

# Looking forward by looking back: APSR's contribution to future repository planning in Australia

Margaret Henty  
Australian Partnership for Sustainable Repositories  
[margaret.henty@apsr.edu.au](mailto:margaret.henty@apsr.edu.au)  
[www.apsr.edu.au](http://www.apsr.edu.au)

Adrian Burton  
Australian Partnership for Sustainable Repositories  
[adrian.burton@apsr.edu.au](mailto:adrian.burton@apsr.edu.au)  
[www.apsr.edu.au](http://www.apsr.edu.au)

## **ABSTRACT**

*The Australian Partnership for Sustainable Repositories (APSR) was established in 2004 with a grant from the Systemic Information Infrastructure (SII) from the Department of Employment, Science and Training (DEST). It was one of a number of projects to benefit from official recognition of the importance of digital sustainability and the need for development of institutional repositories in Australian universities and other organisations. In four years, APSR has contributed significantly to the management of digital information in Australia, through both its development portfolio and its extensive range of outreach activities. There have been benefits to the partners and to the sector as a whole. The work undertaken and the lessons learnt provide useful information for future planning in a field which continues to expand and develop.*

## Introduction

The Australian repository environment has changed significantly since mid 2003 when the Department of Education, Science and Training (DEST) announced the awarding of funds to support four new projects through its Systemic Information Infrastructure (SII) initiative. There was a small number of repositories already established in Australian universities. Most of those had been established by libraries for the purpose of supporting the open access movement for academic article publication and most were based on the EPrints software developed at the University of Southampton. In the four years since that time, we have seen the implementation of repositories in almost every Australian university with an increasingly emphasis on the stewardship and preservation of digital information of all kinds. New paradigms of ICT-enabled research have become mainstream in all disciplines, and the “repository” has emerged as a key piece of eResearch infrastructure in providing enduring access to revolutionary new collections of research data.

The four projects that were given funding in 2003 have all played a large part in this. These were the Meta Access Management System Project (MAMS), The Australian Research Repositories Online to the World (ARROW), Australian Digital Theses Program Expansion and Redevelopment (ADT) and Towards an Australian Partnership for Sustainable Repositories (APSR). It is APSR that will be the subject of this paper.

The Development Proposal for APSR said:

*A vibrant, energetic national research enterprise rests on ready access to data and information, and to scholarly communications. Convergence within technology-based information transformation, transmission and storage leads to a vision of an information infrastructure in which of [sic] all types of information can become readily available to all researchers, independent of location, research methodology or disciplinary base. This is captured by the WINWINI aspiration – what I need, when I need it. (APSR, 2003)*

Today we are much closer to that aspiration.

## Beginnings

The Partnership making up APSR was an eclectic one that included three major research universities (the Australian National University, the University of Sydney and the University of Queensland), the National Library of Australia, and APAC (the Australian Partnership for Advanced Computing). Two other universities, the University of Melbourne and the University of Technology, Sydney, joined as associates. This partnership reflected the broad nature of the issues faced and the capabilities required in managing and sustaining Australia’s research data and scholarly information in digital format. It also came to be APSR’s greatest strength and the basis of its success.

APSR is described in the Media Release issued by the Hon Peter McGauran, Acting Minister for Education, Science and Training, to announce the grants:

*APSR has three parts. First, the proposal has an overall focus on the critical issues of the access continuity and the sustainability of digital collections. Second, it will build on a base of demonstrators for digital continuity and sustainability, embedded in developmental repository facilities within partner institutions. Third, it will contribute to national strength in this area by encouraging the development of skills and expertise and providing coordination through out [sic] the sector. APSR will actively provide international linkages and national services. (McGauran, 2003)*

In the first three years of its operations, APSR activities came under four program headings: Digital Continuity and Sustainability, Practices and Test-beds, National Services and International Linkages.

### ***Digital Sustainability Program***

Online collections of digital research materials offer a new paradigm of access and analysis but the Achilles heel of the new paradigm is the technical, financial, and administrative sustainability of digital collections. The APSR Digital Sustainability Program addressed all these areas with a particular emphasis on the digital preservation and curation of research materials in digital format.

