population of Collecting Institutions

The first steps taken were to identify the various categories of collecting institution, and search out census information on each category. The conventional classification scheme provided by Australian Museums and Galleries Online (AMOL) and referred to in section 2.1 above, was regarded as being comprehensive. However it was noteworthy that some institutions, including some very significant ones, did not sit comfortably under a single heading.

Within the Museums and Art Galleries segments, the natural source of census information was once again AMOL, at
http://www.amol.org.au/guide/museum_types.asp.

This lists about 1,150 institutions. It is very strong on museums and art galleries, but light on libraries, archives and herbaria. It also offers what it refers to as "Major collecting institutions in Australia", at http://amol.org.au/craft/aus_mus/major_inst_index.asp.

A list of Libraries is available from the Australian Libraries Gateway. At http://www.nla.gov.au/apps/libraries?action=MapSearch

This identifies 5,398 Australian libraries. It is complemented by other sources such as ALIA's lists of State Libraries, at http://www.alia.org.au/links/libraries.html, and of University Libraries, at http://www.alia.org.au/links/uni.libraries.html. See also the Council of Australian State Libraries, at http://www.casl.org.au/member.libraries.cfm.

A list of about 30 Archives is provided by the National Archives of Australia, at http://www.archivenet.gov.au/archives.html.

For Herbaria, Australian's Virtual Herbarium (AVH) identifies 8 participating nodes, at: http://www.chah.gov.au/avh/ and a 1999 publication on the site lists about 30 herbaria and botanical gardens, at http://www.chah.gov.au/resources/index.html. A fuller list of about 150 botanic gardens and arboreta is at http://www.anbg.gov.au/chabg/bg-dir/. Meanwhile, ERIN catalogues Commonwealth National Parks, Reserves and Botanic Gardens, at http://www.erin.gov.au/parks/commonwealth/index.html.

A list of about 50 Zoos and Aquaria is provided on the Australasian Regional Association of Zoological Parks and Aquaria site at: http://www.arazpa.org.au/Membership_MemberList.htm.

3.2 The Sample of Collecting Institutions

The Project Brief required that information be acquired from "6-8 key major State, national and regional collecting organisations with material of national significance, with at least one major regional collecting institution. It is anticipated interviews will need to be conducted in Sydney, Melbourne, Canberra and a relevant regional centre".

Following analysis and discussion, it was determined that the sample should provide as much diversity as feasible across the following dimensions:

- category of institution, including at least two museums and two galleries, at least one institution that integrates several conventional categories, and at least one that represents a collaboration among two or more institutions;
- nature of holdings, including some institutions primarily concerned with physical objects and artefacts, some with content, and some with digital content;
- size, including some large, and some medium-sized;
- location, including the three major cities, but at least one other 'regional' location; and
- maturity of digitisation programs, including some acknowledged leaders, and others that were thought not to be as far advanced.

Consideration was given to a considerable number of institutions, in order to produce a list sufficiently short that it was logistically and financially feasible, but which satisfied the above population segmentation.

The following list shows the 11 institutions that were selected to be approached, and from which 6-8 effective studies were to be achieved:

- category of institution:
  - museums: National Museum of Australia (NMA), Powerhouse Museum (PMA), Museum Victoria (MV), ScreenSound, Australian Centre for the Moving Image (ACMI), Tasmanian Museum & Art Gallery (TMAG), Queen Victoria Museum & Art Gallery (QVMAG);
  - galleries: National Gallery of Victoria (NGV), Tasmanian Museum & Art Gallery (TMAG), Queen Victoria Museum & Art Gallery (QVMAG);
  - libraries: Tasmanian State Library, National Library of Australia (NLA) in respect of Picture Australia and Music Australia;
  - herbaria: Tasmanian Museum & Art Gallery (TMAG);
  - archives, zoos and aquaria: omitted, with recourse to desk research;
  - integrated institutions: Tasmanian Museum & Art Gallery (TMAG), Queen Victoria Museum & Art Gallery (QVMAG);
  - collaborations: Picture Australia, Music Australia;
- nature of holdings:
  - physical objects: National Museum of Australia (NMA), Powerhouse Museum (PMA), Museum Victoria (MV), National Gallery of Victoria (NGV), Tasmanian Museum & Art Gallery (TMAG), Queen Victoria Museum & Art Gallery (QVMAG);
  - content: State Library of Tasmania, ScreenSound;
  - digital content: Picture Australia, Music Australia, Australian Centre for the Moving Image (ACMI);

- size:
  - large: National Museum of Australia (NMA), Powerhouse Museum (PMA), Museum Victoria (MV), National Gallery of Victoria (NGV);
  - medium-sized: Tasmanian Museum & Art Gallery (TMAG), Queen Victoria Museum & Art Gallery (QVMAG), State Library of Tasmania;
- location:
  - Canberra: National Museum of Australia (NMA), ScreenSound, Picture Australia, Music Australia;
  - Sydney: Powerhouse Museum (PMA);
  - Melbourne: Museum Victoria (MV), National Gallery of Victoria (NGV), Australian Centre for the Moving Image (ACMI);
  - regional: Tasmanian Museum & Art Gallery (TMAG) and State Library of Tasmania (Hobart); Queen Victoria Museum & Art Gallery (QVMAG) (Launceston).

In addition, a small number of other institutions were identified but held in reserve, in case any of the planned meetings were unable to be achieved in the very short window available. These included National Archives of Australia (NAA), the Australian War Memorial (AWM), the Australia Museum in Sydney, the Arts Precinct in Adelaide, and the Creative Precinct in Brisbane.

3.3 The Procedure Adopted

An outline of the process adopted is provided in Appendix A. The schedule of consultations conducted is in Appendix B.

Quality assurance measures were devised to ensure that the desired outcomes were achieved. Semi-structured templates were prepared for the interviews and reports. The team of two senior consultants conducted the first three interviews together at a complex institution (ScreenSound) and the two collaborative projects at the National Library of Australia, in order to ensure a common understanding of the procedure and outcomes. Each reviewed the other's draft interview reports as soon as they were completed. Each interview report was sent to the interviewees to provide an opportunity for them to review it, together with a written commitment to reflect feedback in the final version. The resultant reports are in Attachment E. Each of the consultants also reviewed the other's draft report-segments as soon as they were completed.

The response of all institutions was very positive. All made time available at very short notice. All made very senior staff available, in several cases including the chief executive, and in many cases involving several relevant and senior staff.

3.4 Impact on User Organisations

The focus of the project was on collecting institutions, and the extent to which they were collaborating with, and even driving, the creative industries. An additional strategy needed to be devised in order to elicit the perspective of downstream business enterprises. However this needed to be achieved within very tight time and resource constraints.

The consultancy team relied upon its contacts within the industry, supplemented by discussions with the DCITA Project Team, and a limited amount of 'snowball sampling', i.e. following trails arising from the interviews with collecting institutions. The organisations contacted included AMOL, a relevant industry association (AIMIA), two software suppliers (Wizard and Allette), a

regional electronic commerce centre that has facilitated collaborations in the interactive multimedia arena (TECC), three companies active in the marketplace (Brainwaave, Crank Media and Qantm), and a major government project in the education sector.

Although these were not formal interviews, some were relatively rich in information, and additional time was spent in excess of that originally intended.

4. Digitisation Policies and Programs

This section summarises the information gathered about digitisation policies and programs within the selected collecting institutions. It presents the information under a series of headings each of which addresses a particular topic within the scope of the project.

4.1 Digitisation Drivers

The two primary drivers for collecting institutions are preservation and access. Digitisation is tending to be undertaken in successive, overlapping waves, of 2-dimensional images, optical character recognition (OCR), 3-dimensional images, music-sound, voice-sound, and video. During the early years of each wave, an additional driver is the acquisition of knowledge and skills.

Most institutions' programs evidence a mix of the two primary motivations, with a spectrum ranging from a very strong emphasis on preservation at one extreme to a very strong emphasis on access at the other, with various blends of the two in between. The spectrum is depicted in the following diagram.

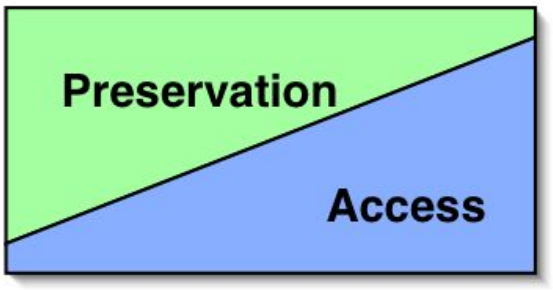

Figure 4.1

The following points are usefully defined within that spectrum:

- preservation of at-risk materials, particularly three-dimensional items. These are primarily holdings whose physical condition is such that the prospects of even medium-term survival are not good. Examples include natural history 'type specimens' and one-of-a-kind artworks and manuscripts. Because contemporary digitisation techniques do not preserve all characteristics of artefacts, multiple high-resolution digital images are likely to be used;
- preservation of the content of at-risk materials, such as valuable artworks, rare books and manuscripts. The same conditions hold, but the artefact itself may be less important than the textual and image contents, and hence a single digital image may suffice. On the other hand, such items may require many images, to reflect the many elements, such as pages;
- shifting forward of formats that are at risk of becoming inaccessible in the near future, due to technological obsolescence. Examples include Laserdisk and 16mm film, but also short-lived digital media like CD-ROMs;
- preservation of materials and provision of access to digital copies, in the case of popular items which would be at-risk if they were subjected to frequent handling, or handling by people without appropriate training and commitment to preservation;
- provision of access to larger numbers of people than would otherwise be feasible, such as items that require special protection, or that attract a great deal of interest during a short period of time;
- provision of access to people at locations remote from the location of the item, saving time, the cost of travel by the people concerned, and/or the logistical effort, cost and risk to the item involved in the event that the item was moved.

4.2 Digitisation Policies and Priorities

Reflecting the diversity of drivers noted above, different collecting institutions evidence different points within the preservation/access spectrum. At one extreme, National Archives of Australia produces only 72 dpi ('web-quality') images, mostly on demand. This is quite sufficient for its users, and the objective is almost entirely access, with very little emphasis on preservation. In most institutions, the appropriate point within the spectrum also varies greatly between collections and object-types.

Libraries tend to focus on images of two-dimensional objects, with a strong emergent emphasis on OCR in order to extract text. Very little work is yet being done on tagging captured text to preserve the structure of the original content. Galleries are concerned about high-quality images for preservation which can then be used to generate medium-resolution images to extend accessibility. Museums want images of 3-dimensional objects to assist curators, and to attract and inform the public. All are interested in voice-sound, musical sound, and video, but few can make them a priority as yet. Most have special issues with particular collections or particular categories of object.

Intellectual property considerations play a substantial role in the determination of many institutions' priorities. Those institutions with substantial holdings that are subject to restrictive intellectual property rights generally simply leave these out completely from digitisation programs. This highly unsatisfactory state of affairs is discussed below in section 5.2.

4.3 Digitisation Programs

Collecting institutions have in few cases been able to acquire external funding specifically to support digitisation programs. Resources have been acquired in almost all cases by compromising other programs and projects, or by spin-off from other activities, especially exhibitions.

Multiple 'waves' of digitisation can be identified as follows:

- facsimile images of primarily 2-dimensional objects such as artworks, printed documents, manuscripts and sheet-music;
- text generated by the application of optical character recognition (OCR) to primarily 2-dimensional objects such as printed documents and manuscripts;
- text with its document structure expressed using standard tags such as DocBook. Through the application of "style sheets", this allows the same work to be presented on the Web, on a home printer or to a print on demand Digital Press.
- images of primarily 3-dimensional objects, such as natural specimens, pottery and statues;
- sound which is primarily voice, such as speeches and oral histories;
- sound which is primarily music;
- animations, wire frames, fly-throughs and other digital simulations of real objects;
- video / 'movies', which is not only intensive in its storage and transmission requirements, but also commonly involves multi-media in the form of a synchronised soundtrack;
- other multi-media forms, such as music-objects comprising synchronised sound and an active displayed score.

Institutions generally do not outsource digitisation activities, primarily because of the risk of harm to the objects and cost constraints, but in some cases because of legal constraints, or because of the desire to develop expertise within the organisation. The National Gallery of Victoria reported that an attempt at outsourcing proved counter-productive except for relatively simple 35mm slide conversion.

Some specialist work is outsourced, however, especially that which has to be because it requires expensive equipment that the institution cannot acquire the funds to purchase. Interviewees consistently stated that some additional work may be outsourced once sufficient expertise has been developed, but under no circumstances would management of the process be outsourced. Most institutions are much more comfortable contracting-in for services to be performed on their own premises rather than contracting-out for performance elsewhere.

