SMART INTERNET TECHNOLOGY CRC

Cultural Institutions and Web 2.0

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Summary

The document reports upon an exploratory survey of the approaches that Australian cultural institutions are implementing to meet Web 2.0 challenges. It is given context by a review that is made of Web developments in order to characterize Web 2.0 applications. A sample of applications that have been undertaken internationally and locally are described under the headings ranging from business resources through to exhibitions, professional development and youth outreach in order to explore strategies for implementation.

The applications serve to introduce business and technical issues that have arisen, including those involved in forming partnerships with peer institutions and with major Internet services. A discussion section follows in which challenges and opportunities relating to management and software support are identified under the headings: Access, Audiences, Authority, Collaboration, Current Awareness, Metadata, Policy, Publishing, Records retention, Rich Web applications, Seeding, Skills and Statistics.

These are seen as common to those convergent areas of application where large repositories are endeavouring to enhance the digital access to their records and information artefacts, and engage patrons further. Each area represents a prospective domain of investigation for research institutions or the cultural institutions themselves. A conclusion summarises these findings with respect to the role that cultural institutions can play in improving access to and involvement with the cultural heritage.

Introduction

'Web 2.0' is an expression that is used to suggest an evolution of the Web as a platform that is more supportive of social interaction. The platform idea was put forward at a 2004 conference (MediaLive International & O'Reilly Media, 2004). The expression has subsequently been criticized by some as meaningless, or more charitably as something that merely represents a state of mind. For example collaborative creation of databases among broad communities on the Web long preceded Web 2.0 suggestions. Nevertheless the term has gained currency while having its definition continually tweaked. An alternative moniker that also has some currency is the 'two-way web'. In either case participants are now active contributors through open interfaces, rather than passive consumers. Within this framework the platform is now seen to provide for:

- Fostering of social networking so that common interests may be developed collaboratively utilizing various media, and irrespective of geographic remoteness.
- Reutilization of information from multiple sources in a personalized way supported by network technologies that approach the capabilities of desktop applications.
- Constructive interaction between organizations and their patrons, so that services may be contributed to and improved by their own user communities.

For the purpose of this study 'cultural institutions' are those organizations open to the general public that house information artefacts representative of national culture, namely galleries, museums, libraries and archives. They provide repository and access services for both general and specialist communities, and use the artefacts for research or exhibition.

Cultural institutions have the opportunity to foster Web 2.0 applications by improving access to their resources by:

i. Developments in access or resource unification. These may be achieved by standardizing search protocols across databases, or by grouping or clustering intermediate metadata for distributed databases.

ii. Seeding of non-repository systems such as online encyclopedias to provide links into their own databases.

iii. Contributing to integrated use of resources through distributed databases or mashups that add value to the databases.

iv. Dissemination of information through facilities provided and maintained by an organization such as podcasts, blogs, wikis, and RSS feeds.

They may also cater for improved patron engagement by providing for:

i. Joint description of resources, for example by enabling users to provide tags that supplement institutional metadata.

ii. Interactive spaces that through open interfaces provide for commentary such as feedback or rating of institutional artefacts.

iii. Contribution to shared resources, for example by enabling provision of patron-supplied images or sounds within distributed databases.

iv. Contributions to socially constructed material such as blogs and wikis that may be maintained by patrons of the institutions.

v. Utilization of rich Internet applications that provide for interactivity comparable to desktop applications through association of dynamic display and interaction with standards-based data interchange and presentation.

vi. Support for user integration of resources by contributing to mashups constructed by patrons.

This background to cultural institutions and Web 2.0 provided the catalyst of an exploratory study carried out as a corporate project for Smart Internet Technology CRC Pty Ltd (Smart Internet) on behalf of Wizard Information Services, a Participant in the CRC through the ACT Consortium. The corporate project plan was authored by Brenton Lovett, Chief Technical Architect, Wizard Information Services.

Its aim was to undertake a brief survey of the strategies being implemented by Australian cultural institutions to come to terms with Web 2.0 development, and meet challenges. This has been complemented by some consideration of management and technical issues that have been reported in the literature. The work leads to some findings that should inform both the institutions and the Australian research and development community of issues and opportunities relating to enhanced provision of access to Australian cultural heritage.

Investigative method

The exploratory study was undertaken by means of literature review, and investigation of websites. This was complemented by several focus group sessions and unstructured personal interviews with a number of key personnel working in a variety of cultural institutions. Given the time constraints, this was undertaken by identifying some representative institutions operating at national and state level, and seeking interviews with relevant parties in those organizations.

A list of individuals consulted is provided in Appendix 1. An interview protocol was used to support the process.

Web 2.0 applications

The ideas expressed in the aforementioned web-development conference were expanded upon at length by O'Reilly (O'Reilly, 2005) where he presented a 'meme' map of the Web as platform, advancing it as a shared pattern of understanding.

Subsequently the Web 2.0 concept has been mulled over at length and appropriated for more specific contexts such as Content 2.0 (Wagner & Majchrzak, 2006/2007), wherein wikis and mashups enable customer centricity, Library 2.0 (Miller, 2005). Casey & Savastinuk (Casey & Savastinuk, 2006) define Library 2.0 service as any service, physical or virtual, that successfully reaches users, is evaluated frequently, and makes use of customer input. The more specific term PL2.0 is applied to public libraries (Chowdhury, Poulter, & McMenemy, 2006). Predictably there are those who speak in terms of Web 3.0 which if anything is a realization of the semantic web

There have been further expositions of what is involved, for example, "sub-categories of what Web 2.0 encapsulates include usability, economy, participation, convergence, design, standardization and remixability" (Curran, Murray, & Christian, 2007). These might be regarded as part of what O'Reilly has elsewhere (O'Reilly, 2004) described as "architecture of participation". Anderson (Anderson, 2007) has extended O'Reilly's ideas in order to outline six 'big' ideas behind Web 2.0 which he describes as individual production and user generated content; harness the power of the crowd; data on an epic scale; architecture of participation; and network effects and openness.

Business is also trying to come to terms with its interaction with social networks, naturally with the use of buzzwords. For instance 'wikinonomics' (Tapscott & Williams, 2006) is based on the four ideas: openness, peering, sharing, and acting globally in order to make use of the knowledge of mass collaboration.

Examples of Anderson's big ideas are as follows:

Individual production and user generated content

Just as desktop publishing software lowered the barrier to self publishing, so network publishing on the Web has been made possible by a host of servers and software applications that provide a media space for an individual. This is publishing in the sense of making 'publicly available'. It is unlikely to have any editorial intermediation, but it provides an avenue for what in the print world may have been dubbed 'vanity publishing'.

With a few clicks, individuals may upload sound recordings moving or still images from their own recording or imaging equipment into their personal media space on a facility like *MySpace* ("MySpace," 2003-2007) or *Flickr* ("Flickr," 2007), tag it with keywords and publish it to the Web world or restrict the content to a specific audience. Similarly, users can set up and write

blogs or work together to create information on wikis. Anderson identifies reputation as a motivating factor in contrast to the monetary motives of the mass media.

Sites such as *Lulu ("Lulu," 2007)* extend the self-publication idea to enable users to combine text formatting and imagery into either digital publications or through production processes to print form. Various fee-based services such as proofreading, formatting or cover-design may be introduced to the production process.

Harnessing the power of the crowd

"Crowdsourcing" builds on the popularity of multimedia sharing websites such as *Flickr* or *YouTube* ("YouTube," 2007) to create a second generation of sites where user generated content is made available for re-use. An example is *ShutterStock* ("Shutterstock," 2007), that acts as an intermediary between amateur content producers and anyone wanting to use their royalty free stock images.

Personal free tagging of objects contributes a crowd vocabulary by means of so-called folksonomy. People use their own vocabulary in order to add explicit meaning to the information artefacts. A significant feature of folksonomy is that continuous generation of tags and ability to produce 'tag clouds' that display their relative frequency of use. The immediacy of tagging makes it possible to make sense of emerging trends of interest. An Australian example is *Scouta* ("Scouta," 2007) which provides for tagging of personalized video and podcast recommendations and sharing of favourites with groups.

Data on an epic scale

Comparing sizes of databases is at best conjecture. A few years ago contrasting the numbers of sites recorded in databases created by search engine crawlers fizzled out amidst cries of not comparing like with like. Wintercorp's, which used to compare sizes, last published an attempt at a ranking in 2005. A relatively recent guesstimation ("Business intelligence lowdown," 2007) attracted many contrary opinions. What is assured is that many of the freely accessible databases on the Web contain prodigious amounts of data and are increasing by terabytes daily. In the case of services such as *Google* and *Amazon.com* ("amazon.com," 2007*)* this is contributed to by users and aggregated as a consequence of the use of services. The company is able to consolidate information about the consumers from their transaction observation.

Social networking sites accumulate their information about content directly from user contribution and sites that provide for multimedia such as *YouTube* and *MySpace* are also rapidly accumulating huge amounts of data.

Architecture of participation

Systems that are designed for user contribution based open sources provide an architecture of participation. This fosters a development community that can take advantage of modular architecture to provide components.

Therefore, through ongoing use of a service, the applications contributing to it are themselves improved. This mass-participation has led for example to enhancement in the variety of search types provided through *Google*.

The network effect

Anderson (Anderson, 2007) makes reference to the network effect as a general economic term used to describe the increase in value to the existing users of a service in which there is some

form of interaction with others, as more and more people start to use it. Jointly constructed sites such as the *Open directory project* ("Open directory project," 2007) used for categorizing Web sources have been a feature of the Web for some time.

In Web 2.0, new software services make use of the network effect for their adoption as social software. For example, *facebook* ("facebook," 2007) styles itself a "social utility" for connecting you with people around you. This incorporates the ability to upload material for sharing and to develop connections with like-minded people with shared interests. As each person joins a social networking site, others potentially benefit.

The network effect also supports the long tail phenomenon by means of which large numbers of niche items result in overall greater use than the relatively small number of heavily used items. For example the cumulative levels of traffic on the millions of small user group blogs far exceeds the traffic on the relatively small number of heavily used blogs. From a marketing point of view it may be thought of as boundless shelf-space effect, and distribution bottlenecks may be alleviated. Commercial sites may earn a larger percentage of their profits from low frequency niche items than from than high frequency best sellers.