The Digital Sustainability Program leveraged the expertise of the National Library of Australia by utilising their considerable experience and capacity for the benefit of the higher education sector as well as others with digital repository needs. In 2005, this Program delivered two internationally-acclaimed reports, which laid the groundwork for further work in implementing sustainable infrastructure solutions for digital collections. The *APSR Sustainability Issues Discussion Paper* (Bradley, 2005) and the *Survey of Data Collections* (Bradley & Henty, 2005) are landmark documents which continue to be used and quoted often.

The National Library has been responsible for two major projects, which will provide lasting benefit to Australian repositories. The PREMIS Requirement Statement (PRESTA) Project aimed to develop a requirements specification for preservation metadata. The specification is based on the PREMIS (PREservation Metadata: Implementation Strategies) final report, the *Data Dictionary for Preservation Metadata* (OCLC, 2005). The project worked to develop a list of mandatory elements for a specified range of formats, developed a functional specification and supported the implementation of the model at the partners' repositories (APSR, 2005).

The second of these projects has been the Automated Obsolescence Notification System, better known as AONS. Format obsolescence is potentially a major problem for every repository manager. This is particularly true, given the dynamic and changing nature of computing environments and, more especially, the rapid and unpredictable drivers that cause formats to become obsolete. This problem is compounded by the ever-increasing number of formats and volume of digital materials in different collections. In addition, the high business value of the specific content of some digital

materials or collections can result in policies that mandate that access be maintained to this data for extended periods of time. AONS was therefore developed as a software tool to help manage format risk and thereby to ensure the long-term curation of digital material held in the repository.

The AONS Project has been conducted in two parts, commencing with software development in 2006 and concluding with the development of an operational service in late 2007. The service provides support to repositories anywhere around Australia (or in fact globally). Users register with the service by providing a URL to a repository's format summary expressed as an XML file. The AONS service displays the summary and allows a repository manager to compare the formats of items in their repository with information from format registries such as PRONOM (National Archives, 2007) and Library of Congress Digital Formats Web Page (Library of Congress, 2007). These registries flag any formats that are likely to become obsolete. Repository managers can then make curation decisions about any items at risk. At the time of writing, AONS is in pilot among the APSR partners. However, there have been significant downloads of the open source software which is available from < <http://sourceforge.net/>>.

AONS has a second useful feature. By downloading and installing AONS locally, an institution can take advantage of a pilot risk metrics implementation. This feature requires manual data entry in order to assign weightings to particular formats to create a risk profile for each format. Over time, by sharing this information between AONS instances it may be possible to build up accurate risk profiles for many common formats.

### ***The APSR Test Bed Program***

The APSR Test Bed Program was regarded as an innovative way of developing infrastructural elements for digital collections. In the first three years of APSR operations, each of the three university partners invested considerable time and effort in developing repository tools and services that are available to the rest of the world.

The University of Queensland has put its name on the international repository map with the development of Fez, the first version of which was released in 2005. Fez is digital repository management software for the Fedora platform. Fedora is a generic framework for managing digital objects. It requires the development of user interfaces for any application (such as an institutional repository). Fez builds upon the sophisticated Fedora base framework to provide an integrated management system to manage common aspects of institutional repository functions such as item deposit, workflow, collections and community management.

Fez has attracted international attention as well as providing a valued local service. At the University of Queensland, it has provided an effective repository system to support eSpace@UQ while delivering additional functionality for digital theses and the Research Quality Framework (RQF). Internationally it has achieved considerable success with seven working installations in place by August 2007 in such diverse countries as Spain,

Norway and the USA. These include the National Digital Science Library and the Colorado Alliance of Research Libraries (CARL). The Fez open source code is now being added to by developers around the world.

The Australian National University adopted the DSpace repository software early on, and has contributed substantially to its development. Scott Yeadon of ANU is a member of the seven-person committers group that oversees all contributions to the DSpace project. In this way, the ANU test bed has had a unique insider's opportunity to promote the specific concerns of Australian universities in developing the DSpace platform. ANU's involvement in DSpace resulted in an international DSpace User Group Meeting in Australia in January, 2006.

The ANU test bed team developed "DSpace-in-a-Box" as a means of enabling others to install DSpace with minimal effort. They have mentored other Australian universities choosing to use the DSpace platform, and have provided workshops in most Australian capitals. In addition, they have provided ongoing informal technical advice and collaboration on DSpace development projects. This has made the ANU test bed a key resource and source of expertise for fledgling institutional repositories in several universities around Australia and New Zealand. In response to the RQF, ANU staff developed the code to support authentication requirements.