4.4 Progress in Digitisation Programs

Progress is highly varied. In almost all cases, digitisation to date has focused on two areas:

- completion of the capture of catalogue data; and
- digital images, of both 2-dimensional and 3-dimensional objects.

In cataloguing, many institutions reported difficulties in completing the transition into the computing era. These included institutions as significant as TMAG and ACMI. It is a serious matter that a significant proportion of the nation's combined catalogue of holdings could still be managed by catalogue-cards, and that some significant collections are not even catalogued.

In digital imaging, many small collecting institutions have made little or no progress. Important exceptions arise where the institution is participating in a national or State program. Medium-sized institutions are making progress, but in most cases are in the very early stages and/or are able to move only very slowly. Even some large institutions are also finding it difficult to capture as much or as quickly as they consider desirable. A few have made considerable inroads into their collections, however. The Museum of Victoria, for example, considers that 3 million of its 16 million items justify the effort and cost of digitisation, and 2 million of them have already been digitised. This includes all of the natural history 'type specimens'.

Only quite limited progress has been made with the other waves of digitisation identified in the previous sub-section. Exceptions arise in institutions whose holdings are strongly in audio, or strongly contemporary, such as the Powerhouse Museum and the collaborators in Music Australia in respect of music, and ScreenSound and ACMI in respect of audio. Video is still a very challenging area for all concerned, because of the huge data-volumes involved, the complex rights issues and the lack of critical mass of customers with the access to broadband networks required for delivery.

4.5 Impediments Holding Back Digitisation

Digitisation has not proceeded quickly, is not proceeding quickly, and under the present conditions will not proceed quickly. This sub-section reports on the insights arising from this project into the impediments that are holding back more rapid development.

4.5.1 Specific Funding for Digitisation

The most significant impediment is the lack of sources of funding for digitisation projects. Despite the widely-acknowledged importance of digitisation, no interviewee reported having access to targeted sources of funding for these purposes.

Specific funding is required to provide:

1/ the IT systems infrastructure required so each organization can capture, store, manage, add metadata and, most importantly, accrete improved or enhanced versions of each item in their collection.

2/ the IT systems to enable discovery, to publish the collection and to federate with other collections.

3/ the digitisation equipment and processes to use it.

4/ the legal clearances to capture and utilise contemporary as well as out of copyright works.

5/ the staff and contractors to do and manage the work.

This can either be done on an institution basis by Federal, State or Local governments or it can be driven by projects with specific outcomes and the requirements include providing these items (1-5) and in a form that persists and can be used in future projects. Digitisation has been made a priority by some overseas governments, with the result that their cultural sectors' substantial holding of digital images, video and audio are now readily available for educational purposes, and are being exploited increasingly actively by the creative industries.

Two important examples are from Scotland and Canada:

1/ The Scottish Cultural Resources Access Network (SCRAN), at http://www.scran.ac.uk,.

SCRAN was established and funded with Pounds Sgt. 10 million to fund the digitisation of the many Scottish museum and galleries collections and to make the items available as digital resources for use in the schools systems, online public use and commercial use. Most of the digitisation occurred at the individual institution level but with strong support and direction by SCRAN. After three years of work on infrastructure, standards, training, digitisation and cataloguing the project is complete and is now at operational breakeven having reached the critical mass of digital resources required to generate a market presence. It now obtains revenue from the commercial use licensing of its collection of 179,000 digital colour and black and white images both casually and on a subscription basis, from £Sgt. 29 to £Sgt. 220 p.a. Educational and research usage is mostly free.

A fact sheet on the project is available from:
<http://www.tasi.ac.uk/resources/scran.html>

2/ The Canadian Heritage Information Network, at http://www.chin.gc.ca/, and specifically its joint project the Virtual Museum of Canada (VMC), at: http://www.virtualmuseum.ca/.
The Virtual Museum of Canada (VMC) was funded with CA$20 million in 2000/2001 and CA$30 million in 2001/2002 to preserve and make accessible online Canadian History and Culture. The project supports joint digitisation projects between member museums and VMC selected on a proposal basis. The completed projects and their digital resources are then made available through the VMC website.

Digitisation is not a substitute for the other activities of Collecting Institutions. Rather than displacing other costs, it represents an additional task, and a new, challenging and expensive one at that. The institutions that have made progress have generally had to withdraw resources from other activities, undermining the quality of the routine work their charter requires them to perform, or slowing progress with other projects. The main exception has been where a proportion of the funding allocated for exhibitions has been earmarked for digitisation of objects relevant to that particular event.

There will be some cost-substitution effects at a later stage. For example, as curators become increasingly able to rely on their catalogue, they will be able to perform some tasks more efficiently. During the long interim period, however, as institutions attack the backlog of holdings that justify investment in digital versions, the expenses involved will be additional to each institution's normal cost-profile.

Simply throwing millions of dollars at the problem would not solve it, however. Investments need to be targeted, and justified.

A primary consideration is the readiness of the technology. This depends firstly on laboratory experiments having been successfully completed, equipment being available, equipment pricing having come down from the inevitable, early, 'novelty' prices associated with low-volume sales, art having become science, and techniques having matured into business processes.

A further important characteristic of technology readiness is mature, stable standards. This is needed to ensure that the anticipated life of the storage-format(s) and storage-media used will be satisfactory, and that, when it eventually becomes necessary, the task of spooling the images forward to future media and formats will be not be unduly difficult or expensive.

Further needs include suitably educated staff, training for them in the specific skills required, and the preparedness of the institution to scale up from trials to full-scale digitisation programmes.

Reference was made earlier in this section to successive, overlapping 'waves' of digitisation. The technologies and processes to support creation of 2-dimensional images, especially of relatively flat objects such as paintings, photographs, manuscripts and sheet-music, is now mature. Where funding is made available, most institutions are now capable of scaling up existing activities, and applying it in an efficient manner.

At least within some institutions, the application of optical character recognition (OCR) to 2-dimensional images, to extract the text, is ready to take off. This activity is capable of delivering high returns on investment, in both the cultural and the economic senses of that term.

Somewhat greater care is needed in the application of funding to 3-dimensional images, music-sound, voice-sound, animation, and video. In general terms, only the more specialised and sophisticated institutions are poised to apply these technologies on a large scale. Major investment in those institutions is warranted, but the majority need smaller-scale resourcing, to enable them to gain greater familiarity with the technologies and their applications, and to conduct initial trials with them.

4.5.2 Other Impediments

Although the availability of funding sources for digitisation work within cultural institutions is critical to progress, there are other factors that need to be addressed in parallel. They include the following:

- the lack of training opportunities at all levels, for executives, for senior managers, for technical staff, for curatorial staff, and for operational staff;
- the lack of deep case studies of applications of digitisation in particular contexts. There are some excellent work being done, but the staff that are doing it are not being goaled or budgeted to provide external documentation of what has been done;
- insufficient information exchange in relation to standards and processes;
- lack of affordable software to support digital object repositories, catalogues for digital and physical objects, and comprehensive digital object management;
- concerns about the archival quality of digital formats. Open standards are acceptable, because the specification is published, and copies are likely to be archived sufficiently widely to enable subsequent recovery and hence interpretation of the contents of files stored using that standard. But storage using proprietary standards risks the contents of a file becoming irrecoverable;
- concerns about the archival quality of digital media. Many digital media have a life far shorter than earlier media. For example, digital audio tape sticks to itself after as little as a couple of years, and CD/DVD substrates can peel within 5-10 years. This is in contrast to 'analogue' recording media, many of which have survived many decades, vellum and paper which have survived centuries, stone tablets which have lasted millennia, and paintings on cave-walls which are still visible after tens of thousands of years.

  Even if the medium itself is relatively stable, there may be no device available with which to read it. Worse, if the reader is proprietary, the specifications may not be archived, and a reader may have be re-invented rather than merely re-constructed;

- specific challenges involved in recovering images from legacy formats and media. An example quoted by QVMAG in Launceston was the need to spool across from Laserdisk the Community History collection's 3,000 most important images. A medium and format once touted as the way of the future quickly came to be seen as a short-term, proprietary product.

A complicating factor mentioned by TMAG was the need to include geo-location information within the metadata. This is important for such matters as the location in which an object was found, or a photograph was taken; and it has value in many circumstances relevant to future usage by creative industry enterprises. It implies the need for integration between collecting institutions' systems and GIS functionality.

A further factor that can create difficulties in some circumstances is origination in digital form, but using proprietary digital formats, especially where the format is unpublished. An example mentioned by Music Australia was scores made available in Finale format where there is as yet no commonly accepted Music XML or tools to create or read it. See http://www.oasis-open.org/cover/xmlMusic.html. This requires an active strategy to forward shift or spool the collection from the proprietary format to open formats once available and tested.

Published proprietary specifications such as RTF and PDF are less problematical, because readers can be sourced from third parties and hence the readability of the object is not totally dependent on a single corporation.

4.6 Digitisation Format Standards

This sub-section addresses two related matters: the standards that are used and are likely to be used by institutions, and the extent to which those standards are compatible with practices in the creative industries.

4.6.1 Formats Used Within Collecting Institutions

The most well-understood digitised format is image. The primary preservation format in use is 300 dpi TIFF, although 1,000 dpi TIFF may become the norm. The primary access or presentation format is 72 dpi JPEG (web-quality). At least some institutions require higher-resolution master preservation copies than TIFF, however, and operate a double-master approach, with high-quality (analogue) negatives as well as TIFF images. As it is currently cheaper to take a 35mm slide and then digitise it at high resolution than it is to take an equivalent born-digital image, there is not necessarily a cost penalty from preserving both analogue and digital masters.

For facsimiles of documents to which OCR techniques are to be applied, lower-resolution TIFF or JPEG may be appropriate, unless the physical object itself is important as well as the content, in which case high-resolution TIFF is most likely.

Appropriate standards for scores such as sheet-music are only now becoming clear, with the Music Australia project being the most likely source of expertise.

Appropriate standards for audio are not entirely clear at this stage, with several alternatives having advantages in particular contexts, and guidelines only now starting to emerge. Master copies appear likely to be held in uncompressed Audio CD / WAV / AIFF format. The most appropriate distribution format currently appears to be MP3 or the newer AAC (a component of MPEG4), at varying sampling levels. It is anticipated that the National Library and ScreenSound will take a lead in this area, through the Music Australia initiative and otherwise.

Appropriate standards for video are also not yet clear. It is anticipated that ScreenSound will play a lead role in analysis and documentation in this area. ScreenSound has not yet determined what will follow Digital Betacam as its mainstream preservation format. For distribution/broadcast purposes, it currently uses MXF (Material eXchange Format), and for presentation purposes DPX.

For multi-media digital works that require synchronisation (such as combined audio and display of music), the emergent SMIL standard is regarded as having considerable promise.

An additional factor that needs to be considered in the selection of media formats is the degree to which each format can hold metadata within the file. This will be critical as files are moved around and shared. While files will be renamed, the internal metadata held with the image or sound will provide a subset of the administration or Dublin Core (DC) metadata held in repositories. For this reason alone JPEG2000 is better than gif, and AAC is better than WAV. The same argument applies to object-structure formats that define the tagging of content, such as standards for marking up texts with XML tags, and the METS object-container definition.

4.6.2 Standards Compatibility Between the Cultural and Creative Sectors

A question addressed by the study was whether the standards used in cultural institutions influence downstream creative industries.

As is discussed in greater depth later in this document, the links between the two sectors are not currently close. In relation to standards, there appears to be little direct influence by either over the other. Fortunately, the creative sector uses standard media formats supported by common software applications and these formats are generally the same as those of the Collection Institutions. They also appear to be at least aware of the international metadata standards such as Dublin Core that are used by cultural institutions, although they may be less aware of Australian national standards such as AGLS.

At this stage, there appears to be no evidence of standards mismatch representing an impediment to collaboration between upstream cultural institutions and downstream creative industries. There is scope for this to arise however:

- collecting institutions have dual emphases on preservation and access; whereas creative industries focus very heavily on quality of presentation. This may lead them to the use of somewhat different standards. Fortunately, preservation demands high-resolution in images, video and sound, which is also the key factor in production quality prior to the manipulation down to a presentation quality; so this difference may not be irreconcilable. Production also needs information on the "structure" within works and problems may arise here. For example an OCR text file of a book is useful to a library for full text searching and web publishing but of very limited use to a publisher who wishes to republish the work as an eBook, or print on demand work.
- collecting institutions currently focus very much on direct delivery to the consumer, and hence on relatively inexpensive, low-resolution formats. The creative industries have so far done very little even to engage with the cultural sector, let alone to fund the investment needed to ensure the availability of high-resolution digital formats.