Openness

Web development has owed a great deal to the tradition of working in an open way. This in turn has been an impetus for Web 2.0. Much social software development has occurred as a consequence of working with open standards, open source software, making use of free data, re-using data and working in a spirit of open innovation. An example of open source software development is the *Firefox* browser and its system of extensible plug-ins. An example of data use is *LibraryThing* ("LibraryThing," 2006-2007) which provides for incorporation by users of descriptive data from a wide range of libraries.

Example projects in cultural institutions

This table provides some examples of existing local and international applications.

Topic	Overview	Functions
Art cataloguing	By means of *Steve* ("Steve: the art museum social tagging project," 2007), a group of American art museums are taking a folksonomic approach to their online collections. They allow patrons to supplement the specialized terminology of the museum professionals (curators and registrars) in order to represent the general public viewpoint.	Tags, folksonomy
Business resources	The *Biz Wiki* ("The Biz Wiki," 2007) is a collection of business information resources available through Ohio University Libraries. It is designed to assist business researchers in finding the best resources for their projects or topics. The *Biz Wiki* contains articles about business reference books, databases, websites, and other research guides. The purpose of this wiki is to experiment with an alternative form of delivery of library information.	Blogs, RSS, wikis

Topic	Overview	Functions
Collection access	Smaller institutions that are trying to expand their reach to new audiences may work through a collaborative, Web portal model such as is used by CAN – a redevelopment of Australian Museums and Galleries On-line (AMOL) (CAN - Collections Australia Network, 2007). CAN makes use of open source software so that smaller museums can produce customizable content for publication through the CAN Web portal.	Portal
	The Metropolitan Museum of Art in New York (The Met) has compared terms assigned by trained cataloguers and untrained cataloguers to existing museum documentation. The Met explored the potential for social tagging to improve access to museum collections. Preliminary studies showed the potential of social tagging and folksonomy to open museum collections to new, more personal meanings. Untrained cataloguers identified content elements not described in formal museum documentation (Trant, 2006) .	Tags, folksonomy
	The *Picture Australia* project ("Picture Australia," 2007) has been in operation for some time as a service that provides searching of image collections reported by a number of Australasian galleries, museums, archives and libraries. Recently the National Library of Australia has extended it further by creating groups, for example "Our town" in *flickr*, the social image sharing site ("Picture Australia: Ourtown " 2007). Images added to the groups are then harvested in order to complement the collections already reported. NLA mediates and checks metadata quality. In so doing, NLA is exploring a model of collecting material that includes provision of services that support the creation and dissemination of knowledge, and improving opportunities for idea sharing among participants.	flickr, tags
	The Museum of Art & Archaeology ("Museum of Art and Archaeology," 2007) on the University of Missouri-Columbia campus has begun to post information about certain pieces and acquisitions on its website. Museum staff members have also begun to write blog entries, to which site and gallery visitors are encouraged to respond. The museum plans to create podcasts that will allow patrons to take audio tours of the galleries or listen along as the artwork is presented on the video screens of their iPods.	Podcasts Podcasts, RSS
Education	Because only a small percentage of college and university students begin searching for information at a library website, University of Washington Libraries	Wikis

Topic	Overview	Functions
	Digital Initiatives unit has begun a project to integrate its digital collections into the information workflow of its students by inserting links into the online encyclopaedia Wikipedia (Lally & Dunford, 2007).	
	The Powerhouse Museum has several blogs and podcasts ("Online resources: Powerhouse Museum," 2007). Blogs include “Free Radicals” which covers issues and ideas related to current themes in science and sustainability and “Observations” which includes astronomy news and discussions from the Sydney Observatory. Examples of podcasts include video and sound recordings of recent lectures and events at the Powerhouse Museum.	Blogs, podcasts
	The Glasgow School of Art Library (Glasgow School of Art Library, 2007) uses Web 2.0 technologies in its current awareness service. Blogs for the subject areas of architecture, fine art and design aim to provide readers with a one-stop shop for information resources. The service offers regular postings of new and updated content and RSS feeds. Postings are accompanied by a resource type icon in order to determine the resource format.	RSS, blogs
Exhibitions	The National Gallery of Victoria (National Gallery of Victoria, 2007) has begun a series of podcast programs. These programs have been designed for upcoming exhibitions including “Australian impressionism” and “Guggenheim collection 1940s to now”. These resources have been created to enrich user experience of the gallery’s exhibitions.	Podcasts
	The Metropolitan Museum’s website features podcasts about exhibitions ("The Metropolitan Museum of Art podcast," 2007).	Podcasts
	The National Archives of Australia hosts the *Documenting a democracy* site ("Documenting a democracy," 2007) [Figure 1] which exhibits sets of constitutional instruments from the Australian Commonwealth, States and Territories. It provides for animated maps that track the formation of constitutional boundaries, timelines and images relating to the writing of the documents, together with theme trails that depict legislative frameworks that apply to matters such as freedoms and land.	animation
Government	Mississippi State University (MSU) has used podcasts to advertise the availability of government documents to	Podcasts

Topic	Overview	Functions
	library users, and to instruct them in the use of these documents (Mississippi State University, 2007). Users may subscribe to feeds that describe library resources or events, and receive instruction on how to use the resources at their convenience. Particular emphasis is given to a project promoting the use of government documents so that librarians can connect students, faculty and other researchers with information materials applicable to a wide range of academic disciplines and to daily life.	
History	The US Library of Congress (LC) (Library of Congress, 2007) has launched a *Library of Congress blog*. As "born-digital" content, LC has pledged that its blogs will be saved and preserved in perpetuity under the Library's National Digital Information Infrastructure and Preservation Program.	Blogs
	The University of Michigan (UM) has launched *mBlog*, a program offering free blogs to UM students and employees ("mblog," 2007). The program is a collaboration of the university library, information technology central services (ITCS), and the university's Bentley Historical Library. It has resulted from student and faculty requests to use blogs and the library's interest in "exploring new modes" of publishing. The program is also to provide a historical narrative of the university and life in the 21st century. Bloggers can choose to have their work considered for archiving by the library.	Blogs
	The Academy of Television Arts & Sciences Foundation (Academy of Television Arts & Sciences Foundation, 2007) from its Archive of American Television makes many of its more than 500 video oral history interviews available from its blog. The site helps users navigate through television history – as told by those who were there. It allows users to create new blogs and flag objectionable content.	Blogs
	The National Archives (National Archives, 2007) in the UK has launched a wiki-based resource to help people interact with its huge body of material, which spans 900 years from the Domesday Book to the present day. The wiki allows anybody to share their tips about searching the National Archives content, to submit articles related to historical records or even to upload transcriptions of documents which previously might have been listed only by name. The service employs technology pioneered by Wikipedia, allowing users to	Wikis

Topic	Overview	Functions
	create an account and contribute to it.	
	The Australian War Memorial (Australian War Memorial, 2007) has several historical blogs available from its website. Topics include: 'George Lambert: Gallipoli and Palestine landscapes', 'Focus: photography and war 1945–2006' and 'Lawrence of Arabia'.	Blogs
Professional development	The purpose of "Library Success: A Best Practices Wiki" ("Library success: a best practices wiki," 2007) is to develop a repository for good ideas within the library profession. The wiki includes success stories, insights and tips, Web links, etc. It is intended to be an easy, non-threatening way for librarians to gain experience with wikis.	Wikis
	Recent conferences have regularly been accompanied by blogs that provide for dialogue between participants. Available from the Museum Victoria's website is a blog ("Many players, many parts," 2007) designed for a forum on performance in cultural institutions.	Blogs
Promotion and marketing	The Arlington Heights Memorial Library has thrice-a-week video blog (or vlog) (Arlington Heights Memorial Library, 2007) to inform patrons about new services and ongoing programs. Recent content included upcoming programs for children and computers and an introduction to virtual reference service. Library staffers film locals to add interest to the introductory segments.	Vlogs
	At the Ann Arbor District Public Library (Ann Arbor District Library, 2007) users are provided with an online presence that aspires to be an extension of the library 'experience' using a personalized space. It includes a combination of seven blogs. Open-source software is available for download.	Blogs
	There is a line of trading cards, similar to baseball cards, that feature librarians around the U.S. ("Librarians get their cards," 2006). The cards were created by a student in the UCLA Department of Information Studies. Her goal in creating the cards was to put more librarians in the spotlight and to change the stereotype of the profession. The idea has been picked up and copied on the photo website *Flickr*.	Flickr
	The University of Illinois at Urbana-Champaign Undergraduate Library has established a *MySpace* page ("MySpace.com - UIUC Undergraduate Library," 2007) which acts as a portal leading back to the library's	

Topic	Overview	Functions
	website. The library has created a library catalogue search box that other *MySpace* members can add to their profiles. This presence is to promote the library and make it visible and accessible to a larger demographic of potential users.	MySpace
	Podcasts developed by the Lansing Public Library in Illinois are available in four areas: adult programs, teen programs, youth programs, and information technology programs ("Lansing Public Library podcast information page," 2007). Freely available for downloading, these podcasts allow the library to promote key services and resources to a target audience and to publicize and capture notable events in the library. The library hosts a Podcast Information Page that both provides users information about how to use a podcast and allows users to subscribe to library feeds.	Podcasts
	The Walker Art Center/Minneapolis Sculpture Garden website offers extended media features ("Minneapolis Sculpture Garden," 2007). Besides general gallery information, this site sponsors podcasts, blogs and RSS feeds. The site features a link where users can download gallery tours and artist information to a mobile phone. The "New Media Initiatives" blog covers interesting art experiments. Besides highlighting popular contemporary art, the site encourages new artists to participate through its blogs and online programs.	Podcasts, Blogs RSS
	On the British Library's website is a selection of blog extracts that review personal visits to its "Sacred Exhibition" ("Sacred Exhibition: blog cuttings," 2007). The Library used Google to find relevant blog samples and states that the overwhelming majority were positive. The exhibition also offers podcasts from a British Library exhibition curator who talks about sacred texts of Judaism, Christianity and Islam.	Blogs, Podcasts
	Many institutions now provide news about current events that are available at their sites, also available in RSS form. For example the State Library of Queensland (State Library of Queensland, 2007) provides for users to keep up-to-date with library news headlines.	RSS
Recommendations	The Polar Bear Expedition Digital Collections ("Polar Bear Expedition Digital Collections," 2007) site features an implicit form of recommender system, link paths. The link paths, found at the bottom of every page, function as a type of automatic recommender system, relaying immediate feedback to researchers on how other visitors reached a particular item or collection. It is hoped that	Tagging "social navigation"