The test bed program at the University of Sydney was established on a DSpace-based institutional repository, with the cooperation of many other digital collection managers distributed around the campus. Development concentrated on the repository middleware called iSpheres. This allows existing digital collections around a university to interoperate. iSpheres provides a researcher or student integrated access to heterogeneous collections of images, sound, video, text, databases or GIS datasets, housed variously around the university and beyond. This project was designed for universities that require a decentralised repository system.

In 2006 and 2007, the University of Sydney test bed developed software to help researchers capture better digital data while on fieldwork. The FieldHelper tool set was designed by field researchers to allow them to retain a maximum amount of descriptive, technical, structural, locational, temporal and relational information about the data they collect. This contextual information about the data not only engenders more eResearch, but also greatly increases the long-term sustainability of data in the repository environment. Originally conceived as a tool for ethno-musicology, FieldHelper has been taken up by other disciplines as diverse as archaeology and botany. Further details of the project and how to obtain the software can be seen at <<http://www.apsr.edu.au/fidas>>.

## **Surveys**

Two landmark surveys conducted by APSR have attracted international interest and been favourably remarked upon. The first of these, *Sustainability Issues for Australian Research Data*, provides the results of a survey of sustainability issues for data-intensive research projects, including the capabilities and demands of research groups

and institutions for the storage, access and long-term management of research data (Buchhorn and McNamara, 2006). This was favourably commented upon in *From Data to Wisdom: Pathways to Successful Data Management for Australian Science*, prepared by a working group of the Prime Minister's Science and Engineering Innovation Council (PMSEIC, 2006). A second survey was intended to increase APSR's understanding of the requirements of institutional repositories, to assess their collective aspirations and to define the place of institutional repositories in the research information infrastructure (Henty, 2007). It resulted in the article "Ten Major Issues in Providing a Repository Service in Australian Universities" published in *DLib Magazine*.

### **Portfolio developments in 2006-7**

The second half of 2006 saw a departure from the test bed model of development and the beginning of a new software development cycle with a focus on services and infrastructure for online collections and a repository interoperability framework. The Repository Development Program, as it came to be known, comprised two major areas of activity: the Collections Services & Infrastructures (COSI) projects and the Repository Interoperability Framework (RIFF) projects. Both of these areas of activity were designed to be collaborative and to take advantage of skills and expertise of the partners. Rather than, for example, making specific improvements to a single repository system, all developments were to apply across platforms and to be widely applicable.

### **Collections Services and Infrastructures (COSI)**

The COSI initiatives are self-contained projects that provide value-added services for repository managers and maintainers. There were three separate projects conducted during 2007. The AONS pilot service was introduced in September, 2007, and has been discussed above. The other two projects are the Benchmark Statistics Project (BEST) and the Online Research Collections Australia (ORCA) Registry.

The focus of the BEST initiative was on developing a Repository Statistics Service that would enhance the type and quality of statistical information about collections (and items) and usage statistics in repositories. The problem to be solved here relates to the strategic need for better, standardised, statistical information about the repository holdings and usage in order to inform a wide range of policy and funding decisions within the overall scholarly communications cycle. More specifically, BEST was designed to provide a federated repository statistics service that would facilitate the automated collection and standard analysis of statistical information about the collections and usage of APSR Partner (and other) repositories. BEST was scoped in late 2007 in association with a reference group of 16 experts in the field. A formal requirement for a web application will be developed in the first half of 2008.

The ORCA Registry was designed to allow institutional repositories, archives and data centres to create and share collection-level information and resources. Its aim was to develop a discovery portal for collections information (that is, information about research collections) for the benefit of researchers wanting to identify what digital collections are available and the conditions under which they might be used. This would provide a

better discovery environment for data collections produced by the wide range of individuals and institutions involved in the Australian innovation system. This includes all Australian higher education institutions; Government-funded research organisations (such as CSIRO); and commercial and not-for-profit organisations in sectors with research interests (such as archives, museums and libraries).

One important aspect of the registry was that it should be able to handle machine-to-machine services related to managing collections within a network of federated repositories. This is important for the enabling of automated searching and harvesting of information and would be an important aspect of linking with similar registry services overseas.

It is likely that operational services for both the ORCA Registry and BEST will be offered through the Australian National Data Service (ANDS) at a later stage. AONS may also be further developed and supported by ANDS at a later stage.