Best Practice and reference sources of information on format standards would be one possible basis for coordination between the two sectors. For libraries, relevant standards are catalogued by the National Library of Australia, and by the Digital Libraries Federation. A less comprehensive document for museums and galleries is available on the AMOL site. The National Gallery of Victoria intends publishing the guidelines that they produced for their Digital Studios if their resources allow. It would be extremely valuable if the information that has been garnered in this report (if only the information on format standards for preservation, production, distribution and presentation) could be refined, published and maintained in a location linked to from all relevant resource-pages and entry-points.

With the possible exception of the specialist institution ScreenSound, however, there is little evidence of the creative industries being even aware of such standard information resources being available. There is likely to be a similar low awareness of Government-originated standards more generally, such as the cooperative activity between National Archives and Standards Australia on

a national online resource discovery standard based on DC/AGLS. While this is intended for use by industry it will require first rate implementations that are efficient and easy to use for discovering content that is relevant to industry.

There are also government-originated Australian Standards on risk management (AS 4360), records management (ISO15489), and information security management (AS 4444). However these do not yet appear to have had a great deal of impact in the private sector generally. There may be some prospects of influence through procurement processes, particularly those used by commissioners such as The Learning Federation which has shown clear leadership on standards in the private sector through its suppliers. This specific matter is further discussed in section 5.5 below.

4.7 Cataloguing and Metadata

Metadata is and will remain a complex matter but it is absolutely essential for any exchange of information and content. There are several categories, which are used for distinct purposes, including:

- administrative metadata (to support management of the objects);
- preservation metadata (to support protection and recovery of objects and their contents);
- structural metadata (to define the elements within an object, and their inter-relationships); and
- descriptive metadata (to support discovery).

Digitisation creates a new object, which becomes part of the institution's holdings. Digitisation therefore necessitates cataloguing of the new objects. There may be multiple digital objects for each physical object that is digitised, and a considerable number of items of metadata may need to be captured for each of them (e.g. details of the recording medium, the format, format parameters such as the resolution, an object-identifier, the storage location, and the identifier of the physical object that the digital objects relate to). In addition, the metadata for the physical object must be enhanced, to cross-refer from the physical object to the digital object(s).

Although the Dublin Core (DC) / Australian Government Locator Service (AGLS) framework is pertinent for many purposes, it requires customisation for the many different categories of object handled by collecting institutions. It would appear that in excess of 50 categories of object need to be distinguished. Each category requires additional mandatory items above and beyond the minimum set specified in AGLS.

DC/AGLS is primarily a tool for discovery and for some purposes, DC/AGLS is simply inadequate. For example, the Music Australia initiative is applying the Functional Requirements for Bibliographic Records (FRBR) Information model, which enables a structured view of the object's relationships with derivatives, including the concepts of a work, expressions of the work, manifestations of the expressions, and instances of the manifestations. This approach is extremely powerful and systems developed the FRBR model can generate DC/AGLS metadata from the information they manage.

Similarly, ScreenSound cannot use DC/AGLS, nor even MARC, for their administrative metadata. It has implemented its own information and metadata model within its MAVIS cataloguing system. It is also looking at the BBC's Standard Media Exchange Framework – Data Model (SMEF-DM) data model.

Serious problems arise in relation to controlled vocabularies, because:

- there is no agreed meta-language in which to hold the discussions. In particular, what are termed in this report 'controlled vocabularies' are sometimes called thesauri, and sometimes dictionaries, without the necessary clarity as to what each of those terms means;

- the establishment of entries requires intense effort by a skilled cataloguer, which makes it slow and expensive when applied across large collections;
- very specific controlled vocabularies are necessary, especially in the Subject element, to reflect the characteristics of the object-type, the collection-type, and the discipline(s) involved;
- in respect of any one object-type, a multiplicity of controlled vocabularies exist and are rationally applied by different institutions, depending on the collection-type and the discipline(s) involved;
- very few inter-vocabulary mappings (sometimes called 'cross-walks') exist, even between reasonably similar controlled vocabularies.

Pilot projects such as Picture Australia and Music Australia are excellent at flushing out such issues. Unfortunately their funding is normally insufficient to do much about it as changing an organisations collection thesauri takes considerable effort and in the case of older collection management systems may be impossible.

For harvesting of metadata, the Open Archives Initiative (OAI) framework has already been implemented by several institutions including Museum Victoria, and by some entry-points including AMOL, and was mentioned by many of the institutions interviewed as being the likely direction.

In the area of object-structure standards, Metadata Encoding and Transmission Standard (METS) was regarded by many as a likely direction.

Museum Victoria drew to attention the critical need for contextual information to accompany objects. They consider that the development of an 'after-market' for digital objects will rely heavily on the availability of information that extends beyond the conventional metadata designed for preservation, access and administration. This was echoed by the National Museum of Australia. Their work with the Le@rning Federation has emphasised the critical need to add value to exhibit resources with contextual information and related material. The believe the Learning Object standard adopted by TLF has substantial advantages to the Museum sector because of its ability to encapsulate contextual and other metadata with digital resources as they move within and between organisations.

4.8 Digital Collection Management

The term 'digital collection management' is used in this sub-section to encompass a variety of terms, including 'digital asset management', 'digital object management' (which tends to be used by software providers) and 'content management' (which tends to be used in the context of e-publishing in general, and web-site content in particular).

Few collecting institutions are satisfied with the software that they currently use to manage their digital collections and to support the new or emerging metadata and format standards. Few packages are available, and most of those are out of the financial reach of small institutions. Even for medium-sized institutions they are expensive, especially those that have diverse collections and therefore need most of the modules in the package.

Large institutions are adopting varying strategies:

- most are looking to customise packages;
- some have commissioned or developed their own customised software (e.g. National Library of Australia); and
- at least one has stimulated the production of a package that meets the needs of themselves and sufficient other institutions in Australia and/or overseas to achieve efficiencies through cost-sharing (ScreenSound).

Particular challenges include the need for co-ordination and integration of the management of:

- the repository of digital works, each with their multiple different forms and versions;
- the metadata catalogue for digital works;
- the metadata catalogue for physical works; and
- the directory of parties who have relationships of various kinds to the works.
- the IP agreements held by the organisation over works and their copyright status

This is critical for all collecting institutions, because museums and galleries will always have both physical and digital objects to manage; and even organisations that deal in 'pure media' like image and video will have holdings and 'back-catalogues' that remain undigitised for the foreseeable future. It is also vital that, as the creative industries convert to being wholly dependent upon digital materials, the vast holdings of as-yet undigitised history do not simply drop out of sight. If they do, the deplorable prospect looms of accidental cultural gaps and historical bias.

Two products came to particular attention during the course of the project:

- MAVIS, owned by ScreenSound and developed and marketed by Wizard Information Systems of Canberra. ScreenSound made clear that the collaboration was critical to enable them to acquire a product that satisfied their needs for a cost that was reachable; and
- EMu (for E-Museums), owned by KE Software of Melbourne. A full suite of EMu modules is expensive for small institutions, and maybe difficult for medium-sized institutions to gain sufficient funding for. The large institutions that have invested in it are finding it highly valuable, as the basis for consolidating their catalogues, and in due course making them available for open public access.

  EMu is extensible by licensees through a 'plug-in' facility. For example, Museum Victoria has developed a facility to support bar-coding, which will be sold to other EMu customers.

The National Library's custom-built Digital Content Management System would be likely to be valuable for many other collecting institutions, but unfortunately the National Library of Australia lacks the resources to prepare and support it for implementation elsewhere even on an Open Source basis.

Other packages mentioned in the context of access and analysis of digital holdings were:

- Platypus, from CSIRO within the context of the Australian Biological Resources Study (ABRS);
- Lucid, from the University of Queensland;
- DELTA, from CSIRO; and
- the Interactive Plant Key to North Queensland Rainforest Trees, from CSIRO.

Several interviewees drew attention to the need for consideration of open source as a potentially relevant strategy in some of the functional areas in which collecting institutions have unfulfilled needs. This requires considerable effort and capability on the part of the individual institution, but could save a great deal of expense. Being by its very nature collaborative, the open source approach could be an effective way for several institutions to pool their limited resources, and develop components of a product, or plug-ins to existing packages.

5. Exploitation and Collaboration

This section summarises the information gathered about the collaborative activities of the selected collecting institutions. It presents the information under a series of topics. The final sub-sections report on the additional aspects on which information was sought.

5.1 Exploitation of Digital Resources

Many collecting institutions provide photographic services to the public generally, enabling direct acquisition through sales on the institution's own premises, or by mail-order, or email-order.

Large and medium-sized collecting institutions generally have their own web-sites, but this is not the case with all small institutions. Small institutions are more likely to have only 'corporate brochure-ware' sites, and even some medium-sized institutions are only now being able to mobilise the resources to move beyond this level.

Many of the larger institutions have at least some of their collection digitised and viewable on the web. Some have at least some of their catalogue accessible, although this is less common among museums and galleries than it is among libraries, where Open Public Access Catalogue (OPAC) modules have been a feature of management packages for many years.

Few collecting institutions have as yet been able to establish Internet commerce services to support sale of their products directly to purchasers using web-browsers. One exception drawn to attention by several interviewees is the Australian War Memorial, whose 'e-commerce' site includes digital images for sale, for non-commercial use.

Pricing policies for the provision of digital copies appears to be generally a variant of the pricing for photocopies and photographic prints. In some cases, low-resolution copies are gratis to the public, but charged to commercial organisations; while in other cases all copies are charged, although perhaps differentially depending on the type of customer. Not surprisingly, only ScreenSound has been required to come to grips with the provision and pricing of production-quality versions of their material and even then the rights most often need to be negotiated separately.

The pricing mechanism is most commonly 'marginal cost recovery', with such components as photography cross-subsidised from the central budget, and the charges based only on administrative expenses. Some institutions may be precluded from charging full cost recovery, in the sense that the excess beyond what the relevant Department of Treasury or Finance might consider to be justifiable as cost recovery would be ceded to consolidated revenue.

5.2 Intellectual Property Issues

Copyright problems plague all collecting institutions, with the worst-affected being those whose collections contain artefacts whose originators were working later than about 1930. A close examination of the nature of the problems was beyond the scope of this project and most of the interviews had to be redirected when the topic of copyright threatened to dominate well in excess of its budgeted time.

Among the key factors are, however:

- the staff time, costs and elapsed time involved in establishing ownership of the various 'slices and dices' of intellectual property;
- remaining uncertainties about ownership, including both disputes and the risk of another claimant appearing;
- inadequacies in fair dealing provisions, relating to:
  - the handling necessary for curatorship;
  - management within an organisation whose staff-members are physically dispersed;
  - use for research;

  - preparation for exhibitions;
  - implementation of exhibitions;
  - display of thumb-nail images or video for previews, and especially
  - display within the controlled environment of the museum or gallery;
- the staff time, costs and elapsed time involved in negotiating a licence;
- the staff time, costs and elapsed time involved in acquiring a licence (is generally is necessary even though there may be no fee involved);
- in some cases, the size of the fee sought;
- uncertainties about the costs that will be involved, particularly under compulsory licence provisions; and
- the prohibitive (and unbudgeted) costs and management time involved should any party commence litigation against the institution.

The National Gallery of Victoria (NGV) provided a specific instance of a difficulty created by the Digital Agenda Amendment Act (which is currently being reviewed by the Attorney-General's Department). Although the Act appears to have been intended to achieve equivalence across media types, it did not achieve it in application. While there is very little difference in content from reading a physical book and a digitised version online there is a big difference in viewing a DVD at home and previewing a postage stamp sized version of it online.

In the example given the Gallery may be precluded from displaying a digital image including contextual information on a LCD panel adjacent to the actual painting.

Similarly, ScreenSound is precluded by the Digital Agenda amendments from digitising audio, even though it is vital to do so in order for the institution to fulfil its statutory obligations, and even though it has made copies of this kind for many years prior to the amendment being enacted.

Another example is seen in relation to the Virtual Exhibition on '1,000 Years of the Olympic Games: Treasures of Ancient Greece', which is a digital version of a physical exhibition mounted by the Powerhouse Museum at the time of the Sydney Olympics in 2000. See http://www.phm.gov.au/ancient_greek_olympics/. The site carries a statement "Due to copyright reasons, some sections of this website are no longer available". This is all the more significant in view of the subject-matter being over two millennia old.

As a result, most collecting institutions are adopting the conservative strategy of simply avoiding the digitisation of objects unless:

- the objects are, or are very likely to be, free of any intellectual property rights;
- the institution is the owner of the rights; or
- the institution exercises the rights on behalf of the owner.