Topic	Overview	Functions
	link paths will provide alternate and unexpected interrelations between subjects and collections that visitors will follow, retracing the steps of others. This project was conceived by a professor at University of Michigan School of Information, who brought together a group of students to brainstorm new and creative methods of displaying archival content online.	
	Delany College Library is embracing social tools such as blogs, *del.icio.us* and *LibraryThing* ("LibraryThing," 2006-2007). *LibraryThing* offers collectors and casual readers alike a way to keep track of personal book collections easily, and find and connect with others whose libraries are similar. Relying on data from the Amazon, LC, and other library catalogues worldwide for catalogue records and book jacket graphics, *LibraryThing* also depends on user-generated content such as book reviews, tags, ratings, and changes to catalogue records to create a dynamic, social space for book lovers.	Blogs, Tagging
Reference service	New York-based Stony Brook University Health Sciences Library adopted new tools to support the electronic based information resource system ("Health Sciences Library - Stony Brook University HSL," 2007). Collaborative Web tools, including wikis, instant messaging, RSS feeds and social networking sites, have improved the reference services and staff intranet system of the library.	Wikis, RSS feeds, instant messaging
	There is an initiative called “slam the boards” that invites librarians from libraries worldwide to go to online "Answer" sites, such as: Yahoo Answers, Amazon's Askville and The WikiPedia Reference Desk. Librarians answer the questions and identify themselves as reference librarians from their library ("Answer board librarians," 2007).	wiki
Resource guides	The San Mateo Library in California has classified its bookmarked electronic resources according to the Dewey Decimal System, to develop subject guides on *del.icio.us*. Because of the flexibility of tagging, the library sees these as presenting potential for use as dynamic, easy-to-update, electronic resource guides ("City of San Mateo: Public Library," 2007).	Social bookmarks
	The librarians at Saint Joseph County Public Library, Indiana, used open source wiki software to create a successful subject guide that facilitates customer feedback (Casey & Savastinuk, 2006) ("St. Joseph	Wikis

Topic	Overview	Functions
	County Public Library," 2007).	
Youth outreach	The State Library of Victoria's "Inside a dog" is a website for young people about books. Users can read and write reviews, meet the library's online author-in-residence, listen to podcasts and talk about books on the forum ("Inside a dog," 2007) .	Blogs, Podcasts
	The Public Library of Charlotte and Mecklenburg County (PLCMC) in Charlotte, North Carolina, has a teen outreach program that includes a presence in *Teen Second Life (Public Library of Charlotte and Mecklenburg, 2007)*. It is trialling a virtual sphere for youth that is informative and interactive and functions as a bridge to other youth organisations. *Teen Second Life* is a virtual environment geared just for youth, ages 13 to 17.	Second Life
	PLCMC has a multimedia production studio where teens produced a commercial about the summer reading program to vodcast to their peers ("Library Loft: PLCMC teen pages," 2007)[Figure 2]. They also uploaded the commercial to *YouTube*.	Vodcasts, YouTube Podcasts,
	Brooklyn College Library has used *MySpace* ("Myspace: Brooklyn College Library " 2007) so that participants may post personal profiles containing their favourite books and movies, photos, and videos. They can email, chat, and post bulletins to those they accept as 'friends.' The library listed among its more than 1790 friends nearly two dozen libraries or librarians who have set up *MySpace* profiles.	MySpace
	Mosman Library has set up teen space on *MySpace* ("MySpace: Mosman Library Teen Zone," 2007). The "Teen Zone" also includes flickr photos and a blog and is a forum or civic space for teens.	MySpace, flickr, blogs

Discussion

Many of the applications that have been identified are specific to a particular cultural institution, but lend themselves to application by other similar organizations. The numerous physical forms of information artefacts and the different approaches to production and application have produced varied professional approaches to their organization and management in libraries, archives, galleries and museums. However, digitization of these artefacts allied with increasing amounts of born-digital material has diminished the distinction between the institutions, at least as perceived by Web users.

Convergence may still be a problematic term for the professionals working within the institutions, but it seems an appropriate way of describing the products they are making available over the Web. Institutional distinctions are of little concern to those who make use of or contribute from outside the organizations to the repositories of digital objects.

This engagement has both a popular and a professional dimension. That is, there are elements of interest for both the general public and for professionals in government, business or research. For example ‘current awareness’ (one of the subheadings that follow) has a popular dimension with respect to notifying the public of forthcoming exhibitions, and a professional dimension by providing selective dissemination of information on new acquisitions for collections. Further, for the information profession itself there is a current awareness element through a variety of blogs and feeds, as well as aggregators of these, for example *Libworm* ("Libworm " 2007).

The evolutionary aspect of the Web means that many applications are continuously Beta – that is, relatively stable, but effectively always being tested and developed. While this may be viewed with apprehension by institutions, it also provides for continuing innovation. It is an incentive to try out services rather than hold off. However it presents challenges to institutional IT departments which continually strive to impose standard operating environments in order to maintain software, and find that they must deal with interfaces to many non-standard environments that are beyond their control.

Those who have had to develop formal computing arrangements with other institutions have characterized them as Business-to-business (B2B) or Business-to-government (B2G). By extension, formal computing arrangements with partners have been portrayed as B2P. For the environment in which institutions try to engage the public as partners, though with much less formality, we might use the contraction B2p.

Accompanying this there is an increasing emphasis on connection rather than (but hopefully, not to the detriment of) collection. Mitchell and Singh (Mitchell & Singh, 2006) highlight this with reference to developing *EdNA* in Australia. They favour the definition of repository as a person to whom some matter is entrusted or confided. They see *EdNA* as a collaboration with its future in the repositories being based upon trust, while connecting collections and supporting conversations for the educational community.

The following sections provide comment upon some of the issues that must be addressed for the B2p environment, where the businesses in this case are cultural institutions.

Access

Internet sites that have attracted major use – what Dempsey (Dempsey, 2006, July) terms ‘gravitational pull’ - have effectively catered for seamless discovery of accumulated information resources. This may be whether the resources are file types as provided for by services like *Google* or Y*ahoo,* or predominantly physical materials as is the case with *Amazon*. These services have led users to higher expectations of accessibility.

Many cultural institutions continue to labour with Web interfaces that have been derived from information retrieval systems designed primarily to work in conjunction with collection management within the organisations, rather than discovery from without. Applications of these interfaces have in many cases differentiated types of material into separate groups, and require searching of multiple collections rather than provide for integrated searching followed by differentiation if required.

There are unifying initiatives such as the *Collections Australia Network* that brings together exhibit descriptions, and *Libraries Australia*, which brings together descriptions of items manifest in library collections. However these remain constrained by such difficulties as moving from collections to individual items in the case of museums, or in the case of libraries moving from items such as journals of conference proceedings to their individual articles.

Federated searching such as that being developed through the federated search project coordinated by NLA (National Library of Australia, 2006) provides the ability to bring together multiple collections. It reduces the time commitment required of users to seek information from multiple sources, and lessens the fragmentation presented by a variety of services and institutions. However, it is limited by the varying levels and quality of description provided for different materials.

The associated software challenge is partly to improve information retrieval through such capabilities as ranking and relevance feedback, but also to increase abilities to deal with variations in metadata such as by crosswalking between metadata standards (Getty Research Institute, 2007) and thereby provide the capacity for greater refinement of searches, and crucially, reduce differentiation of artefacts until the user seeks such differentiation..

An alternative perspective on access is provided by small collections that are not maintained by institutions, but which may draw upon metadata from the institutions. The amenability of social database software has led to the recording of material for accessibility. Australian examples in *LibraryThing* include that of the Canberra Spinners & Weavers Guild ("User cswlibrarian: profile " 2007) which itemises its material, and the META Library has been created to support the study of eCommunications within Sydney University’s META Centre ("User METAlibrary: profile " 2007).

Audiences

Institutions that have built their procedures on the management and display of physical objects, have found that the relationship between an object and its observer changes, particularly when the observer is able to contribute to the information about an object or its visual or aural exposition. In a digital environment what may initially be produced as a broadcast, may soon become a conversation.

Analysis of what users look at in the digital environment, and what they discuss influences the design of exhibitions – the audience dynamic changes so that multiple interpretations may be presented more so than in the physical context. Virtual exhibitions may improve upon the limitations of physical display and present to a wider audience, for example the *Electronic swatchbook* (Powerhouse Museum, 2005). Reaction to exhibitions such as these may then enable identification of demand that was not previously identifiable.

There is less need to identify a critical mass to justify a publishing project – the projects can start small and be more iterative. The small percentage of holdings that may be on physical display may be increased to a larger percentage if digital exhibition use gives support to funding for further digitization programs. This should stimulate curatorial staff to see the benefit to recording as much as practicable about an artefact and encouraging further contributions exploring other angles.

There are audiences for education, for research and for recreation. Educators are familiar with making use of learning object repositories, and drawing from these along with material from catalogues and repositories to develop e-learning. There is a great deal of room for development of further learning objects that may be utilized in conjunction with the artefacts available from the cultural institutions (The Le@rning Federation, 2007). Development of understanding should promote further use and engagement between the sectors.

Research audiences have long been both users of, and contributors to the repositories available through cultural institutions. They have been provided for as database vendors and repositories moved from providing abstracts of hard copy to full text accompanying surrogate records. Now they are demanding source materials ranging from the records in archives to the dataset of collected research data that underlie scientific papers. These present challenges of digitization and metadata formalization and rights management.