### **Repository Interoperability Project (RIFF)**

Within the scholarly communications cycle, there are common practices and workflows which could be made simpler and which could be integrated into the institutional repository. The RIFF projects took specific workflows which are common to scholarly communications and integrated them with DSpace and Fez+Fedora. These included working with journals, conferences, images, fieldwork, word-processing and the creation of researcher portfolios. Let us look at one of these in some detail.

Journal publication is currently the major form of scholarly communication, and increasingly many researchers are looking to quality open publishing options to ensure the widest access to their work. The RIFF project on online journals was set up to improve scholarly communications workflows for the production, preservation and dissemination of electronically published scholarly journals in the Australian higher education and research sector.

This was done by harnessing the Open Journal System (OJS), a powerful Web-based e-journal production environment developed by the Public Knowledge Project in Canada (PKP, 2007), and automatically connecting it to DSpace or Fez+Fedora through a Submission Service, developed concurrently as part of the overall RIFF initiative. Here, OJS is still retained as a standalone editorial and production platform for editors, authors and so on, but the journal editions, once completed, are migrated onto DSpace or Fez+Fedora. The benefits of this phase of the workflow are that DSpace or Fez+Fedora provides essential services, such as long-term preservation, persistent identifiers for bibliographic control, and common search/discovery mechanisms, to name but a few.

An associated part of this project is the development of tools so that journals can be disseminated in attractive, user-friendly, ways that can also be specifically 'branded' to reflect institutional and other affiliations. This project has provided, for the Australian higher education and research sector, an efficient, low-cost, durable system for the

production, preservation and dissemination for scholarly journals that will improve the impact of, and worldwide access to, their research outputs.

This project was an excellent example of collaboration within and beyond the APSR partnership, bringing together expert staff from The University of Sydney, the Australian National University, The University of Queensland, The National Library of Australia, University of Technology, Sydney, Swinburne University and the Public Knowledge Project at Simon Fraser University in Canada.

Details of the other RIFF projects can be found on the APSR website at < <http://www.apsr.edu.au/currentprojects/>>.

### **Software services for repository integration**

Underlying both the COSI and RIFF projects was a need to develop software 'services' that would enable the seamless integration of the software environments used with DSpace and Fez+Fedora. Here APSR has developed two Web-based 'service' applications. The first was a 'Submission Service' that translates and routes Submission Information Packages (SIP) from the workflow environments to DSpace or Fez+Fedora for automatic ingestion. The second was a platform-independent 'Dissemination Service' that would enable richer Web-interfaces and experiences for end-users. This work drew heavily on the expertise of the National Library of Australia in facilitating the adoption of the Metadata Encoding and Transmission Standard (METS) as a common format for exchanging data between repositories and other workflow environments.

### ***The National Services Program***

When APSR was established, repositories in Australia were only just being introduced. An important aspect of the proposal leading to the formation of APSR was that it include an outreach arm, with two primary aims, to provide advisory technical services and to provide effective skills transfer opportunities. Through this program, APSR would use its tools, expertise, information sources and contacts to build an integrated set of advisory and support services aimed at addressing the requirements of all those engaged in repository management. Key aspects of the National Services Program would include education and advocacy, enhancing cooperation between institutions, the provision of advice on standards and best practice, and problem solving.

It has been in the provision of education and advocacy that APSR has made itself best known. Since mid 2005, APSR has offered a wide range of activities in a diverse range of cities which have included every capital city in Australia. The audience for these events has been wide: policy makers, repository managers and their staff, systems developers and programmers, and academic researchers. Over 1,500 people have attended APSR events designed to improve repository management and develop the skills associated with data management and stewardship. The audience for our various activities and events has not been limited to the higher education sector, but has come as well from government administrative and research organisations, the cultural sector

and private enterprise. Many New Zealanders have crossed the Tasman to attend the events.

Noteworthy events have included Open Repositories 2006, held at the University of Sydney, and incorporating an international DSpace Users Group Meeting. This series of linked events attracted over 150 people, a significant proportion from overseas, and proved so popular and timely in terms of its content, that it has led to further conferences in Texas and Southampton, with more to come. Another popular event was eResearch 2007, organised in association with MAPS (Middleware Action Plan and Strategy), and held in Brisbane. This attracted over 350 people, and demonstrated the increasing sophistication and importance of repositories as they interlink more closely with the national research agenda.