This directs the choice of collections and objects away from copyright works whose originator's date of death is less than 50 years ago, i.e. currently 1953. There is a vast amount of material yet to be digitised that is free of copyright difficulties, and hence institutions have no difficulty applying such resources as are available for digitisation tasks. But AIMIA executives made the point that if one of the criteria for judging the success of digitisation projects is commercial sales of downstream products, then the content has to be fairly recent to be attractive: "Nostalgia is not what it used to be" for the high spending youth digital marketplace.

But it seems very doubtful that priorities that are determined by careful reference to intellectual property uncertainties and costs correspond to those that would otherwise be judged to be in the best interests of the fulfilment of each collecting institution's statute, objectives and strategy. It appears still less likely that this approach accords with the interests of the downstream creative industries, let alone of an economically rational outcome, or of one in the nation's best interests.

Music Australia commented that extension beyond the present pilot would be seriously constrained unless workable arrangements can be achieved in relation to the discovery of ownership, rapid and low-cost negotiation of licence conditions, and low-cost access. A successful full implementation of Music Australia has the potential to actually increase revenues for the music industry through flow-on effects, but it is not clear that this perception is shared by all participants in the industry. Strong alliances will need to be created between the project and the music industry, including APRA/AMCOS, ARIA and record companies.

5.3 Lateral Collaboration

Collaboration within the cultural sector, already considerable even before the advent of the digital era, is substantial and growing. Examples of undertakings that involve participation by multiple institutions include ones co-ordinated by AMOL as well as Picture Australia and Music Australia. The following section reports on a specific form of collaboration: touring programs, and the scope for such exhibits to be digitised.

A very important form of collaboration that required careful consideration in the context of this project is ‘entry-points’ (sometimes called ‘gateways’, and sometimes misleadingly referred to using the for-profit / consumer marketing term ‘portals’).

An entry-point is a web-site designed to address the needs of a particular market segment, by providing convenient discovery services for relevant resources, irrespective of the location of the repository in which they are stored.

Any entry-point will have either a centralised or dispersed strategy to handle each of the three dimensions inherent in a digital collection web site:

- the catalogue of metadata
- the repository of digital materials
- the management of the material and/or metadata.

These dimensions can be combined in a number of ways but the three most common architectures are:

(1) Centralised. A central repository is operated by the entry-point, and may include master copies stored on behalf of participants, and/or copies of materials whose master versions are stored elsewhere. Discovery is achieved using a central catalogue also operated by the entry-point. This has advantages such as sufficient scale, control over presentation quality, and visibility; but also disadvantages such as excessive scale, loss of control by the owners of the master copies, and insensitivity to diversity. This category has two sub-forms: the creation and maintenance of materials may be performed by a central organisation, or by the participants themselves;

(2) Federated. Resources are stored in dispersed repositories, but with a central catalogue stored at the entry-point site, including metadata about the remotely-stored resources. This may be achieved through submission of metadata to the entry-point, or by harvesting by the entry-point of the metadata from participating sites. This takes advantage of scale and ensures visibility, while enabling participants to retain full responsibility for both the resources and the metadata;

(3) Brokered. This features dispersed repositories and dispersed catalogues, with the entry-point maintaining a list of participants and details of their search-facilities, and operating a `query-broker'. For each enquiry made by a visitor, the brokering service submits a query to each participating site, consolidates the responses, and returns them to the enquirer. This involves minimal commitment from participants (to the extent that they may be unaware that the brokering service even exists), but generally provides a much slower response-time to enquirers.

Important entry-points operating in the cultural sector include:

- Australian Museums and Galleries Online (AMOL). This currently has about 100 participants in a type (2) federated entry-point, but considering moving to a hybrid of type (2) federated for large institutions, and a type (1) centralised for small and medium institutions. Owners retain responsibility for creation and maintenance of the published materials, reducing the level of resources required at the central entry point;
- Picture Australia. This currently has about 25 participants in a type (2) federated entry-point, covering over 630,000 images, with the largest contributors being the State Libraries of N.S.W. and of Victoria, but with several museums and galleries also participating;
- Music Australia. This is more recent and more technically challenging, and currently has 4 participants in a pilot project, using a type (2) federated entry-point;
- Australian Virtual Herbarium (AVH). This is a type (3) brokered service;
- On-Line Zoological Collections of Australian Museums (OZCAM), This has been an out-growth of AVH, and is also a type (3) brokered service, due for launch shortly;
- Tasmanian eHeritage. This is a type (1) centralised entry-point at State level. It was initially driven by the State Library, but it involves regional collecting institutions other than libraries, and is intended to be broadened into a collaboration involving all major institutions in the State as well as regional libraries, museums and galleries.

Picture Australia has strong anecdotal evidence that discovery of images via the entry-point is a significance driver of access to, and purchase of, images from the participant's site (in the case of the Australian War Memorial) and through on-location, mail and email orders in other cases.

There are several significant impediments to the effectiveness of these entry-points. Important among these are:

- the impracticability (if not sheer impossibility) of encouraging all participants to apply the same controlled vocabularies, particularly within the Subject element. The impracticability arises because the institutions have collections of many different kinds, and rational decisions by each institution within its own frame of reference results in different controlled vocabularies being judged to be the most appropriate;
- the lack of 'semantic mappings' between controlled vocabularies,
- the challenges involved in achieving quality cataloguing across large collections, and the consequential variability of metadata and hence of query results; and
- the challenges involved in achieving consistency of metadata submission mechanisms across all participating institutions. Various combinations of metadata submission are used, including spidering followed by extraction of meta-tags, proprietary-protocol harvesting of metadata, and OAI based harvesting.

5.4 The Creation of Virtual Versions of Touring Exhibitions

The consultants were asked to evaluate the feasibility of existing touring programs being converted to digital online exhibitions. By 'touring programs' is meant in this context exhibitions prepared primarily by one collecting institution, but lent out to other, usually distant institutions. Touring Exhibitions address a number of objectives:

- to encourage co-operation between collecting institutions in curating an exhibition where no single museum or gallery would hold all of the required artefacts to make it viable and rewarding for visitors;
- to enable each of the contributing organisations to host the exhibition on their premises;
- to thereby make the consolidated experience available to people in many places, who would not otherwise have the opportunity to do so, especially in regional and rural Australia;
- to share the considerable expenses involved in curating, directing and managing a quality exhibition.

Physical exhibitions are, however, still 'one of a kind' and often 'once in a lifetime'. They are very difficult, if not impossible, to physically replicate. They are often expensive to pack up, relocate and set up. This inherently limits the number of times and the size of the city that a more complex touring exhibition can visit.

The digitisation of Touring Exhibitions and their conversion to a traditional 2-dimensional or a Virtual 3D website is a potential solution to some of these problems.

A relatively straightforward exhibition digitisation program involves:

- taking high resolution photos of flat and 3D objects against neutral backgrounds with professional lighting, most often in a studio;
- managing the images and their derivatives in a media asset management application such as Canto Cumulus
- capturing all of the contextual information;
- developing a visual theme;
- developing navigation paths;
- building the site in a tool such as Dreamweaver or Adobe GoLive;
- re-working images and adding graphics and icons;
- satisfying accessibility guidelines, including ensuring that "alt" information is added;
- proofing, pilot hosting and usability testing with typical customers;
- hosting.

Complex projects such as the 3D Virtual "1000 years of the Olympic Games" exhibition from the Powerhouse Museum involve many more tasks.

Developing virtual online versions of touring exhibitions may come to be within the skills set of medium-sized galleries and museums, but is likely to remain beyond that of the small ones. Depending on what services and equipment can be sourced for free or borrowed, it is unlikely that a professionally curated and presented exhibition could be delivered for much under $20,000 with a more common budget being around $50,000.

Lateral collaboration among institutions is important, to pool materials, expertise and funding. The further opportunity exists for collecting institutions to partner with content developers who are experienced in producing Virtual Exhibitions, or are prepared to invest in developing the skills and tools necessary to produce them efficiently. A pool of such talent could be kept relatively busy recording, enhancing and publishing touring exhibitions. These companies do not have to be located in major centres and there could be advantages to them being in regional locations with occasional site visits for digitisation, etc.

Of course the tactile nature of some physical exhibits would be absent from Virtual Exhibitions but this could be compensated for by the ability to add value such as virtual fly-throughs, extreme close-ups, rich contextual information and linking to other resources.

The advantages of capturing Touring Exhibition and converting them to Virtual Exhibitions include:

- documentation and preservation of the items and the contextual information in the Tour especially those that have been aggregated with material from regional and metropolitan museums, as well as private collections;
- extension of the exhibits. Over time the exhibition could "accrete" new material that may have been identified or submitted after the museum had opened;
- accessibility of the exhibition by all Australians, irrespective of their location, time availability and potentially their language or disability;
- potential to increase the visitor traffic to the physical exhibition when it arrives nearby;

- an increase in the pool of individual digital resources that are discoverable online, and available for exploitation by the education sector and by business enterprises in the creative industries.

The following were identified as constraints on the digitisation of physical exhibitions in order to generate virtual exhibitions:

- budget shortages. Collecting institutions generally feel themselves to be under-funded in this area, and have to short-change vital ongoing tasks in order to fund exhibitions;
- skills shortages within collecting institutions. The curators of Tours need to be trained. This training needs to include the benefits and traps in realisations, the various creative, technical and development choices, how to brief an external producer, how to project manage and publish;
- shortage of content producers with the requisite expertise. There are many small interactive media developers in Australia. AIMIA has some 200 as production members, and the TLF normally receives 10 to 15 responses for each tender it releases for Learning Object Development. But not many already understand the museum and gallery sectors well, nor are many really equipped to develop high quality virtual exhibition.

  Workshops for current and would-be content producers are required to bring them up to speed. An Online Forum and more frequent physical Forums where Curators and Producers can meet such as OZeCulture would be very valuable;
- shortages of technical resources. Access to photographic Studios, 3D image capture and wireframe capture equipment with skilled operators is required. These resources could either be centrally located in each state or available via touring resource vans. It is possible that some Content Producers would already have access to these tools as well;
- copyright issues. Licence terms need to go above and beyond those required for conventional touring exhibitions. Moreover, the digital copies are far more appropriable online than the physical objects on display but this risk can be managed and ameliorated.

5.5 Downstream Collaboration

Most accesses and purchases of digitised material are currently made by consumers. There is also considerable use by organisations within the education sector, which are for the most part not-for-profit.

Very few instances were discovered in which a collecting institution was involved with a downstream creative industry business enterprise in anything resembling an ongoing partnership. Acquisition of digital images is a not infrequent activity, but in most cases there is little sense even of ‘repeat business’, let along ‘relationship marketing’ or a ‘supply-chain strategic partnership’.

The organisations most commonly nominated as potential downstream partners were the ABC and The Learning Federation, with some mentions of local television stations and newspaper and magazine publishers.

Business enterprises in the creative industries are focused primarily on the file-format and communication requirements of the channel to market, and this is often determined by the publisher or commissioner. In sourcing digital resources for a production they want to be able to:

- discover material that is potentially useful in the project;
- examine previews of the short-listed material to narrow down the selection;
- acquire the rights to use the selected material in the desired way;
- acquire the material in the best available quality in an appropriate file format; and

- have good documentation of the provenance of the material they are using so they can to prove 'title' to their commissioners.
- obtain as much contextual information as possible about the resource.

If these conditions are not fulfilled, downstream collaboration simply will not happen or will only happen when the material or result is truly unobtainable in any other way.

For their part, at least some collecting institutions are guarded in their attitudes to downstream for-profit corporations. There is a feeling that companies expect access gratis, that they focus only on the specific project that they are currently working on, that they have little motivation to enter meaningfully into partnerships with cultural institutions, and that they would bring to the table little in the way of resources or even expertise.

Museum Victoria has already digitised much of its collection, and has already produced over 20 web-based projects utilising digital images. It considers that the opportunity does now exist for joint R&D with academics and content development companies on the cost-effective capture, manipulation and visualisation of 3-dimensional objects.

The Music Australia service appears to have very considerable potential for downstream collaborations, but requires active and willing participation from copyright agencies and copyright owners.

ScreenSound is a special case, because it is the primary collecting institution in a marketspace that is well-developed, and that requires the mobilisation of substantial funding in order to undertake a project. It accordingly needs to be examined quite specifically, rather than being generalised about within a broad report of this nature. In particular, it has been working closely with the commercial and content production sectors for much of its history, supplying them with critical historical footage and sound recordings on a cost recovery basis for use in documentaries, news broadcasts and movies.

On the other hand, ScreenSound is a one-of-a-kind collecting institution, and competition policy would seem very likely to require that it maintain a level playing-field in its dealings with downstream corporations. That is likely to severely limit the extent to which exclusive partnering and clustering are feasible.