Scientific data can be brought together with imagery and metadata from geographic information systems such as been done for fauna distributions by Museum Victoria with its bioinformatics data (Museum Victoria, 2002). Apart from providing motivational online exhibitions, interactive material such as this supports education and encourages further reporting of data from both specialists and the public at large. A next step is to provide the software that enables the reporting, vetting and incorporation of further data.

Popular use of interactive sites provides recreational education which the younger generations increasingly utilize for interaction, but which also provides education by participation. Further, Australia has a burgeoning population of retired ‘babyboomers’ in many cases motivated to contribute where social interactivity is catered for in sites, whether it be genealogical information for archives, reading blogs for libraries or creative imagery for galleries. Vanity publishing is also part of this equation as the audience realizes that there are additional mechanisms for supporting digital publishing.

The use of metrics for identification of user characteristics and the avenues that bring them to information objects is an important aspect of potential audience identification. So is the support of interest groups that are focused on institutional offerings. An example of such facilitation is the use of the open source software, *Moodle* by EdNA to provide collaborative space for forums, wikis, surveys and the like (Mitchell & Singh, 2006). In the case of EdNA this encourages groups such as professional associations, multidisciplinary project teams, curriculum clusters and training organisations, and education departments.

Authority

Since the advent of the Web, a great deal has been written about determining website quality, much of it by libraries which are interested in promoting the information literacy of their patrons. There are various online tutorials that support the learning of evaluation, for examples *net.Tutor* (Ohio State University Libraries, 1997-2007). These approaches to evaluation generally place identification of the authority of sources as central to their list of evaluation criteria.

Social bookmarking and tagging tools help institutions to establish better conduits to the public. The authoritative information with its huge investment in information organization may be complemented by the nous of Web users who can readily add different perspectives to the representations of cultural objects – public metadata. However this same process may prejudice the reputation of institutional information.

How trustworthy is the 'wisdom of the crowd'? Does it really make for a common sense? Proponents of *Wikipedia* (including its founder) have argued that in spite of its openness, a relatively small number of contributors are responsible for the majority of its maintenance. Recent research (Kittur, Chi, Pendleton, Suh, & Mytkowicz, 2007) has suggested otherwise – that the spread of contribution to both *Wikipedia* and *del.icio.us* has undergone a decline in elite user influence with an increasing extent of contribution from relatively low use contributors.

This has implications for social stratification of collaborative sites over time. The large influx of novice users places pressures on the founders to introduce more structure and hierarchy if there is to be any attempt to continue quality control. On *Wikipedia* there is now a protection policy that allows for some pages that are fully protected for administrator maintenance only, and other pages that are semi-protected and may not be modified by new or un-registered users. It is possible to use the site to view listing of material that is categorized as heavily vandalized – interesting viewing! It has recently been reported that the German version of *Wikipedia* is to be limited to instant editing capabilities to "trusted editors" (Chapman, 2007, Sept 21)

Trust is an attribute that is built up over a long period and is hard won by institutions that focus on the quality of the products and services. It is easily lost, or more difficult to retain when the organizations expose themselves to participation with social networks outside their control. Professional staff who have enabled their institutions to be gatekeepers are understandably nervous about relinquishing a perceived authoritative role. With such networks, the user rather than the organization becomes central to a service, and there is significant challenge to the status quo.

Bringing user-generated content into the institutional framework presents challenges to many aspects of an organization including information quality, software maintenance, education, marketing, and management structure. There is questioning of the worth of continuing to maintain the authority established by curators, librarian and archivists. As Ellis and Kelly (Ellis & Kelly, 2007) point out, curatorial staff have additional, deep-seated concerns about authority once user content is brought into the mix. The concept of external parties editing the content of an institutional site is problematic from both a brand and a 'trusted organisation' perspective.

Another aspect of this concern is when institutional material is copied onto other sites where it may be given a context quite different to the one in which it was originally presented. An image that is originally shown as an historical exhibit and given an appropriate curatorial or metadata envelope may be copied and used without the envelope or attribution, and with quite different intent.

Institutions can be expected to commit to ongoing social network arrangements, providing the resulting facilities:

- Are resourced to provide for prototyping, project management and assessment.
- Have clear policy about the ownership and use of data.
- Are designed to provide for a graduated model of trusted users.
- Provide for interface design that through graphics readily differentiates authoritative from user-generated content.
- Can easily isolate authoritative from popular description and revert when necessary to an authoritative view of data.
- Ensure service level agreements with third party service providers.
- Provide for scalability and reliability of use should demand increase rapidly.
- Maintain security of the institutional data.

The mechanisms for supporting authority are therefore a combination of management and technical implementation.

In reporting on perceptions of libraries and information resources following detailed surveying, OCLC has noted that consumers are unaware of the rich electronic content information available. Nevertheless, they continue to trust libraries as reliable sources of information (OCLC Online Computer Library Center Inc, 2005). It is reasonable to assume that similar sentiments apply to other cultural repositories. However many Web users are unaware of the 'brand'. They are happy to grab the content without questioning the provenance. This may be particularly problematical when, as noted above an artefact may be re-used in other contexts without attribution – or possible worse, with attribution!

Web monitoring services have sprung up to guard the interest of websites and monitor use of material on and from them. Such a service may be used to preserve integrity of the site for its community members, respond to security alerts, deal with spam and vandalism, irrelevant or inflammatory or pornographic content, and monitor intellectual property issues for example with video monitoring. An example of such a service on the Web is provided by *ICUC* ("ICUC Moderation Services," 2007). A repository may act independently to make use of such a service in order to help maintain its authority. There may well be opportunities for collaborating institutions to develop their own services that provide a facility for auditing and moderating collaboratively built sites in which they participate.

Collaboration

The Web provides for the mechanics of collaboration. However as those among its founders have noted, there is a tension between collaborative activity and being able to coordinate efforts between large groups. Small groups may act independently and innovate without much reference to the wider community; larger institutionalized groups are more hidebound by the bureaucratic and regulatory restrictions that constitute them: "… a small group can innovate rapidly and efficiently, but this produces a subculture whose concepts are not understood by others. Coordinating actions across a large group, however, is

painfully slow and takes an enormous amount of communication” (Berners-Lee, Hendler, & Lassila, 2001). Institutions are inevitably subject to these impediments.

Nevertheless, there are a number of examples of productive institutional collaboration among Australian cultural institutions: *Documenting a democracy*, *Picture Australia*, *MusicAustralia* ("MusicAustralia," 2007) are all the results of effective joint effort, and federated searching.

Even so, it would seem that the cultural institutions continue to focus on their respective domains. In terms of areas like education and exhibitions there is much potential for bringing together the artefacts in museums and galleries and the relevant material associated with them in libraries and archives. From a museum viewpoint, the Web facilitates collaboration in documenting and interpreting collections and also allows cooperative collecting and virtual lending. Spiess and Crew (Spiess & Crew, 2000) of the Smithsonian’s National Museum of American History (NMAH) have noted that as NMAH has developed Web products, they have provided links to other sites or objects with thematically related topics. As they point out, objects unavailable for physical lending may be lent virtually to enhance the electronic visitor's experience and increase the educational value of the product.

Perhaps further inter-institutional collaboration could be stimulated by something akin to MLA in the UK (Museums Libraries and Archives Council, 2000). MLA was launched as the umbrella strategic body, replacing the Museums and Galleries Commission and the Library and Information Commission, and including archives within its portfolio. Potential for collaboration without divided responsibility between them extends to joint use of streaming servers, and curating of exhibitions where the joint planning involves IT support and possible input from multiple institutions. A portal for entry into the collections, *Cornucopia* (Museums Libraries and Archives Council, 2007) is structured for access by broad categories as well as cross-collection searching.

This access has been extended further within a European model ("MICHAEL - Multilingual Inventory of Cultural Heritage in Europe," 2007) initially a partnership between France, Italy and the UK, but with European Commission funding being extended to a further 11 European countries. In addition to subject entry points there are entry points by audience, time period and spatially to allow its users to search, browse and examine descriptions of resources held in institutions [Figure 3]. There is a focus on interoperability between national cultural portals to promote access to digital content from museums, libraries and archives.

Building upon its present internal collaborative approach, and utilizing international links in the various types of institutions, Australia might make use of such a model in order to work with neighbours on similar portal access.

Current awareness

Computer-based systems have always had the strength of currency – the ability to deliver the most up-to-date information. The variety of delivery mechanisms is now such that all media may be supplied to the desktop, subject to bandwidth. In the preceding section on applications, there were numerous examples where podcasts, blogs and RSS provided immediacy in relation to new acquisitions in collections, forthcoming exhibitions or educational programmes.

The profusion of material now becomes the problem. As always, there are two main problems to deal with – one is trying to cover the breadth of material that might be germane to ones interests, the other is filtering well enough to be able to digest what is personally relevant.

The plethora of material appearing on blogs has led to blog aggregators that enable users to monitor a range of discipline-oriented material, as well as report their own contributions through RSS feeds. For example *Libworm beta* (developed from *Medworm* by Frankie Dolan), which covers library-oriented blogs has been developed to be a professional development tool that incorporates a search engine and current awareness. The material may be accessed via preset broad 'feed categories', by subject or through tag clouds. It is presently (Libworm, 2007) based on about 1400 RSS feeds. Their contents are searchable and results may themselves be output as an RSS feed.

In terms of socially constructed sites, there are advances in the extent to which participants may personalize how they keep aware of what is entering the databases. For example, all *LibraryThing* accounts may utilize RSS feeds for new books added, as well as for new reviews written by a member. *LibraryThing* widgets have also been developed to include book jacket images (which come via library-supplied metadata). Like, *LibraryThing* and *del.icio.us* widgets can be created to highlight a nominated tag along with new acquisitions.

Some libraries use LibraryThing to display new books added to the collection, others to feature recommended books, material in particular genres or specific to age groups, although this is carried out per medium of tagging that they supply over and above the supplied subject headings. Similarly, del.icio.us offers a tool set that enables registered institutions to make use of tag roll and link roll features. Institutions' can provide rolling updates back at their own websites relating to material that they have bookmarked at the source.