The national importance of the Research Quality Framework (RQF) was shown in two well-attended one day seminars in Melbourne and Sydney which explored official requirements for the RQF and brought together staff from institutional repositories, university research offices and DEST. These were organised in association with ARROW, and have been followed by other jointly organised events.

## **Communications**

Australia is a large country and it is difficult to reach all parts of it. For this reason, APSR developed a number of mechanisms to support publicity for events and activities. The APSR website, [www.apsr.edu.au](http://www.apsr.edu.au), has played an important role in providing access to a regularly produced newsletter, discussion papers, project reports and software. Usage of these publications has been high: each issue of the newsletter is downloaded over 1,000 times, and some individual reports have been downloaded over 2,000 times in pdf form. For those unable to attend APSR events, podcasts of presentations via the website have had an appreciative audience. The list-server, `apsr_announcements`, grew to over 300 members and has been used to publicise events, new publications and occasional news items. Two wikis were established, one to provide technical information about projects and the other to support members of the ORCA Support Network.

## **ORCA Support Network**

The development of the ORCA Registry in 2007 was accompanied by creation of the ORCA Support Network, set up to coordinate support for online research collections. Membership of the Network included all the APSR partners, with meetings being held monthly via the access grid and information shared via a publicly accessible wiki.

The Support Network was established on the basis that technical support for research activities is best delivered at the level of the institution or research group. It was designed to provide a human and social network of researchers engaged in eResearch, collection managers and “eResearch technologists” (data scientists and domain-specific informatics specialists).

The ORCA Support Network was set up with four areas of activity: communications forums to increase the connectedness of the stakeholder groups; training, with a focus on research data management skills; the creation of registries of eResearch projects, eResearch experts and eResearch collections and consulting - the ORCA partners offer consultancies in their areas of expertise and extend work already under way informally in their own region or sector.

### **International Linkages Program**

A lesser-known aspect of APSR has been its international linkages program. This was established to encourage Australian participation in and contribution to the development of international standards and to encourage greater interchange with overseas developments, thereby widening the national skill base. APSR has made a notable contribution to the development of interoperability standards, primarily through the work of the National Library of Australia. PREMIS allows the capture of consistent metadata in standard form and METS improves the movement of metadata into and between repositories. The International Linkages Program has allowed APSR staff and partners to present the results of APSR projects and activities to conferences and events overseas, and brought overseas speakers to take part in local events.

### ***APSR and FRODO projects***

The APSR program cannot be judged in isolation of the other Federated Repositories of Online Digital Objects (FRODO) SII programs, the activities of which have significantly complemented and reinforced those of APSR. The ARROW initiative has helped to develop a robust repository system in collaboration with the library services provider VTLS and has been active in developing a community of repository service providers. ARROW, and the related DART and ARCHER projects, have worked positively with APSR to build some of the cross platform national services such as the research collections registry (ORCA), the aggregated statistics service (BEST), and the automated obsolescence notification service (AONS). They have also collaborated with, and actively contributed to, the APSR outreach and training programs.

The MAMS project has provided a broad infrastructure for controlling access to repositories. The generic nature of the MAMS solution has implications for all kinds of identity management and authenticated and authorised access to online resources. APSR has specifically benefited from input from the MAMS project in enabling sector-wide controlled access to collections in repositories and APSR pilot services.

### ***Influencing its own Future***

The very existence of successful programs such as APSR has influenced the future of research infrastructure planning in Australia. Here was evidence of a new kind of “infrastructure” that addresses capability as well as capacity, that treats the “data” as part of the infrastructure itself, that thrives because of its inclusive and collaborative nature, and that focuses on a new breed of systemic information infrastructure for a new era of scholarly communications.

Ideas and approaches that emerged from APSR have been influential in the specification of the NCRIS Platforms for Collaboration, and APSR staff have been active in the public consultation process. APSR-developed frameworks and white papers on sustainability and eResearch data have made an impact on the policy and planning agenda in this area.

As the SII funding environment draws to a close, so too does the federal funding for APSR. Elements of the program will live on in the new NCRIS funding environment, others will be sustained by the partners and the partnership independently. Yet other elements have been absorbed into the daily work of researchers and repository managers around Australia and beyond.