5.6 Experiences from The Learning Federation Tenders

One of the objectives of this report was to assess the potential and effectiveness of the collaboration activities conducted by consortia developing content for the Learning Federation.

The Le@rning Federation is an initiative of State and Federal governments of Australia and New Zealand. Over the period 2001-2006 the Initiative aims to develop online interactive curriculum content specifically for Australian and New Zealand schools. The Initiative will support teachers in enhancing student learning thereby greatly improving educational outcomes for students.

The Learning Federation (TLF) through a sequence of tenders has issued 19 contracts over the past 18 months for the development of learning modules made up of Learning Objects. Learning Objects (LO) are a standard promoted by the US Department of Defence's Advanced Distributed Learning Project and the IMS Project to allow for the re-use, adaptation and "mix and match" of online learning material. LOs use a similar approach to METS having various containers for metadata and zipped packages of resources such as HTML and images. LOs must include XML based metadata covering the educational context, technical requirements, administrative and structural matters. Learning Objects are now becoming adopted as the approach for re-usability.

Because of the subject-matter of the TLF projects contracted to date, very few have required any input from collecting institutions to date. Only 1 of the 14 successful tenderers has been a museum (NMA), in that case partnered with a multimedia developer. 10 of the 14 have been content producers, in many cases in partnership with educational and subject area writers. 2 were

Universities. 9 of the 14 included at least one subcontracted organisation, most often writers, developers and University subject matter experts.

It is anticipated by TLF that, as these organisations gain experience in the area of Learning Objects and the subject area, they will work more closely with collecting institutions and take advantage of their depth of subject matter expertise and access to existing digital resources.

One commercial organization has been awarded three TLF contracts which required them to make a substantial investment in new tools and skills and complying with the TLF technical requirements and quality processes. After the pain of this period they now believe they are much better able to complete on the global market for production of Learning Objects.

This experience is also being echoed by the National Museum of Australia. They believe the rigorous processes and standards required by the TLF including detailed specifications and the usage of Learning Objects as a management and distribution strategy will be very beneficial.

Three of the difficulties of note facing developers of learning material are:

1/ Identification of organisations and individuals with specialist expertise in a particular subject area who can work with them

2/ Identification of relevant resources that are already available in digital form or can be readily and cost-effectively digitised.

3/ Obtaining the necessary IP permissions for the required usages of the desired material

Collaborations between the cultural and creative sectors do not arise naturally. Most small businesses will normally avoid collaborations because of the time and dollar cost of the additional layer of co-ordination, the potential for confusion in objectives and motivations, and the difficulties that arise because of the 'different rates of metabolism' as Tony Benson expressed it in the 1999 report to DCITA ('The IT Engine Room: SMEs in Australia's IT&T industry').

The TLF is seen by both sectors as the major potential "Commissioner" of the content projects that will make it worthwhile for Content Developers to work with Collecting Institutions. Clearly TLF in its role of a Commissioner is driving the adoption of Best Practice standards throughout its supply and customer chain because of the value and prestige of their development contracts. This is a model that can be applied in other areas.

5.7 Opportunities for Cluster Development

The term 'clustering' was originally applied to regionally-based collaboration, such as that in Silicon Valley, and in the North Italian industrial ceramics industries. Subsequently, however, its usage has been considerably broadened to cover many other kinds of collaboration.

On the basis of the interviews and analyses conducted, the following bases for clustering are apparent:

- co-location. This may be close, walking-distance proximity, as occurs on university campuses, in CBDs (as with the Powerhouse Museum and the ABC in Ultimo), in industrial estates, and for example in the Adelaide North Terrace arts precinct and now the Brisbane creative precinct. Or it may be same-town or same-district, short-drive proximity, as in the case of Melbourne's animation and interactive games clusters, and creative industries located in the vicinity of Fox Studios in Sydney;
- complementary holdings. Lateral collaborations among collecting institutions may seek to achieve the effect of combining their collections in a particular subject-matter, or inter-relating their holdings in two closely related areas. An example would be museums with strong holdings relevant to viticulture, wine-making and the cultural history of wine regions working

with local governments, the tourism industry and specialist enterprises within the creative industries;

- major events. In addition to Olympic and Commonwealth Games, regular arts festivals and film festivals, and special events such as Wagner's Ring Cycle in Adelaide, can provide a nucleus for partnerships and consortia that can outlive the event itself;
- major contracts. Long-running partnering and consortia can also emerge from collaborations to apply for R&D grants, for one-time funds such as specific government initiatives such as Federation Funds, and the Harradine Legacy in Tasmania; and to tender for major commissioned projects such as those currently being performed for TLF;
- personal networks. An important source of collaborative activity is people, including people who know other people (most commonly professionally, or through conference meetings, but sometimes personally), and people who know other organisations, whether by reputation or by having previously been employed there. The power of personal networks in the clustering process should not be under-estimated.

6. Summary of Findings

6.1 Digitisation

There is a high degree of awareness of digitisation within the cultural sector generally. All large collecting institutions have made considerable progress, but all are also impeded by a number of factors. The same impediments have resulted in medium-sized institutions being held back, and they are only now making headway. Most small institutions have made little progress to date, but some are taking advantage of available support, where it exists.

Progress to date is concentrated on digital imaging, particularly of primarily 2-dimensional objects. Moving beyond facsimile images to include extraction of text is a current trend, as is more sophisticated capture of 3-dimensional objects. Although voice-capture is increasingly in digital formats, conversion of existing analogue recordings in such areas as oral histories is much slower. Musical sound is increasingly attracting attention, but is held back by the uncertainties, costs and risk of litigation over copyright. Some progress is being made, nonetheless, in the area of linkage between music sound and digitised music manuscripts. For all but the specialist institutions, video is currently a low priority, and beyond their reach both technically and financially.

The drivers for digitisation are varied among institutions. This reflects their highly differentiated collection-types and holdings. Most have access as a major objective; and even among the most conservation-oriented institutions and programs there are planned spin-offs in favour of access. Most institutions are capturing in sufficiently high-resolution formats that most currently envisaged uses can be supported. There is, however, a strong focus on direct service to consumers. To date, demand from enterprises in the creative industries continues to be mostly sporadic, once-off requests, with little sense of relationship-building.

6.2 Digitisation Standards

The standards that are being applied by collecting institutions are fairly consistent across segments. That is to say that strong communications networks exists within the relevant professions. Libraries use the National Library of Australia as a reference-point. Coordination mechanisms also exist among museums, galleries, herbaria and zoological collection managers. The coordination mechanisms do, however, require support in order to place them on a more reliable and professionally-managed footing.

The storage formats that are being used by collecting institutions appear to create few significant impediments to the availability of digitised images to the creative industry. For example, although web-accessible images are low-resolution (commonly 72 dpi), almost all institutions have higher-resolution masters (mostly 300 dpi, but higher for some categories of objects, especially artworks). Assurance is needed that professional work on application of standards in Australia reflects the need for the creative industries to have access to appropriate-resolution digital objects.

6.3 Discovery

Discovery is highly dependent on catalogue completeness and quality. Some institutions are far from having completed the capture of their large catalogues into machine-readable form. Many still have much work to do in bringing the entries to a sufficient level to support efficient and effective curatorship. Digitisation adds to the cataloguing challenge, in that it creates new artefacts that need to be both documented, and related to the object from which they are derived; and in many cases it results in multiple new artefacts for each existing physical object. Modern XML-based collection management systems can cope with this, whereas legacy systems cannot. This leads to substantial work having to be done to co-ordinate two systems: one for digital and other for legacy analogue.

6.4 Inter-Sectoral Collaboration

The governing statutes of collecting institutions are of necessity to a considerable extent inward-facing. This is because of their responsibilities to collect, conserve and protect a vast volume of highly diverse objects of historical and cultural significance. In regard to access to their collections, institutions have an ethos that dictates equitable access by all Australians, and that ethos is stimulated and sustained by the terms of their objectives.

To date, corporations generally have operated on the fringes of the sector, primarily as sponsors and benefactors, and only from time to time as users of holdings as factors of production. It is uncommon for institutions to formally recognise the active supply of materials to business enterprises in the creative sector as a specific objective, and very uncommon for any such business enterprises to establish even informal partnering arrangements with collecting institutions.

In short, collaboration of any kind between the cultural and creative industry sectors has not yet been developed. This represents a major limitation on the achievability of the more sophisticated forms of collaboration such as clustering.

The following sub-sections utilise the activity model developed during the project as a framework for further investigating the nature of this problem.

6.4.1 Collecting Institutions' Channels to Market

Collecting institutions generally have access as a major function within their terms of reference. Access can be provided through several different channels to the ultimate users:

- direct. Access has most commonly been implemented by means of direct access by 'consumers' to the institutions' holdings, by means of consumer visits to the institution's premises, travelling exhibitions, mail-order sales, and in recent years web-based access;
- intermediated. Some instances exist in which access is provided through other parties. Examples include display and sales on premises of other parties, exhibitions on the sites of other parties, and loans of items to other parties for inclusion in their own exhibitions. An Internet equivalent is federated discovery schemes, whereby the institution's catalogue data is made available to a remote search-facility; and
- value-added. With intermediated access, the other party plays a largely neutral role, primarily making space available. The other party may, however, be an active participant, e.g. by combining the institution's material with material from elsewhere, arranging sponsorship, or taking intellectual leadership in the activity.

Value-adding parties have most commonly been other collecting institutions. The scope already exists for far more professional exploitation of the materials held by collecting institutions, and the scope is increasing as digitisation programs move forward. The for-profit creative sector is not currently closely engaged with collecting institutions, and the opportunity exists to encourage more constructive relationships.

6.4.2 Pre-Conditions for Downstream Collaboration

Great cultural richness is sustained within Australian Collecting Institutions. There are a number of pre-conditions for exploitation of that cultural richness. Important among them are:

- critical mass of digital materials to attract and hold the attention of Content Producers with the confidence that there “must be something there relevant and worthwhile”;
- holdings must be discoverable, and discovery must be feasible in a fairly finely-grained manner (e.g. a photograph of a woman with an umbrella in a 1920's Sydney street-scene, rather than of 'Hunter Street, Sydney, 1924');
- holdings must be previewable online to weed out the false positives;

- holdings must already exist in a sufficiently high-quality digital format, or be able to be so digitised, at relatively short notice, for costs that are commensurate with the value to the user;
- rights to re-use material in productions must be readily available and wherever possible based on a suite of pre-agreed templates or 'protocols'. In a regime in which every licence has to be individually negotiated and handcrafted, legal costs are unjustifiably high, and so are management and operational costs for all parties involved, and the resultant delays are so substantial as to undermine many initiatives;
- fulfilment should be online and ideally be in real-time.
- collecting institutions must be attuned not only to the needs and interests of consumers, but also to the somewhat different needs and interests of business enterprises in the creative industries that are seeking to apply their holdings for economic gain;
- business enterprises in the creative industries must engage with the cultural sector. This requires appreciation of the nature of their governing statutes and ethos, the business models and the institutional and funding constraints within which they work, as well as the kinds of holdings within the sector, and the means of discovering items of relevance to specific needs.

6.4.3 Commercial Drivers for Downstream Collaboration

Once these pre-conditions are satisfied, commercial drivers are needed, to generate economic activity. From the activity model developed in the course of conducting this project, there would appear to be the following possibilities:

- collecting institutions as driver. A considerable amount of active marketing is performed in the context of direct-to-consumer promotion of visits to institutions and to their web-sites. Communications with companies in the creative industries could be somewhat more actively pursued. Such a 'supply-push' model is, however, unlikely to be precisely enough attuned to rapidly changing fashions, and hence would not by itself provide sufficient impetus;
- agglomerated consumption as driver. It is feasible that the Internet will stimulate a new breed of consumer. Toffler long ago envisaged the rise of the 'prosumer', and consultants more recently have written about the prospects of e-communities concentrating demand, and expressing their needs sufficiently clearly, such that producer organisations can create product specifically for them. This 'ultimate-demand-pull' model is, however, unlikely to support the mobilisation of the significant funding needed to finance major projects, at least not in the short term;
- business enterprises in the creative industry as driver. Creative companies claim the abilities to detect the zeitgeist, to monitor changes in interests and taste, and to fashion new experiences that will catch the public's imagination. They should therefore be able to exercise 'mediated demand-pull' on behalf of consumers. On the other hand, much of the creative industry comprises small companies, which lack the access to funding needed to support major projects;
- entrepreneurs as driver. Where a lack of initiative is shown by the primary players in any industry, opportunities exist for an outside party to sew together deals, and extract considerable risk-taker's profit. This 'impresario model', or 'commissioner model' depends on confident individuals, with access to lines of funding, with the abilities both to detect circumstances in which cultural resources can be linked to demand and to devise and implement a plan to deliver an outcome.