For instance the Pescosolido Library employs tags to describe book contents as well as give call numbers, and a branch of the Cleveland Heights–University Heights Public Library has *LibraryThing* accounts covering mystery, horror, and speculative fiction (Rethlefsen, 2007, Sept 15). Within each of these accounts, patrons and staff can quickly find materials on a subgenre, with a type of character, or written by women, from tagging provided by the library. It is unfortunate that such descriptive material is not added originally for copy cataloguing by other libraries in the composite library databases.

Making use of tagging to focus searches has led to developments in information retrieval software that could well be applied to the formally applied indexing in repository collections. Bibliographic database software has facilitated current awareness using classification and subject heading metadata since long before the Web. The institutional databases also have years of effort invested in metadata such as MARC format that provides for extensive retrieval capability that is relatively underutilized. Graphic representations of the content of institutional databases (say by index term or classification cloud displays) would assist patrons who are endeavouring to personalise current awareness strategies.

Marketing of institutions is a consequence of provision of information through current awareness even if using material gathered by, rather than about, the institution. It may be used to complement targeted audience evaluations.

With respect to museums Ellis and Kelly (Ellis & Kelly, 2007) have suggested that provided expectation can be managed, a strength of Web 2.0 is its media visibility and that

museums can look to this publicity and use it to their own advantage. In contrast to server-side technologies, or hardware, Web 2.0 is now talked about, debated, and repeatedly cited in the public media. They argue that “doing Web 2.0” just for the funding is wrong, but that it is appropriate to emphasize that funding follows significant social movement, and may well be available for technologies that pioneer new ways of engaging users.

Metadata

Control of metadata has long been the province of cataloguers. However there is now understanding that within an environment that encourages user contributions to description, a more adaptive approach must be taken. For example Stone (Stone, 2007) describes a resource discovery unit at the State Library of Queensland that has evolved into the managers of the data that have been formulated over the years, making use of multiple metadata formats for integrated presentation and utilizing an internal wiki for maintenance of procedural content.

However, the extent of metadata provision varies greatly between institutions. For example Spiess and Crew (Spiess & Crew, 2000) lament what they see as a root cause of trouble in museums: “ … because of lack of staff and time, over the years, minimal information has generally been recorded about the items in our collections. For many items, we have only the object's name, the donor's name, a brief description, and an accession number. Museums require richer contextual information for research, interpretation, and exhibition activities. For example, information is needed on the history of the people and events associated with the object and on the object's origin, use, physical nature, and symbolic import”.

Even where institutions have developed metadata there is considerable variance in the application of metadata schemes, and in the completeness of material description. Libraries have had the benefit in this respect of a long-standing scheme and rules for levels of description. However the artefacts described by all institutions have generally been discrete objects. Increasingly attention is turning to the description of heterogenous data compilations with all of the challenges of description that they entail.

Cultural institutions may well be required to play a much greater role in the organization of data that supports e-science or cyberinfrastructure. There is a growing awareness of the worth of data sets in scientific research areas, and the need to manage them for effective re-utilization and persistent availability. With respect to scholarly communication in general, Lynch (Lynch, 2007) has pointed out that there are social and political factors moving us towards open access and the development of technical and social models to assure the persistence and integrity of important digital data over time, or as he sees e-science ‘the investment it represents can be amplified by disclosure, curation and facilitation of reuse’.

This re-usability is likely to be brought within the scholarly publication model in such a way that for example journal articles that interpret data through illustrations, will need to enable users to drill down to those same data and re-interpret them and use them for other purposes. The data themselves will require published metadata that enable effective organisation and description, and be positioned in sustainable repositories where the metadata may be applied.

A recent report (Microsoft Research, 2006) sees databases as an essential part of the infrastructure of science, though bemoaning the presently poor integration of journals and databases. The report supports Lesk's notion that the paradigm of scientific method is moving from "Hypothesize, design and run experiment, analyse results" to "hypothesize, look up answer in data base". It is noted that metadata have a primary role to support tools that perform data integration and exploit Web services that transform the data or compute new derived data. There is also an expectation of a new breed of publication emerging that will cater primarily for researchers who wish to publish valuable scientific data for others to analyze.

There are probably too many disadvantages in bringing the repositories of data together, particularly when the software may be sent to the data (i.e. directed at the data at its source). However the software needs to utilize metadata, and there is a case for consolidation of metadata repositories.

Work has progressed in the area of integrating metadata from repositories. The ABC model is an "event-aware" model designed to enable the precise recording of life cycle events for digital objects in the library, archives and museum domains (Hunter, 2006). Hunter has extended the ABC model, so that it may be used to capture precisely the provenance or lineage of scientific models. She sees it as providing a top-level ontology for defining the classes and properties associated with scientific models.

Software support must be allied with curation. Data curation has been applied for some time with social science data under the rubric of data librarianship. Its international professional association, IASSIS, brings together researchers and scientists who are producers and users of micro and macro-level social data; information specialists who preserve social data, manage facilities and provide services that promote the secondary use of social data; and methodologists and computing specialists who advance technical methods to manipulate and analyze social data (International Association for Social Science Information Service & Technology, 2007). It may be anticipated that more specialist groupings in particular disciplines will form to work with the research data residing in digital libraries.

The 'tagging' of data in such repositories can be expected to be specialized and to be indexing using controlled vocabularies and ontologies. However, in more general public environments, popular tagging warrants further investigation in cataloguing systems and finding aids that were not designed to hold multiple viewpoints

The *LibraryThing* site (Rethlefsen, 2007, Sept 15) supports reporting of personal collections of books and rating those books. In so doing it enables contributors to download metadata (library cataloguing) from a wide range of library sources to enable. Quite apart from the issues of who actually owns that metadata ownership there is supplementation by personal tagging provided. This means some redundancy of tagging (i.e. repetition of the subject matter of the book), but also is used for characteristics for example '2004 read'; 'give away when read'; 'wish list'.

There is a need for better utilization of existing cataloguing formats – in some cases releasing provided data that have been long hidden, together with a need for library systems to be more flexible in provision of metadata labels to provide multiple viewpoints of the same information object. This in turn provides for differentiated and refined retrieval.

Although tagging may be so free form as to introduce more noise than it contributes to retrieval, tagging facilities themselves may be improved to enhance the tagging process.

For example there is the process of bundling group tags into categories. This is somewhat like what has been possible in pre-Web information retrieval using what were called ‘hedges’ - grouping of index terms in labelled categories in information retrieval systems. Task tagging where the tags are designed for specific groups such as subjects for classes in education is a variation on this. Some libraries have even gone to the extent of using Dewey Classification to bundle tags in social systems for their own use.

Policy

Public sector organizations usually articulate strategy as part of a public policy framework, which itself may be circumscribed by legislative requirements. At a federal level in Australia there are additional policy documents, for example “Government online” (Australian Government Information Management Office, 2000) that among other things requires all non-commercial publications to be made available online.

It is to be expected within individual institutions that policy cognisant of the Web environment is adapted to deal with technological impact, and in particular to address:

- Priorities for digitization of existing physical material in collections including preservation approaches – these may for example require establishment of principles for dealing with unique material, or with artefacts in whole or part.
- Management of ‘born-digital’ material, the ways that it will be incorporated within collections and preservation strategies employed – for example whether it needs to be preserved with associated viewing software.
- The developing needs of generalist and specialist audiences and how these might be dealt with using appropriate ICT – which may require principles for analysis of online access.
- Optimization of network access to collections through finding aids, descriptive metadata and associated search technologies – which may involve principles about the extent of description provided from within an organization or used from other sources, and the extent of application of standards.
- Content management and development of programmes for utilization of materials to support education and exhibitions – which may be embraced within a publishing strategy.
- Collaborative approaches to working with other institutions, professionals, and the general public for engagement with digital materials.

These principles may be expressed to some extent within broad strategy documents, though increasingly organizations are finding it useful to have more detailed strategy documents pertaining to digital procedures, as for example NGA’s “Collections digitisation strategy” (National Gallery of Australia, 2006)

With increasing collaboration, the development of policy for commitment to Web involvement is also necessary between institutions. At an inter-institutional level, a cohesive approach to development may be undertaken in order to reduce barriers to online delivery, for example by improving integration of existing finding aids and improving the usability and interconnection of Web interfaces. There may also be have a joint digitization projects,

and schemes for improving knowledge about resources and the information literacy of the general public, so that the resources are effectively used.

There has been recognition of this in the public library community as manifest by the information access plan of the NSLA (National and State Libraries Australasia, 2006-2007). It has taken this over from the former Council of Australian State Libraries which initiated projects that involved linking digital services, promoting federated searching, simplifying interfaces, and streamlining procedures for connecting people and items.

Publishing

Most cultural institutions have adopted a publishing role on the Web if only to provide material that provides user instruction and advice on the portal that they manage. Beyond this they have published promotional and marketing material online. However, they can really bring the power of the Web to bear when they publish their own material to the Web consolidated within curated exhibitions or educational programs (examples of which have been mentioned under ‘applications’), or discovery programmes such as the ‘journeys’ at SLNSW (State Library of New South Wales, 2007).

Yet the potential for publishing seems virtually limitless given attention to digitization of collections, utilization of content management software, an entrepreneurial approach and resources for curation and innovation. This may also lead to publishing leadership such as that provided by Stanford University Libraries with Highwire Press ("HighWire Press," 1995-2007) where the libraries provide both the repository and publication process for a range of scholarly journals.

Entry into this area may require a rethink of the traditional ‘disinterest’ that gives grounds for institutions to sit back and provide the material for disciplinary specialists to analyze. At least there might be a more proactive role in seeking sponsorship for and commissioning work for digital publication with disciplinary specialists.

Gold (Gold, 2007 (Sep/Oct)) has called for further library involvement in publishing for cyberinfrastructure, but her comments might be applied to all cultural institutions. She refers to libraries working with scholarly societies and academic publishers to help develop publishing standards and systems. It is felt that they could play a similar role in developing data publication standards and systems such as publishing workflows, global identifier schemes, linking schemes, standards for data clean-up and normalization, and for providing credit and recognition to data authors, and rights management in general.

The digital publishing need not however be initiated by the repositories. Web self-publishing facilities such as *Lulu* ("Lulu," 2007) cater for limited free digital use complemented by fee-for-service digital publishing. If the self-publisher requires, print products too may be produced from the digital compositions making use of integration of disparate text and imagery. It is to be expected that self-publishers making use of such facilities, will increasingly wish to incorporate digital material from cultural institutions. Procedures to facilitate rights management and appropriate income are fundamental to provide support for such a process.

Records retention

In the paragraphs above, mention was made of policy in relation to digital objects either when they are created that way, or when they are converted from an original physical item. The evolving Web will continue to introduce hurdles to preservation and recordkeeping. Two that are pressing and likely to have impact upon cultural institutions, are social networking and cyberinfrastructure.

NLA, which preserves what would otherwise be ephemeral websites through its *Pandora* facility, itemizes in its own exclusions, section 3.7 (National Library of Australia, 1996 -). Examples on the exclusions list include websites employing a Web camera that uploads digital images for broadcast; datasets; discussion lists, chat rooms, bulletin boards and news groups; promotional websites; and advertising websites that are compilations of information from other sources and are not original in content.

They also allow for exceptions to these, and after all are not referring to material that they have created themselves. However cultural institutions are likely to be involved in the creation or support of some or all of these media, and will have to make preservation decisions about them. As in many cases they involve public interaction, some decisions may perhaps be made according to recordkeeping principles such as retention scheduling.

This would mean for example that at its outset an institutional blog should have associated metadata to describe when and how it would be retained, as well as providing sufficient descriptive or administrative information to ensure adequate access and retrieval over the long term for regulatory or historical purposes. In some cases this may also mean a requirement for description of processes for refreshing and migrating data and its associated software in order to keep the documents usable.

Despite ‘datasets’ appearing on NLA’s exclusion list, as noted in the **metadata** section above there is likely to be increasing role for existing repositories to support cyberinfrastructure through data curation.

Gold (Gold, 2007 (Sep/Oct)) has drawn attention to this by asserting libraries’ core mission to sustain long-term access to the research record, and their culture of standards development and collaboration across institutional boundaries. She sees librarians playing roles in the selection, acquisition, and licensing of data and data sets; in creating metadata (or metadata standards) for discovery and description of data sets; in creating or organizing documentation related to data; and in offering preservation services for digital data.

She also refers to the role common to archives and libraries, of advising in the appraisal and selection of what data to keep for the long term, as well as assisting users with finding data relevant to their research, using third-party high level directories and data discovery sources.

Rich Web applications

Web users are now working in a setting where what they activate through browsers resembles the environment supported by desktop software. External content may be brought seamlessly to screen within local applications; images and sounds may be rendered in conjunction with demographic or statistical representations; retrieval software is seamlessly associated with drag and drop shopping baskets.

The advances in Web applications, also called rich Internet applications such as *Ajax* (Asynchronous JavaScript + XML) (Garrett, 2005) operate by introducing another layer to a session between a user and a site without slowing down interactions. They may in fact

speed them by enabling asynchronous interaction and retaining the data and program state at an application server**.** *Google* has put them into effect with applications like *Gmail* and *Google Maps.*

The application engine which is invoked at the beginning of webpage session renders the interface which the user manipulates while the application communicates with the remote server on the user's behalf. *Ajax* combines a number of technologies including Javascript and is undertaken within a framework of standards such as XML for data interchange and XHML for data presentation. Other such environments are *Flex* and *OpenLazl* for *Adobe Flash.*

At C2RMF in France, use has been made of the *Ajax*-based *Ruby on Rails* development environment ("Ruby on Rails," 2007) to achieve interoperability between multiple repositories. A large multimedia galley image collection has been brought together with semantic web mapping making use of the Concept Reference Model for cultural heritage documentation defined by the International Committee for International Museum Documentation (CIDOC). It is intended to extend this work by cross mapping between the C2RMF database and the bibliographic system based on UNIMARC (Pillay, Aitken, Pitzalis, & Lahanier, 2007).

Possible applications in the environment of cultural institutions that draw upon server side repository information supplied by the institutions and associate this with data from other sources (mashup), include users being able to:

- Mix at their own desktop channels of streaming media together with static documents and images from a group of sites in order to produce an exhibition or display that is automatically kept current and may in turn be 'syndicated'.
- Personalize their view of incoming repository images, for example by dragging and dropping material, adding their own descriptive material and re-publishing it.
- Make use of research referencing tools for collaborative work - For example *Zotero* assists with organization of information sources by sensing when users are viewing a Web object, then automatically save the full reference information in a way that may be shared ("Zotero," 2007).
- Produce tailored reports from source data that are exportable for example into spreadsheets.
- Produce guides to organizational resources that incorporate material from the organization's own blogs, together with headlines, and aggregators, all selectively scanned and automatically updated.
- Associate demographic or time series data with collection data to illustrate geographical or temporal distributions of repository material

There is potential for the institutions themselves to develop applications that may be utilized by social networking sites. Sites such as *LibraryThing* have developed widgets to download from repositories (in its case libraries). Conversely, since the repositories stand to benefit from contributing to such sites, they may develop widgets to be offered for specific communities to use at their sites to bring in data from the repositories (along with authoritative metadata and attribution).

Web-based organizations habitually have made use of open software libraries, and are increasingly making use of infrastructure facilities provided by other major Internet agents. For example *Jamglue* ("Jamglue," 2007) provides for an online music community that uploads and records and personalizes sound with provision for remixing. It facilitates sharing of tracks created and provides for inclusion of these into blogs of the like of *MySpace*. It also provides for tracking of use such as times played and blogs into which material has been rolled.

Jamglue has been able to scale to increasing demand by making use of computing architecture powered by Amazon Web Services. They use Amazon S3 facility for music library and image storage and EC2 to handle backend audio processing such as an Amazon Machine Image (AMI) containing applications for the S3 repository, use Web service interfaces to requisition machines for use, and for configuring security and network access permissions.

Seeding

Cultural institutions that regularly monitor Web statistics note that a relatively small percentage of users come directly to their site. Instead the audience will click through from search results produced by search engines, or by better known sites that may have embedded links to their site.

The gravitational pull mentioned earlier, may be used to the advantage of organizations that are in a position to contribute directly to social sites with material that then brings users to the resources of their own site. Carrying this out on a manual basis has been experimented with for example by Lally and Dunford of University of Washington Libraries. The authors (Lally & Dunford, 2007) reported on a project that involved inserting into *Wikipedia* links that brought users into its digital collections, working on the basis that a limited number of students begin by searching a library website (OCLC Online Computer Library Center Inc, 2005). Their Web statistics software indicated that increasing numbers of users came to their library site as a result, and they were able to track clickthroughs from individual encyclopaedia entries that they had contributed.

There is value in larger organizations contributing to entries in facilities that are not tied to a particular institution. This applies with metadatabases such as *Picture Australia* where users may proceed from the combined database to follow links back to host institutions. This works efficiently if harvesting software is carrying out the database building automatically so that contributors need input only to their own institutional databases.

A further development in *Picture Australia* is a project in which users of the photo-sharing service *Flickr* when contributing their images may assign them to groups (an example is ‘Ourtown’) that are then regularly harvested by the NLA and integrated with Picture Australia images. Hooton (Hooton, 2006) has noted the way that this is opening up the wealth of history sitting in family photograph albums, as well as enabling contributors to view juxtapositions of past and present images. It is also leading to creation of further imagery that references the *Picture Australia* collections. Pearce (Pearce, 2006) notes too, that creators of selected images referenced in *Flickr* are being approached to provide archival quality material that may be retained in NLA’s own collection.

A variation on this approach is presently carried out professionally in relation to Australian literature in the *Austlit* database. Here material is linked to *Libraries Australia* so that when records are retrieved, checks may be carried out to identify physical holdings. *Austlit* has a decided advantage for retrieval in incorporating FRBR principles (Tillett, 2004) which provide for grouping of different manifestations of particular works. However *Austlit* is for subscription access.

LibraryThing also provides for users to group manifestations of works together in the FRBR manner, and it is possible for institutions to seed it in order to provide pointers to specialist material held in collections. A number of libraries use it to enhance access to their collections. This can be put into effect by incorporating widgets provided by *LibraryThing.* In this way lists of books newly added to the *LibraryThing* site may be rolled to a Web page or blog using a small piece of JavaScript.

However, it seems more attractive to develop an automatic approach to such seeding. There seems to be a case for tools that provide for uploading (fertilization?) of social sites with selected material from repository sites, whilst avoiding repetitive data entry of the metadata envelope.

Skills

Cultural institutions must address the skills base that is required for effective progression within the evolving Web environment. For specific projects, it may be preferred to bring together people with project management, software development, information organization and subject specialization skills. However, there seems to be a continuing case for education for more generic information management professionals.

Courses with an information focus have for some time tried to move away from the approach of information services with a particular institutional orientation such as archives or libraries. Many aspire now to deal with information management in a broader environment. However there continues to be a need to address skills related to data curation and digital preservation, the provision of digital information services, information modelling, content management and information architecture, and understanding of the ontologies and metadata that support these.

Gold, maintaining this when referring to the need to support cyberinfrastructure, has pointed to the requirement of skills for managing datasets as complex objects; creating standards related to data publication, description, citation, discovery, and reuse; and addressing policies for data disclosure (Gold, 2007 (Sep/Oct)).

One response to this in the US has been to provide continuing education in immersive learning. UIUC Graduate School of Library and Information Science has introduced a ‘virtual worlds’ course with involvement in *Second Life* and attention among other things to applications, resources, and exhibits and information services in the virtual environment ("Virtual world librarianship in Second Life," 2007).

Professional education in Australia can be responsive through continuing education to information management developments by means of short courses that provide exposure to rich Web applications, metadata advances or utilization of social networking sites within corporate framework. Inclusion of such material within the formal university curricula can benefit from association with cultural institutions through student involvement in ongoing projects, and practitioner input to curriculum development.

Statistics

Much use is made by administrators of site visits or page views. This may reflect the old problem of measuring what can be, rather than what should be measured. It may be understandable in terms of hard pressed managers seeking quantifiable approaches justification of funding. However such data are as superficial as the counts of people coming into the foyers of cultural institutions. There's nothing to say whether they went any further, what they did if they did look at or use an exhibit,… were they engaged?