There is little evidence of 'demand-pull' currently providing much impetus. There were only isolated mentions of corporations with the combination of vision and access to capital necessary to aggregate demand, or to invest in advance with the expectation of profits large enough to deliver sufficiently high returns. Indeed, many collecting institutions mentioned no for-profit corpora-

tions at all when this topic was discussed. Based on their experiences, their expectations were that the necessary impetus would only come from government. In the model developed in section 2.6, there is a dire shortage of the Commissioners needed to drive the process.

Several interviewees talked of The Learning Federation as such an initiative, in some cases positively, and in others less so, fearing that the average $300,000 per contract[1] was too small to enable serious work to be done on a one of basis. A strategy of being able to issue a contract to develop a sequence of 3 or 4 Learning projects to a consortium of Collecting Institutions and Content Developers would provide substantial benefits.

There is also little evidence of 'supply-push' from collecting institutions driving new business. This could eventuate, but only after the pre-conditions are fulfilled. The suggestions in the following section address this.

It is impracticable to attempt to legislate for entrepreneurship, only to vary the regulatory settings so as to ease restraints on it, to ensure infrastructure is available that lower the costs of participation, and provide some encouragement to it. There may also be a role for government in encouraging the cultural and creative sectors to organise themselves in such a manner that more entrepreneurs detect more opportunities.

1. Although future TLF projects may reach as high as $800,000 per title depending on the subject matter

7. Conclusions and Suggestions

This section offers a range of suggestions that the consultants consider, on the basis of the information gleaned from this project, would contribute to the overall objectives of the Creative Industries Cluster Study.

In the medium term (say 1-3 years from now), it may become feasible to directly address the question of stronger linkages between the cultural sector and the creative industries.

In the meantime, however, much foundation work still needs to be done, to enable collecting institutions to make sufficient progress with their digitisation activities, and to lay the foundations for meaningful interactions between the two sectors.

The majority of the suggestions are accordingly aimed at developmental aspects within collecting institutions, and at means of addressing the difficulties created by the current copyright regime. A smaller number relate to the links between collecting institutions and the creative industries, and to the stimulation of clusters.

7.1 Developmental Aspects Within the Cultural Sector

This first series of suggestions is intended to bring collecting institutions to the point at which they can play an active role in partnerships with business enterprises in the creative industries, and are motivated to do so.

S1.1 – Earmarked Funding Sources

It is suggested that consideration be given to the establishment of a national program to provide funding to support digitisation of holdings by cultural institutions, earmarked for:

- digitisation infrastructure (particularly digitisation equipment, high-capacity storage, and digital object management and cataloguing software);
- training in digitisation project planning, execution and management; and
- priority conversions (primarily additional trained labour).
- quality metadata including contextual information and structural mark-up to assist re-use

The conditions applying to bids for such funding would need to take into account the diversity of national, State and regional collecting institutions, and the practicalities of finding matching funds, multi-skilling, etc.

The project would take account of the now-completed SCRAN project, which funded the digitisation of the collections of Scottish institutions for use in the schools systems, online public use and commercial use. It is now generating significant funding from the licensing of digital content to business enterprises in the creative industries.

Digitisation programs in the Australian cultural sector appear to be significantly less well supported than those in countries such as the U.K. and Canada. For example, AMOL is provided with a small fraction of the funding of the equivalent services in Canada and even Scotland. This suggestion would go some way towards enabling Australian collecting institutions to catch up with their equivalents overseas, and hence recover some of the disadvantage that Australian creative industries suffer in this area.

S1.2 – Training for Technical, Curatorial and Operational Staff

It is suggested that consideration be given to an initiative in relation to the training of technical, curatorial and operational staff at collecting institutions, comprising the following:

- analysis of training requirements;
- design and development of a (say) 2-day course;

- preparation of resources to underpin the course, and to support technical, curatorial and operational staff on the job; and
- a touring programme, to send an appropriate instructor or instructors around the State and Territory capitals and selected regional centres, to deliver the course.

It is envisaged that the scope of such a course would include characteristics of digitisation, media, formats, and processes including capture, quality control and cataloguing.

It would be advisable for this initiative to leverage off existing professional and disciplinary networks in the area, and for copyright licences to be made available to ensure the subsequent availability of the materials for further training events, and for ongoing enhancement and updating.

S1.3 – Standards Services

It is suggested that a project be funded that will provide clear leadership and guidance on "Best Practice" for all collecting institution professionals in the areas of standards for formats, protocols, business and technical procedure, information models, metadata and controlled vocabularies.

The tasks would include:

- validation and refinement of the standards matrix provided in this report;
- preparation and publication of a consolidated set of links to, and short descriptions of, existing documentation, of standards, of business process descriptions, and of Best Practice case studies of their application, with recommendations applicable to each category of collecting institution;
- the allocation and funding of responsibilities to maintain the documentation;
- convincing all collecting institutions of the benefits of publishing the standards that they utilise;
- coordination of a rationalisation process in relation to controlled vocabularies suitable for Australian needs. This would take into account experiences of such undertakings as the U.K. High Level Thesaurus (HILT) project; and
- promotion of these standards and services to the various content production sectors via industry associations.

The project could use the information in this report as a starting-point, and would need to take account of the experience of such services as the U.K. Technical Advisory Service for Images (TASI), at http://tasi.ac.uk.

S1.4 – Business Development Seminars

It is suggested that consideration be give to an initiative in relation to business development within collecting institutions, comprising the following:

- analysis of the needs of senior executives in the area;
- design and development of one or more seminars;
- preparation of resources to underpin the seminars; and
- conduct of the seminars in a central location, bringing executives together for the express purpose.

These seminars could be usefully complemented by periodic conferences in digital collections, bringing together institutions' executives, curators and senior technical staff. In order to ensure maximum sharing of experiences, this should expressly aim at encompassing all categories of institution, rather than being specifically targeted at just, say, museums, or galleries, or libraries, or archives.

S1.5 – Digital Object Catalogue and Repository Software

It is suggested that consideration be give to an initiative in relation to the acquisition and maintenance by collecting institutions of the necessary tools to support cataloguing of digitised holdings, and management of digital object repositories.

Australia has world-leading products in this area, which are out of reach of many Australian institutions, especially among the regional and smaller State organisations. Two commercial Australian products of especial relevance are:

- EMu from KE Software of Melbourne, for collections management by museums, art galleries, herbaria and botanic gardens. See http://www.kesoftware.com/emu/index.html and http://weboldaust.mel.kesoftware.com/emu/overview.html;
- MAVIS from ScreenSound and Wizard IS in Canberra, for the management of collections of audiovisual analogue and digital material, objects, equipment, memorabilia and paper documentation. See http://www.wizardis.com.au/ns4/products/mavis/introducingmavis.html and http://www.wizardis.com.au/ns4/products/mavis/mavisfeatures.html.

Obvious potential approaches might comprise a bulk purchase of licences and technical support for collecting institutions; or the brokering of a small set of pre-negotiated licences that suit the needs of diverse Australian institutions. This would save them the transaction costs and delays involved in individual negotiations, and provide significantly less expensive access to the products. The advantages to the suppliers would be reduced marketing costs, cash flow, and a clear demonstration of the support of the Australian government, which is of value during negotiations overseas. Am alternate approach may well involve a number of Collecting Institutions collaborating on an Open Source implementation funded as part of a larger digitisation project.

S1.6 – A National PURL Resolver Service

It is suggested that consideration be given to the commissioning of a project to investigate and develop a proposal for a national ‘PURL Resolver Service’ available to all sectors, to provide assurance that resources will be able to be found at their Permanent Universal Resource Locator addresses. This would augment any existing internal resolvers, and help those without one.

There are considerable difficulties involved in ensuring the ongoing accessibility of the files in which digital content is stored. The generic solution to this problem is conventionally referred to as a Permanent Universal Resource Locator (PURL). PURLs need to be 'resolved', i.e. translated into the current address where the file is to be found. This in turn requires that a database be maintained, and periodically checked and updated. The National Library operates such a 'resolver service' for some categories of its own files. The State Library of Tasmania is currently implementing a resolver service for one particular purpose that it intends generalising to additional categories of files.

S1.7 – Pilots

It is suggested that funding be earmarked for pilot projects designed to produce knowledge that will overcome key impediments identified in this Report.

Pilots are vital to progress. Central or pooled funding can enable many institutions with related needs to learn a considerable amount about new technologies or processes, without duplicating experiments and causing undue upheavals to their operations.

Of especially value are pilots that have sufficient scope to generate spin-offs in the form of expertise and technology. Structuring pilots so as to ensure collaboration with downstream organisations may help to increase alignment and understanding.

The choice of pilot location can be critical. In some cases, a particularly sophisticated and/or large institution may be well-placed to use relatively modest funds to conduct an experiment, demonstration, or proof-of-concept utilising extensions of existing infrastructure (e.g. Music Australia). On the other hand, projects that are checking the effects of scale, or comprehensibility, or that need to be trialled against a broad public (rather than the sub-set of the public that is prepared to pay an entrance fee) may be best performed in a small, regional institution. Meanwhile, those that are inherently cross-disciplinary in nature are most likely to be effective in multi-functional institutions, such as TMAG or QVMAG.

S1.8 – Exploitation of Pilots

It is suggested that the outcomes of pilot projects be communicated through appropriate channels such as newsletters and conferences, be made available in digital format, and be made discoverable through relevant entry-points.

Successful pilot projects are not always used as fully as they might be. The work is not completed until the story has been documented in case study form, and communicated to parties that can gain from the know-how that has been generated. This can be valuably augmented by site-visits and presentations.

In some cases the delays in obtaining budgets for exploitation of the outcomes of successful pilots have been so long that the original team has dispersed or the technology has changed. The moment is easily lost when a successful pilot could have been scaled to successful full-scale project which could have had a substantial impact. Specific exploitation budgets and policies would increase the success rate of pilots going mainstream.

The same principles can be applied to projects that were not actually conceived as pilots, but whose outcomes are of broad interest and which can be regarded as beacon case studies (or, indeed, as failures whose lessons need to be assimilated). Examples of beacon case studies might include the Australian War Memorial's use of metadata for discovery and its establishment of an eCommerce site, and the Australian Virtual Herbarium's brokered discovery scheme, the approaches to the building of strong lateral collaborations taken by Picture Australia and Music Australia, and the State Library of Tasmania’s PURL Resolver project.

7.2 Intellectual Property

There are issues related to intellectual property including issues of perception of relevant legislation and its impact on management of intellectual property which are seen as impediments to digitisation by collecting institutions, and hence collaborations and clustering.. The following suggestions are designed to address these issues:

S2.1 – Copyright Law

It is suggested that consideration be given to an initiative to examine the extent to which copyright law or its current management creates impediments to the work of collecting institutions, in such areas as collection management, research, educational programs and exhibitions, and the measures available to address the issues.

S2.2 – The Digital Agenda Amendment Act

It is suggested that consideration be given to encourage collecting institutions to make a combined submission to the current review of the Copyright Amendment (Digital Agenda) Act, in order to consolidate information about its effects on the management practices of the collecting institutions.

S2.3 – Copyright Clearance Mechanisms

It is suggested that consideration be give to an initiative to examine the processes whereby collecting institutions identify the ownership of intellectual property rights, and seek and gain copyright clearances, and the scope for reducing the costs and delays involved, e.g. through:

- changes to the law;
- nation-level negotiations with representatives of intellectual property rights-owners; and
- infrastructure to facilitate discovery and clearance, such as a rightsholder directory service: or
- services perhaps in conjunction with collecting societies.

S2.4 – Copyright Clearance Infrastructure and Services

It is suggested that consideration be given to an initiative to establish a scheme to enable licensing to be achieved quickly and efficiently.

A first step towards overcoming this impediment may be the establishment of a small set of copyright licence templates or 'protocols' that will cover 90% of the situations faced by CIs.

This needs to be combined with an entry-point that provides discovery, licence acquisition and payment services. This would very substantially reduce the staff time, cost and elapsed time to negotiate and acquire licences of various types. An example of this functionality is seen in the AEShareNet service which performs all of these functions but which, at this stage, is focussed primarily on the needs of the Vocational Education & Training and other education sectors.

This may be a commercial opportunity for a for-profit enterprise. It seems more likely, however, that it will need to be performed by a collective of institutions, or an industry association operating a not-for-profit service. The establishment of such an initiative is likely to be dependent on direct government funding, as was the case with AEShareNet for the vocational education and training (VET) sector.

S2.5 – Rights Expression Language

It is suggested that cultural and creative industries be encouraged to implement an appropriate rights expression language.