From query logs there may also be extracted metrics on queries submitted, reformulations, session boundaries, results actually explored (clickthrough data), and time spent reading each result. Development in metrics in the commercial world is driven by the need to see reasons for 'monetizing' sites. Hence services such as *Feedburner* ("FeedBurner," 2007) have been developed that may be brought on board to provide time series indications of site use, incorporations of feeds within aggregators, and clickthrough and clickback data.

Apart from trying to determine whether and how onsite content is used at institutional sites, complexity is added by trying to measure content use when it has been distributed through syndicated feeds, rolled into blogs or replicated on websites. Further, rich applications may introduce extra distortion to the utilization of page view data.

Improved metrics are desirable in order to give some indication of the extent of engagement by users, for example:

- Ratio of unique clicks as a percentage of unique opens – this takes into account clickthroughs only for circumstances where messages have first been opened, and may provide a better indication of relevance of message content along with the effectiveness of the design or currency of message and of trust.
- Numbers of contributions to institutional blogs that relate to specific exhibitions.
- Extent of application of tagging that supplements institutional indexing.
- Tracking movement around catalogues, for example when users select subject headings from one item to move to others
- Quality aspects of tagging that indicate such aspects of spread of application of quasi synonyms, redundancies, or misapplications from typographical inconsistencies.

Conclusion

How should cultural institutions design for participation?

Much of the preceding discussion has been about re-orientation away from one way delivery of information towards an exchange between institutions and their users – the 'conversation'. The user or patron or customer) becomes a participant. The participant contributes to the interpretation of collections, and may also contribute to the digital collection. However the software that supports the participation will only be effective if it can build upon a foundation provided by sound policy development, appropriate digitization, unified searching environments, and effective description provided by institutions.

The ease of use of facilities such as online shopping for books and recordings, and the equal ease and stimulation provided by social networking sites has put pressure on cultural institutions to foster similar approaches. Their resources are immense. By virtue of their role, they have 'data on an epic scale' in the way referred to earlier. However much of it remains in physical form. It will be continuing digitization programmes that bring it to the epic stage from a Web viewpoint.

The following points summarise the issues that are raised in the discussion, and in some cases speculate on directions for further investigation or development. Each area represents a prospective domain of investigation for research institutions or the cultural institutions themselves.

Improvements in access will depend upon improving retrieval capabilities in repository software by applying ranking and relevance feedback capabilities, or using markup metadata to report contents of repositories into search engines that provide such facilities. Allied with this, must be rationalization of descriptive metadata to permit unification of different types of information repositories.

Audience support may be fostered by the use of software that supports collaborative spaces in conjunction with information resources from institutional repositories. It may also be better determined by more sophisticated use of data from use of both the collaborative areas, and the traffic through institutional sites – particularly the avenues taken to the site, and the tasks engaged in while there.

Mechanisms for retaining and identifying authority of institutional data must combine management framework (such as identifying graduated levels of participant responsibility), a design framework (such as providing for interfaces that differentiate authoritative from user-generated content), and a technical framework (for example providing for scalable infrastructure to support heavy periods of use – and retain user faith).

Collaboration by combining distributed collections through federated search mechanisms may be further pursued by inter-institutional development of educational products and B2p (as suggested in the discussion introduction) collaborations that provide for extended public and professional participation in compilations, anthologies and exhibitions.

Current awareness facilities are being developed within social network sites, and are being utilized by some libraries to facilitate reporting of types of material from their own collections. It would be good to see institutions doing the reverse process – providing widgets to enable updates of their own material to be reported into social sites.

Metadata continue to provide a foundation for effective retrieval. The power of the metadata may be unlocked by continuing to develop interfaces for effective guidance of users, and by in turn incorporating the capacity to enable users to contribute descriptive material of their own in order to provide further perspectives on information objects.

Publishing opportunities are virtually limitless based upon the extent of collections. This may be better facilitated by bringing together internal content management applications with rich Web applications particular to make more use of metadata for contextualizing the information that it describes.

Recordkeeping has the potential to become a process more prominent for all institutions. Records retention is not only to support the regulatory requirements of their own governance, but to maintain metadata about social and research datasets so that these in turn may be associated with repository information.

There is a great deal of potential for exploiting rich Web applications for associating material from distributed repositories, for bringing different metadata to bear on the information that it describes, and for introducing material to and from socially constructed avenues.

Seeding of external social networks with information about repositories is an attraction to institutions that wish to direct more use to their resources. However, it is unlikely to be sustainable while the process is carried out manually on an ad hoc basis as in the examples noted earlier. Automation of the process is one of the areas that may be investigated with rich applications in order to complement social sites with authoritative information.

Cultural institutions have the opportunity to contribute to skills development by providing 'laboratories' for student projects, and this in turn will enhance the education and preparation for the information management professions.

There is much to be learnt through social network analysis and about the sociology of participation as manifest by the ways interfaces and retrieval are used. Design of metrics that provide such a picture should be incorporated into the development of new interfaces and mashups. The statistics subsequently obtained from these can contribute further to system development.

Giving project teams the room to try things that may not work is an important element of these practices, and an education in itself.

With respect to policy for the Web 2.0 environment, a flexible approach to management of digital content may be articulated under the umbrella of wider sector strategy, and responsive to the rapid environmental changes. However it should be amplified by strategy documents that explain an organization's approach to digitization, access, metadata provision and public engagement through digital services.

Glossary

Term	Explanation
Artefact	Any object that is the subject of collection, maintenance and curation in a repository. They may be digitized to become information artefacts in a variety of forms.
Blogs	A blog (a portmanteau of Web log) is any kind of diary published on the Web, usually written by an individual (a "blogger") but also by corporate bodies. Many blogs provide commentary or news on a particular subject such as food, politics, or local news. Blogging is regarded by some as an important social phenomenon as it contributes to the easy exchange of ideas among a large and growing international community ("the blogosphere"). The home page usually shows the most recent article and links to earlier articles, the owner's profile and Web logs written by the owner's friends. There is usually a facility for readers to add comments to the bottom of articles. A blog is commonly displayed in reverse chronological order.
Crosswalking	Matching elements from different metadata schemes.
CSS	A Cascading Style Sheet is used to describe the presentation (colour, font, size, etc) of a Web document. Its most common application is to style pages written in HTML and XHTML, but the language can be applied to any kind of XML document. Style information can be included in-line in the HTML file or in a separate CSS file (which can then be easily shared by multiple HTML files). Multiple levels of CSS files “cascade”, allowing selective overriding of styles in a previous CSS file.
Curation	Maintaining and adding value to artefacts; when applied to digital curation it implies a trusted body of digital information for present and future use, and includes the management and appraisal of data over the life-cycle of scholarly and scientific materials.
Cyberinfrastructure	(or e-science) The distributed and integrated computer, information and communication technologies that provide an ongoing platform for scientific research endeavour by support for a range of facilities enabling coherent data acquisition, storage, management, integration, mining, and visualization on the Internet.
Folksonomy	(also known as collaborative tagging , social classification, social indexing, social tagging, and other names) is the practice and method of collaboratively creating and managing tags to annotate and categorize content. In contrast to traditional subject indexing, metadata is not only generated by experts but also by creators and consumers of the content. Usually freely chosen keywords are used instead of a controlled vocabulary.
JavaScript	Formerly "LiveScript", JavaScript is Netscape's simple, cross-platform, Web scripting language. It was influenced by many languages and was designed to have a similar look to Java (which is a Sun trademark), but be easier for non-

	programmers to work with. JavaScript is intimately tied to the World-Wide Web, and currently runs in only three environments - as a server-side scripting language, as an embedded language in server-parsed HTML, and as an embedded language run in Web browsers where it is the most important part of DHTML. For a time, only Netscape's products supported JavaScript. Microsoft now supports a work-alike which they call JScript. The resulting inconsistencies make it difficult to write JavaScript that behaves the same in all browsers. This could be attributed to the slow progress of JavaScript through the standards bodies.
Learning object	A uniquely identified and self-contained digital resource that is described with metadata, and may be used to support learning.
Mashup	A Web application that combines data from more than one source into a single integrated tool; a typical example is the use of cartographic data from *Google Maps* to add location information to real-estate data from *Craigslist*, thereby creating a new and distinct Web service that was not originally envisaged by either source. The term mashup originally referred to the practice in pop music (notably hip-hop) of producing a new song by mixing two or more existing pieces.
Metadata	Metadata is data about data. An item of metadata may describe an individual datum, or content item, or a collection of data including multiple content items. For example, metadata would document data about data elements or attributes, (name, size, data type, etc) and data about records or data structures (length, fields, columns, etc) and data about data (where it is located, how it is associated, ownership, etc.). Metadata may include descriptive information about the context, quality and condition, or characteristics of the data. The metadata required for effective data management varies with the type of data and context of use.
Podcast	This is a portmanteau of the words "iPod" and "broadcast", the Apple iPod being the brand of portable media player for which the first podcasting scripts were developed. A podcast is a digital media file, or a series of such files, that is distributed over the Internet using syndication feeds for playback on portable media players and personal computers. The term, like "radio", can refer either to the content itself or to the method by which it is syndicated; the latter is also termed podcasting. The host or author of a podcast is often called a podcaster.
RSS	Really Simple Syndication (formerly Rich Site Summary) refers to a family of document types for listing updates to a site. RSS documents (generally called "RSS feeds") were once readable only with RSS readers (generally called "aggregators") like *BottomFeeder*. However, in recent years, aggregator functionality has become integrated into Web browsers. RSS feeds generally publish frequently updated content such as blog entries,

	news headlines or podcasts. The feed typically contains either a summary of content from an associated site or the full text. RSS makes it possible for people to keep up with their favourite sites in an automated manner that's easier than checking them manually.
Semantic Web	The semantic Web is an evolving extension of the World Wide Web in which Web content can be expressed not only in natural language, but also in a format that can be read and used by software agents, enabling computers and people to work in cooperation. It derives from W3C director Sir Tim Berners-Lee's vision of the Web as a universal medium for data, information, and knowledge exchange.
Tagging	A tag is a (relevant) keyword or term associated with or assigned to a piece of information (e.g. a picture, a geographic map, a blog entry, or video clip) as a whole or only to a part of it (e.g. "timed tags" assigned to specific moment in time in a video), for purposes of keyword-based classification and search of information.
Widget	A discrete set of software code that may be embedded within a Web page, then automatically invoked without requiring separate compilation; typically uses Dynamic HTML, JavaScript or Flash languages.
Wiki	Any collaborative site that users can easily modify via the Web. A wiki allows anyone, using a browser, to edit, delete or modify content that has been placed on the site, including the work of other authors. This has been found to work surprisingly well since contributors tend to be more numerous and persistent than vandals and old versions of pages are always available. Text is entered using a simple mark-up language which is then rendered as HTML. In contrast, a Web log, typically authored by an individual, does not allow visitors to change the original posted material, only add comments. Wiki wiki means "quick" in Hawaiian. One of the best-known wikis is Wikipedia.