Collecting Institutions need to be encouraged to add more sophisticated rights and rightsholder information management functionality to their Collection Management Systems. It is important that all of these copyright management systems utilise the same digital rights expression language and information model, which also needs to address different media types, delivery technologies, markets and business requirements.

The copyright licence templates mentioned above would also be expressed in the rights expression language so that access and usage management systems can implement and honour the source agreements. Downstream systems can also interpret and act on licenses issued by Collecting institutions expressed in XML and embedded in or accompanying the content.

S2.6 – Rights Enabled Collection Management Systems

It is suggested that the extension of existing content and collection management systems to interface with rights management schemes be actively encouraged.

The copyright management system functionality needs to be either integrated within or interfaced to at least KE Software's EMu, and perhaps also with MAVIS from ScreenSound/Wizard.

S2.7 Education and Training

It is suggested that consideration be given to the development of a comprehensive program to improve expertise amongst collecting institutions in the understanding and management of intellectual property matters.

7.3 Linkages Between Collecting Institutions and the Creative Industries

The following suggestions are intended to enhance communications between the cultural and creative sectors, and thereby facilitate various forms of collaboration, including partnering and clustering.

S3.1 – Channels of Communication

It is suggested that measures be investigated to enhance the channels of communication from collecting institutions to business enterprises within the cultural industries. These are needed to ensure that relevant companies are aware of current research areas, collection foci, and ideas for themed exhibitions. In particular:

- collecting institutions should be encouraged to complement their marketing to consumers and schools, by enhancing, and where necessary initiating, promotional communications targeted at business enterprises in the creative sector;
- large institutions may perform this individually;
- groups may find advantages in forming lateral clusters within geographical areas (e.g. the Sydney museums and galleries projecting to Fox Studios, and the Melbourne institutions to the local computer games industry);
- there may also be value in an appropriate national organisation playing a coordinative role in the maintenance of contact-lists, and the preparation of regular periodicals.

S3.2 – Digitisation of Touring Exhibitions

It is suggested that a program be developed whereby collecting institutions are actively encouraged to directly involve enterprises from the creative industries in the conception and planning of new touring exhibitions.

Such a program would need to bring together the relevant curators from each of the main collecting institutions involved, the senior staff responsible for digitisation, and business enterprises with appropriate skills. This might be achieved through, for example, specialist workshops, for which travel and venue costs were covered by an earmarked fund.

7.4 The Stimulation of Clusters

This final series of suggestions is intended to provide some impetus towards clustering, as required under the project's terms of reference. As has been argued above, however, the pre-conditions for clustering to occur are not yet satisfied, and it is not considered that measures such as these will be effective, without the prior foundational measures suggested in the three preceding sub-sections.

In general, it is suggested that the focus be on programs in the high-payback areas of music, animation and video.

S4.1 – Case Study of ScreenSound and Potential Functional Clustering

It is suggested that more detailed study be undertaken of especially promising opportunities for downstream collaboration, centred around ScreenSound and its relationships with creative industry business enterprises, including TV channels, particularly the ABC, including the role of the

MAVIS package in enabling those relationships. The scope of the project would need to extend to the question as to whether it could better perform its role if it were established by the Parliament as the compulsory deposit institution for films, videos and published CD-ROMs and DVDs.

S4.2 – Assessment of Music Australia as a Nucleus for a Functional Cluster

It is suggested that a more detailed study be undertaken of the potential for Music Australia to stimulate innovation both in the music industry and in other creative industries that use music. It may be that, with the explosive growth in Apple's iTunes Music Store during its first few weeks of existence, the way may be becoming clear as to how to overcome the blockage that has plagued the Record industry since the advent of P2P tools.

Such a project would need to map the landscape of the Australian music and related industries, conduct consultations with senior executives in key industry associations and corporations, research and "bless" appropriate standards and examine the scope for efficient, web-based copyright clearance and licensing services.

S4.3 – Assessment of the Education Sector as a Nucleus for a Functional Cluster

It is suggested that a detailed study be undertaken of the potential for initiatives in the education sector to stimulate innovation both in the cultural sector and the creative industries. In particular, it may be possible to encourage TLF to adapt its objectives, scope and/or modus operandi to better encourage clustering.

Such a project would, however, need to reflect the specific needs of the education sector, and involve all of the relevant portfolio departments.

S4.4 – Case Studies of Regional Clustering

It is suggested that more detailed study be undertaken of especially promising opportunities for collaboration within a restricted regional area. Three prospects for this are:

- the Victorian interactive games industry together with the various Melbourne-based collecting institutions, especially Museum Victoria, in view of the considerable progress it has made in its digitisation program;
- a Sydney-based cluster, including collecting institutions in conjunction with Fox Studios; and
- the northern Tasmanian area, including QVMAG and the Launceston Digital Development Forum.

In each case, the full gamut of factors should be defined to be within scope, including business models, alternative partnering arrangements, standards, and imaginative solutions to the many copyright impediments.

S4.5 – Demonstrator Projects in Advanced Visualisation

It is suggested that consideration be given to the funding of one or more demonstrator projects in the area of 3-dimensional modelling and visualisation particularly of Australian fauna and flora, involving one or more collecting institutions such as Museum Victoria, university centres (such as the super-computing facility APAC and the high-bandwidth network GrangeNet), and one or more relevant business enterprises from the creative industries.

S4.6 – Demonstrator Projects in Open Public Access to Catalogues

It is suggested that consideration be given to the funding of one or more demonstrator projects in the area of public access to catalogues via web-forms. This would involve one or more collecting institutions such as Museum Victoria, supplier KE Software, and relevant business enterprises from the creative industries.

Appendix A: Conduct of the Assignment

A Project Plan and Schedule was agreed at the outset of the Project on 16 April 2003. This was adhered to, with minor timing variations.

Stage 1 (Planning and Identification) commenced with a Launch Workshop, during which a small group exchanged information on standards, collecting institutions, relevant downstream organisations, and people with expertise in the area. The participants were the members of the Xamax and DCITA Project Teams, Debbie Campbell from the National Library, and Adrian Cunningham from the National Archives of Australia.

A Background Paper for interviewees was developed and reviewed. The schedule of institutions to be interviewed was discussed and articulated. A template for the conduct of interviews was developed and reviewed. An initial draft of the report structure was produced and reviewed. An activities model of the value-chain linking the collecting institutions and the cultural industries was prepared and reviewed. Lists of standards were compiled, and a matrix developed to provide better structure than mere lists can offer. Preliminary consultations were held, and desk research performed on institutions and standards. Stage 1 was completed on time on 23 April, despite the intervention of Easter and Anzac Day.

Stage 2 (Research and Consultation) required that arrangements be made to conduct lengthy face-to-face interviews with over 20 people in collecting institutions in over a dozen locations in 5 cities. Consultees included senior executives and managers and busy senior technical staff. Participants showed a great deal of willingness and enthusiasm, and provided a great deal of detail, reflecting the timeliness of the study.

In parallel, further research was conducted into key standards, and telephone and face-to-face contact was made with a dozen important players in the creative industries downstream from the collecting institutions. The report outline was further articulated. A mid-project report was submitted, including review of the project risk factors. Stage 2 was completed on time on 7 May, with the remarkable result of only a single one of the originally planned interviews not being able to eventuate.

State 3 (Analysis and Data Capture) involved capture of the large amount of data arising from the meetings, and assimilation of the written material that was gathered. Analysis was undertaken, copies of the reports were sent to the consultees for review, and follow-up undertaken. Stage 3 was completed on time on 14 May.

Stage 4 (Drafting and Editing) involved the preparation of the report in a sufficiently advanced form for the DCITA Project Team to undertake review. Stage 4 was completed on time on 23 May.

Stage 5 (Production of the Final Report) was completed on time on 9 June 2003.

Appendix B: Consultations Schedule

Interviewees Schedule	Interviewee	Position	URL	Interviewer
National Archives Of Australia	Adrian Cunningham		http://www.naa.gov.au	Roger Clarke and Peter Higgs
National Library Of Australia	Debbie Campbell		http://www.nla.gov.au	Roger Clarke and Peter Higgs
National Museum of Australia	Darren Peacock		http://www.nma.gov.au	Peter Higgs (by phone)
ScreenSound, Canberra	Ron Brent	Director (Former)	http://www.screensound.gov.au	Roger Clarke and Peter Higgs
	Pam Saunders	Deputy Director Collection and Technology Services		
	David Boden	Senior Manager, Preservation and Technical Services		
	Ian Gilmour	Engineering and Research		
Music Australia At The NATIONAL LIBRARY OF AUSTRALIA, CANBERRA	Mary Louise Ayres		http://www.musicaustralia.org	Roger Clarke and Peter Higgs
Picture Australia At The NATIONAL LIBRARY OF AUSTRALIA, CANBERRA	Tony Boston		http://www.pictureaustralia.org	Roger Clarke and Peter Higgs
Australian Centre For The Moving Image (ACMI), Melbourne	Simon Pockley	Collections Manager	http://www.acmi.net.au/	Peter Higgs
National Gallery Of Victoria	Helen Page		http://www.ngv.vic.gov.au	Peter Higgs
Museum Victoria	Tim Hart	Director Outreach, Information Technology and Multimedia	http://www.museum.vic.gov.au	Peter Higgs
Powerhouse Museum, Sydney	Kevin Sumption	Associate Director Division of Knowledge and Information Management	http://www.phm.gov.au	Peter Higgs
Australian Museums and Galleries Online (AMOL)	Basil Dewhurst	Technical Producer AMOL	http://amol.org.au	Peter Higgs
Tasmanian Museum And Art Gallery	Bill Bleathman	Director	http://www.tmag.tas.gov.au/	Roger Clarke

	Alison Melrose	Co-ordinating Curator (Information Services)		
	Dr Andrew Rozeselds	Deputy Director Collections and Research		
State Library	Lloyd Sokvitne	Senior Manager (System Support and Development)	http://www.statelibrary.tas.gov.au/	Roger Clarke
	Jan Lavelle	Systems Librarian, Service Tasmania Online		
Queen Victoria Museum And Gallery	Chris Tassle	Acting Director	http://www.qvmag.tas.gov.au/communitycoll.html	Roger Clarke
	Martin George	I.T. Manager		
	John Leeming	Photography Manager		
The Learning Federation (TLF), Melbourne	Susan Mann	Chief Operation Officer	http://www.thelearningfederation.edu.au	Peter Higgs
	Stuart Tait	Manager Market Information and Research		
Crank Media Pty Ltd	Tony Holzner		http://www.crankmedia.com.au	Roger Clarke
Allette Systems	Nick Carr	Managing Director		Peter Higgs
Wizard Information Services	Tony Robey	CEO	http://www.wizardis.com.au/	Roger Clarke and Peter Higgs
	Brenton Lovett,	Senior Systems Architect,		
Brainwaave Interactive	Tom Kennedy	CEO, Chair Internet Industry Association, and Boardmember AFC	http://www.brainwaave.com.au/	Peter Higgs
Australian Interactive Media Industry Association	Sandra Davey	President	http://www.aimia.com.au/	Peter Higgs
	Louise Van Rooyen	Executive Director		
University Of Tasmania	Christine Goodacre	Director, Flexible Education Unit	http://www.utas.edu.au	Roger Clarke (by Phone)
Tasmanian ECommerce Centre (TECC)	Anthony Rowley		http://www.tecc.com.au/	Roger Clarke
Open Training And Education Network (TAFE NSW/OTEN)	Tim Hand	Education & Training manager	http://www.oten.edu.au/oten/	Peter Higgs

Appendix C Background Information Provided to Consultees

A consultancy assignment is being undertaken on behalf of the Film and Digital Content Branch of the Commonwealth Department of Communications, Information Technology and the Arts (DCITA). It is part of a program called the Creative Industries Cluster Study. The purpose of the Study as a whole is to examine digital content and applications, and the scope for collaborations of various kinds to exploit and enhance Australia's capabilities in the area.

As part of the third phase of the Study, Roger Clarke of Xamax Consultancy and Peter Higgs of Content Strategies have been engaged to report on several aspects of the activities of collecting institutions such as art galleries, libraries, museums and archives. The consultants are seeking the cooperation of a small number of selected collecting institutions. The topics that they would like to discuss with key staff at those institutions are as follows:

- Digitisation Policies and Programs:
  - what is the primary driver for digitisation, i.e. is it perceived as a strategic matter, or is it a response to requests for access to particular materials
  - what approaches are being adopted to the creation of digital content
  - which parts of institutions' collections have been prioritised, and why
  - is the work insourced or outsourced, and will that pattern change
  - how much progress has been made
  - through what channels is institutions' digital content being promoted
  - through what channels is institutions' digital content being disseminated
  - are difficulties being experienced in relation to intellectual property
  - what other impediments exist, and how might they be addressed
- Technical Standards for digital content, its discovery, its transmission, its provision to content integrators, its provision to delivery channels and directly to consumers, and the management of intellectual property rights:
  - which standards are currently being applied
  - which standards are being considered
  - which emergent standards appear promising
- Collaborations, in order to better exploit available digital content:
  - in what ways are collecting institutions cooperating with one another
  - with what other organisations are collecting institutions currently engaging, particularly 'downstream' organisations that exploit content or disseminate it
  - how well have the relationships and projects performed
  - what additional opportunities exist for clustering
  - what impediments exist, and how might they be addressed

Appendix D: Schedule of Relevant Standards

Sorted by Type of Standard and Domain

Type of Standard	Domain of Standard	Acronym	Name	Managing Body	URL	Primary Sectors
Architecture	Preservation & Admin, Presentation & Discovery, Production & Distribution	IMS Repository	IMS Digital Repositories Specification	IMS Global Learning Consortium, Inc.	http://www.imsglobal.org/digitalrepositories/index.cfm	Education Library
MD_Controlled Vocabularies	Presentation & Discovery, Preservation & Admin	MODS version 2.0	Metadata Object Description Service	Library of Congress	http://www.loc.gov/standards/mods/	Library
MD_Controlled Vocabularies	Presentation & Discovery, Production & Distribution, Preservation & Admin, Structure & Action	XML Schema	XML Schemas	W3C	http://www.w3.org/XML/Schema/	Library Museum Gallery Archives Education Content_Production
MD_Controlled Vocabularies MD_Framework Elements	Rights	<indecs>	Indecs Metadata Rights Dictionary		http://www.indecs.org/	
MD_Framework Elements	Presentation & Discovery	DCMI	Dublin Core Metadata Initiative	Dublin Core Metadata Initiative	http://dublincore.org/documents/dcmi-terms/	Library Museum Gallery Archives Education
MD_Framework Elements	Presentation & Discovery	HTML	Hyper Text Markup Language	W3C		Library Archives Education Gallery Museum Content_Production
MD_Framework Elements	Presentation & Discovery, Preservation & Admin	EdNA Metadata Application Profile	Metadata Application Profile		http://standards.edna.edu.au/metadata/	Education Content_Production
MD_Framework Elements	Presentation & Discovery, Production & Distribution, Preservation & Admin, Structure & Action, LifeCycle	METS	Metadata Encoding & Transmission Standard	Library of Congress	http://www.loc.gov/standards/mets/METSOverview.html	Library
MD_Framework Elements	Presentation & Discovery, Production & Distribution, Preservation & Admin, Structure & Action, LifeCycle	XML	eXtensible MarkUp Language	WorldWideWeb Consortium	http://www.w3.org/	Library Archives Education Content_Production Gallery Museum
MD_Framework Elements	Preservation & Admin, Presentation & Discovery	SGML	Standard Generalized Markup Language		http://xml.coverpages.org/sgml.html	Library Archives Education Content_Production
MD_Framework Elements	Rights	XrML	eXtensible Rights Markup Language		http://www.xrml.org/	Content_Production

MD_Framework Elements MD_Controlled Vocabularies		ARIADNE			http://www.ariadne-eu.org	Education
MD_Framework Elements MD_Controlled Vocabularies		CEN/ISSS WS-LT			http://www.cenorm.be/isss/Workshop/lt	Education
MD_Framework Elements MD_Controlled Vocabularies	Presentation & Discovery, Preservation & Admin	AGLS	Australian Government Locator Service		http://www.naa.gov.au/recordkeeping/gov_online/agls/summary.html	Archives
MD_Framework Elements MD_Controlled Vocabularies	Presentation & Discovery, Production & Distribution, Preservation & Admin, Structure & Action, LifeCycle	MPEG-7	MPEG Multimedia Content Description Interface		http://mpeg.telecomitalialab.com/standards/mpeg-7/mpeg-7.htm	Content_Production Gallery Museum Education
MD_Framework Elements MD_Controlled Vocabularies	Preservation & Admin, LifeCycle	MARC	Machine Readable Cataloguing		http://lcweb.loc.gov/mets/	Library
MD_Framework Elements MD_Controlled Vocabularies	Preservation & Admin, Presentation & Discovery	CIDOC CRM	CIDOC Conceptual Reference Model		http://cidoc.ics.forth.gr/	Museum
MD_Framework Elements MD_Controlled Vocabularies	Preservation & Admin, Production & Distribution, Presentation & Discovery, Structure & Action	LOM	Learning Object Metadata		http://ltsc.ieee.org/wg12/index.html	Education
MD_Framework Elements MD_Controlled Vocabularies	Production & Distribution	MXF	Material Exchange Format	SMPTE, MPEG	http://www.pro-mpeg.org/mxf.htm	Content_Production Archives
MD_Framework Elements MD_Controlled Vocabularies	Production & Distribution, Presentation & Discovery, Structure & Action	ADL/SCORM	Sharable Content Object Reference Model	Advanced Distributed Learning (ADL) Initiative	http://www.adlnet.org/	Education
MD_Framework Elements MD_Controlled Vocabularies	Production & Distribution, Preservation & Admin, LifeCycle	BBC SMEF DM	Standard Media Exchange Framework	BBC	http://www.bbc.co.uk/guidelines/smef/	Content_Production
MD_Framework Elements MD_Controlled Vocabularies	Rights	ODRL	Open Digital Rights Language	ODRL Initiative	http://www.odrl.net/	Library Museum Gallery Archives Education Content_Production
MD_Framework Elements MD_Controlled Vocabularies	Rights	MPEG-21 –	MPEG Multimedia Framework	ISO	http://mpeg.telecomitalialab.com/standards/mpeg-21/mpeg-21.htm	Content_Production

MD_Framework Elements MD_Controlled Vocabularies	Transactions, Presentation & Discovery	ISO 8459-5:2002 (DR 03101 CP)	Information and documentation - Bibliographic data element director	ISO		
MD_Unique Identifiers	Presentation & Discovery, Preservation & Admin	ISBN	International Standard Book Number	The International ISBN Agency	http://isbn-international.org/html/userman/usm4.htm	Library
MD_Unique Identifiers	Presentation & Discovery, Preservation & Admin	ISRC	International Standard Recording Code	International Federation of the Phonographic Industry	http://www.nlc-bnc.ca/iso/tc46sc9/standard/3901e.htm#Intro	
MD_Unique Identifiers	Presentation & Discovery, Preservation & Admin	ISRN	International Standard Technical Report Number	ISRN Registration Authority		Library Archives
MD_Unique Identifiers	Presentation & Discovery, Preservation & Admin	PII	Publisher Item Identifier	American Institute of Physics	http://www.aip.org/epub/piius.html	Library
MD_Unique Identifiers	Presentation & Discovery, Preservation & Admin	SICI	Serial Item Contribution Identifier		http://sunsite.berkeley.edu/SICI/	Library
MD_Unique Identifiers	Presentation & Discovery, Preservation & Admin, Structure & Action, LifeCycle, Production & Distribution	DOI	Digital Object Identifier	DOI Foundation	http://www,doi,org	Library Museum Gallery
MD_Unique Identifiers	Presentation & Discovery, Production & Distribution, Preservation & Admin, Structure & Action	ISAN	International Standard Audiovisual Number		http://www.nlc-bnc.ca/iso/tc46sc9/isan.htm	Museum Library Gallery
Media Formats	Presentation & Discovery	MP3	ISO MPEG 1 Audio Layer 3	MPEG	http://mpeg.telecomitalialab.com/	Archives
Media Formats	Presentation & Discovery	PNG	Portable Network Graphics	WorldWideWeb Consortium	http://www.libpng.org/	Library Archives Gallery Museum Education Content_Production
Media Formats	Presentation & Discovery	SVG	Scalable Vector Graphics	WorldWideWeb Consortium	http://www.w3.org/TR/SVG/	Library Museum Gallery Education Content_Production
Media Formats	Presentation & Discovery	XHTML	Extensible HyperText Markup Language	W3C	http://www.w3.org/TR/xhtml1/	Library Museum Gallery Education Content_Production

Media Formats	Presentation & Discovery, Production & Distribution	AAC	MPEG-2 Advanced Audio Coding	MPEG	http://mpeg.telecomitalialab.com/standards/mpeg-4/mpeg-4.htm#3.4	Archives Museum Library Gallery Education Content_Production
Media Formats	Presentation & Discovery, Production & Distribution, Preservation & Admin	JPEG2000 (.jp2)	JPEG Image Compression Standard		http://www.jpeg.org/JPEG2000.html	Library Museum Gallery Archives Education Content_Production
Media Formats	Presentation & Discovery, Production & Distribution, Preservation & Admin, Input & Capturing	TIFF	Tagged Image File Format			Library Museum Gallery Archives Education
Media Formats	Presentation & Discovery, Production & Distribution, Preservation & Admin, Structure & Action	VRML	Virtual Reality Modelling Language	Web3D Consortium	http://www.web3d.org/fs_technicalinfo.htm	Library Museum Gallery Education Content_Production
Media Formats	Presentation & Discovery, Production & Distribution, Structure & Action, LifeCycle	MPEG4	MPEG Video Format	MPEG4 Industry Forum	http://www.m4if.org/	
Media Formats	Preservation & Admin, Production & Distribution, Presentation & Discovery	RTF	Rich Text Format V 1.5	Microsoft	http://www.biblioscape.com/rtf15_spec.htm	Library Archives Education
Media Formats	Structure & Action	DND CALS DTD 2.0	Continuous Acquisition and Lifecycle Support DTD	CANADIAN DEPARTMENT OF NATIONAL DEFENCE		Archives
Media Formats	Structure & Action	EAD	Encoded Archival Description	Library of Congress	http://lcweb.loc.gov/ead/	Archives Library Museum Gallery
Media Formats	Structure & Action, Input & Capturing	TEI DTD	Text Encoding Initiative Guidelines for Electronic Text Encoding and Interchange		http://www.tei-c.org/Guidelines2/index.html	Library Archives
Media Formats	Transactions	DPX	File Format for Digital Moving-Picture Exchange		http://www.smpte.org/	
Processes	Input & Capturing, LifeCycle	JIDI	The JIDI Digitisation Model		http://www.tasi.ac.uk/advice/managing/jidi_model.html	Library Museum Education
Processes	Presentation & Discovery, Preservation & Admin	ISSN	International Standard Serial Number	ISSN International Centre	http://www.issn.org:8080/pub/	Library
Processes	Presentation & Discovery, Production & Distribution	IMS Package	IMS Content Packaging Specification	IMS Global Learning Consortium, Inc.	http://www.imsglobal.org/content/packaging/index.cfm	Education Content_Production

Processes	Preservation & Admin, Structure & Action, LifeCycle, Input & Capturing	Spectrum	SPECTRUM: The UK Museum Documentation Standard	MDA (UK)	http://www.mda.org.uk/spectrum.htm	Museum
Protocols		CQL	Common Query Language		http://www.loc.gov/z3950/agency/zing/cql/index.html	Library
Protocols		IT019 2427	Directories of libraries	IT-019	https://committees.standards.com.au/COMMITTEES/IT-019/PROJECTS/2427	Library Museum Gallery Archives
Protocols		SOAP	Simple Object Access Protocol V1.1		http://www.w3.org/TR/SOAP/	
Protocols		Zoom	Z39.50 Object-Orientation Model	Library of Congress	http://zoom.z3950.org/index.html	Library Museum Gallery Archives
Protocols	Parties	Liberty	Federated Identity Web Services	Liberty Alliances	http://projectliberty.org	Library Museum Gallery Archives Education Content_Production
Protocols	Presentation & Discovery	SRU/WS	Search/Retrieve Web Service		http://www.loc.gov/z3950/agency/zing/srw/background.html	
Protocols	Presentation & Discovery	Z39.50	Z39.50 Retrieval Protocol	Library of Congress	http://lcweb.loc.gov/z3950/agency/	Library
Protocols	Presentation & Discovery, Transactions	OAI	Open Archives Initiative		http://www.openarchives.org/	Archives Library Gallery Museum
Protocols	Transactions	WSDL	Web Services Description Language (WSDL) 1.1		http://www.w3.org/TR/wsdl	
Protocols	Transactions, Presentation & Discovery	UDDI	Universal Description, Discovery and Integration		http://www.uddi.org/	
Protocols MD_Unique Identifiers	Presentation & Discovery, Production & Distribution, Preservation & Admin	PURL	Persistent Universal Resource Locator		http://purl.org/	Archives Gallery Museum Library Education Content_Production

MD is used as the abbreviation of Metadata