Appendix 1: People interviewed or attending focus groups

Date	Place	Person	Title	Institution
10.8.2007	Canberra; NAA	Mr Steven Ellis	Assistant Director, General Operations and Preservations	National Archives
10.8.2007	Canberra; NLA	Dr Judith Pearce	Deputy Director, Innovation	National Library of Australia
10.8.2007	Canberra; NLA	Dr Warwick Cathro	Assistant Director-General, Innovation	National Library of Australia
10.8.2007	Canberra; NLA	Mr Tony Boston	Assistant Director-General, Collaborative Resource Sharing Services	National Library of Australia
10.8.2007	Canberra; NLA	Mr Basil Dewhurst	Manager, Resource Discovery Services	National Library of Australia
10.8.2007	Canberra; NLA	Ms Carmel McInerny	Manager, Reader Services Branch	National Library of Australia
10.8.2007	Canberra; NLA	Ms Amelia McKenzie	Director, Asian Collections	National Library of Australia
10.8.2007	Canberra; NLA	Mr Lee Christofis	Dance Curator, Music and Dance Branch	National Library of Australia
10.8.2007	Canberra; NLA	Ms Fiona Hooton	Manager, Picture Australia	National Library of Australia
10.8.2007	Canberra; NLA	Ms Liz Holcombe	Web Manager	Australian War Memorial
16.8.2007	Sydney; PhM	Mr Sebastian Chan	Manager, Web Services Digital Multimedia	Powerhouse Museum
16.8.2007	Sydney; PhM	Ms Joy Suliman	Project Manager, Collections Australia Network	Collections Australia Network
16.8.2007	Sydney; PhM	Ms Megan Martin	Manager, Caroline Simpson Library & Research Centre	Historic Houses Trust
16.8.2007	Sydney; PhM	Ms Angela Stengel	Web Editor	Historic Houses Trust
16.8.2007	Sydney; PhM	Ms Inara Walden	Curator, Museum of Sydney	Historic Houses Trust
16.8.2007	Sydney; SLNSW	Ms Lucy Arundell	Assistant State Librarian, eLibrary Services & CIO	State Library of New South Wales
16.8.2007	Sydney; SLNSW	Ms Mylee Joseph	Consultant, Young People and Older Persons	State Library of New South Wales
16.8.2007	Sydney; SLNSW	Ms Ellen Forsyth	Consultant, Public Library Services	State Library of New South Wales
22.8.2007	Melbourne; Arts Victoria	Jonny Brownbill	Manager, Public Information	Museum Victoria
22.8.2007	Melbourne; Arts Victoria	Michael Parry	Head of Media Technology	Australian Centre for the Moving Image
22.8.2007	Melbourne; Arts Victoria	Dr Ken Walker	Deputy Head of Sciences	Museum Victoria
22.8.2007	Melbourne; Arts Victoria	Mr Maksim Lin	Multimedia Systems Developer / Administrator	National Gallery of Victoria
22.8.2007	Melbourne; Arts Victoria	Mr Jon Luker	Online Multimedia Designer	National Gallery of Victoria

Date	Place	Person	Title	Institution
22.8.2007	Melbourne; Arts Victoria	Tim Fisher	Senior Curator	The Arts Centre
22.8.2007	Melbourne; Arts Victoria	Eleanor Whitworth	A/g Senior Arts Officer	Arts Victoria
22.8.2007	Melbourne; SLV	Anne Beaumont	Senior Research & Development Coordinator, Office of eStrategy & Innovation	State Library of Victoria
22.8.2007	Melbourne; SLV	Prue Mercer	Planning & Project Management, Office of eStrategy & Innovation	State Library of Victoria
5.09.2007	Brisbane; QUT	Lesley Sharp	Manager, ICT Project	State Library of South Australia
5.09.2007	Brisbane; QUT	Andrew Piper	Manager, Collection Specialists	State Library of South Australia
13.09.2007	Brisbane, SLQ	Anna Raunik	Executive Manager, Resource Discovery	State Library of Queensland
13.09.2007	Brisbane, SLQ	Kerry Cody	Head, Information Management & IT	Queensland Museum

Appendix 2: Illustrations of sites

Figure 1: *Documenting a democracy* site

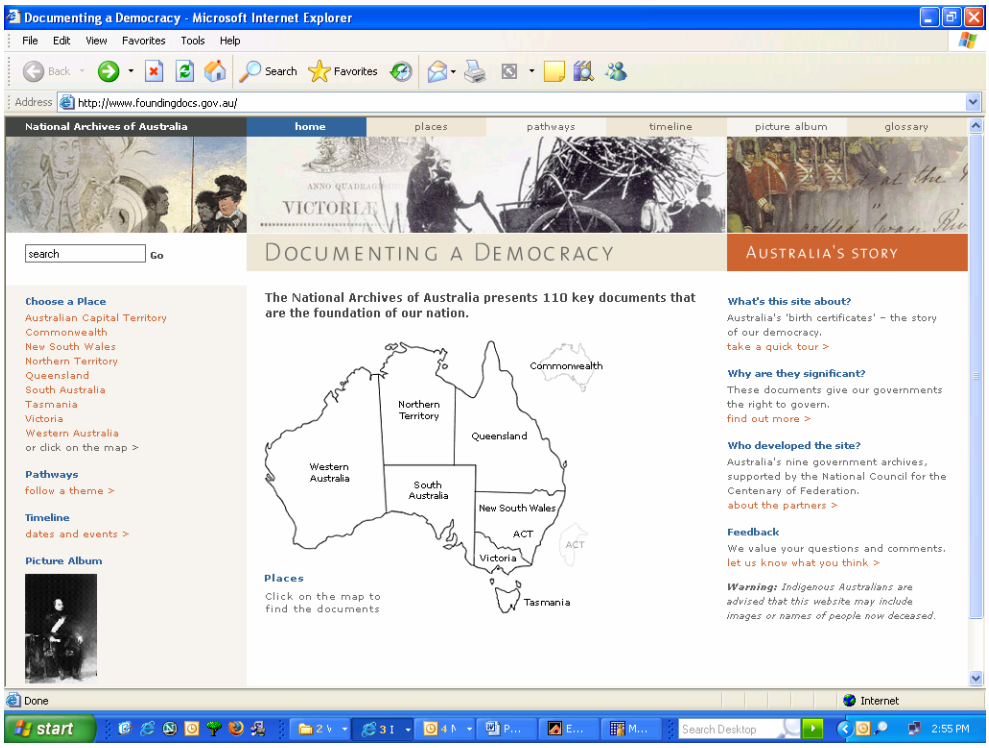

Figure 2: *Library Loft: PLCMC teen pages*

Figure 3: *MICHAEL - Multilingual Inventory of Cultural Heritage in Europe*

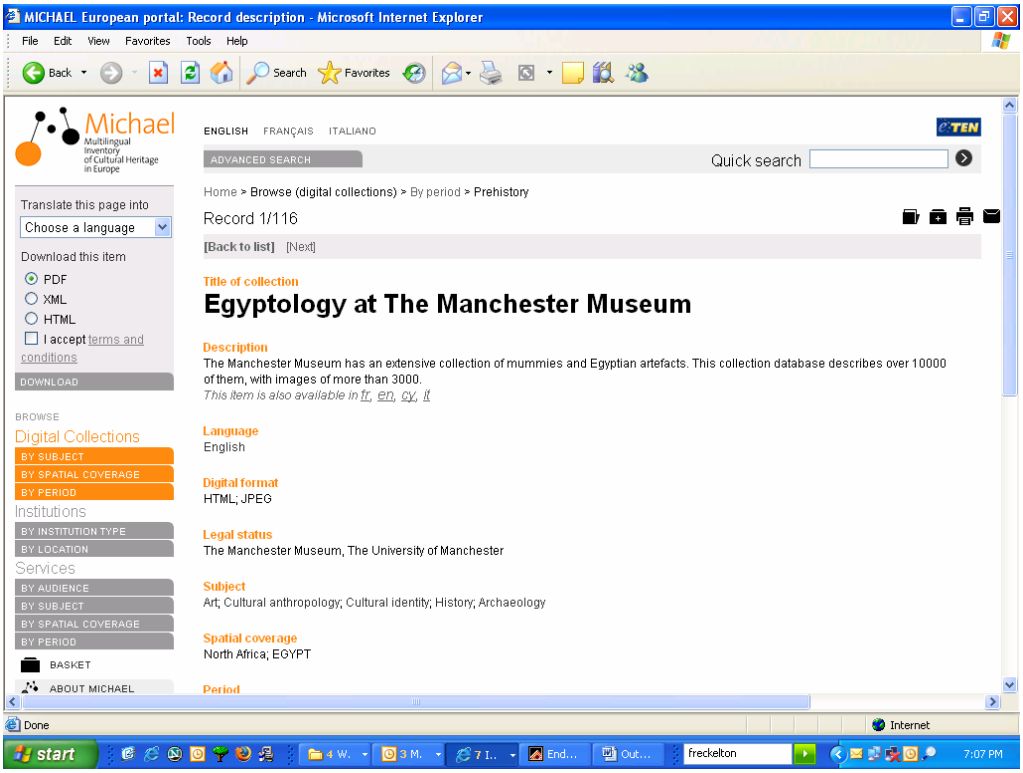

Figure 4: *Public Library bookmark provision on del.icio.us*

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