## **Conclusion**

The Australian Partnership for Sustainable Repositories united the efforts of a group of institutions that were already committed to the continuity of access to research materials in digital format. The aim of the partnership was to extend the commitments of partner organisations to create systems and services with sector-wide significance and application.

The partnership framework has enabled a collaborative approach to training, outreach, national services, and systems development. The outcomes of these collaborative initiatives have been greater by far than the sum of the individual parts and have been fundamentally broader and more systemic than anything that would have emerged by separate effort.

Significant institutional resources have been complemented by federal government funding of \$4.2m over four years. The injection of federal funds has catalysed cohesion, communication, and collaboration amongst repository service providers in Australia. Over the four year period, the adoption of, and engagement with, standards-based repository systems has been enhanced across Australia. These systems are better integrated with institutional infrastructure and researcher workflow.

APSR sponsored services are now available to enable researchers to more easily submit and better disseminate and “publish” their research materials. Other services are available to assist repository managers manage the risk of digital obsolescence

Awareness and capability in the sector has increased significantly due in significant part to the work of the APSR outreach program. Repository service providers at the majority of Australian universities are deeply engaged with the information management needs of their researcher communities and better prepared to meet those needs in the many diverse contexts of e-research, open access, and research quality assessment.

## **Resources**

In the past four years, APSR has produced a considerable quantity of resources which will continue to be of value to the Australian and international repository communities.

The APSR website can be found at <http://www.apsr.edu.au/> and is hosted by the Australian National University.

The site contains all documentation relating to projects and events. The publications include project reports, discussion papers, the newsletter and documentation about APSR and its ongoing activities. There are also links to publications about repositories and digital preservation which have been contributed by APSR staff members and partners to non-APSR publications. All software developed by APSR and its partners is open source and much of this is available for download. Records of all APSR events are available including programs, podcasts, presentations and photographs. The ORCA pages link to publicly available training materials developed by partners.

With the cessation of government funding for APSR at the end of 2007, every effort will be made to ensure that the APSR website is maintained for the foreseeable future. All publications, presentations, podcasts, software and other documentation will be moved to the ANU Demetrius repository, and the site itself will remain at its current location for some years. The APSR site has also been harvested by the National Library of Australia on a regular basis as part of its PANDORA project.

## References

APSR 2003, *Towards an Australian Partnership for Sustainable Repositories – A National Infrastructure Development. Project Proposal*, APSR, Canberra, viewed August 22, 2007, <<http://www.apsr.edu.au/documents/APSR.pdf>>

APSR, 2005 *Data Dictionary for Preservation Metadata: Final report of the PREMIS Working Group*, APSR, viewed September 4, 2007, <<http://www.oclc.org/research/projects/pmwg/>>

APSR, 2007, *FIDAS – Fieldwork Data Sustainability*, APSR, Canberra, viewed September 4, 2007 <<http://www.apsr.edu.au/fidas>>

APSR, 2007, *APSR Projects*, APSR, Canberra, viewed September 4, 2007 <<http://www.apsr.edu.au/currentprojects/>>

Bradley, K, 2005, *APSR Sustainability Issues Discussion Paper*, APSR, Canberra, viewed September 2, 2007 <[http://www.apsr.edu.au/documents/APSR\\_Sustainability\\_Issues\\_Paper.pdf](http://www.apsr.edu.au/documents/APSR_Sustainability_Issues_Paper.pdf)>

Bradley, K & Henty, M (2005), *Survey of Data Collections: a research project undertaken for the Australian Partnership for Sustainable Repositories*. APSR, Canberra, viewed September 4 2007, <[http://www.apsr.edu.au/publications/data\\_collections\\_survey.pdf](http://www.apsr.edu.au/publications/data_collections_survey.pdf)>

Buchhorn, M & McNamara, P, 2006, *Sustainability Issues for Australian Research Data: Report of the Australian eResearch Sustainability Survey Project*, APSR, Canberra, viewed January 9, 2008, <<http://dspace.anu.edu.au/handle/1885/44304>>

Henty, M, 2007, “Ten Major Issues in Providing a Repository Service in Australian Universities”, *DLib Magazine*, viewed January 9, 2008, <<http://www.dlib.org/dlib/may07/henty/05henty.html>>

Library of Congress, 2007, *Sustainability of Digital Formats: Planning for Library of Congress Collections*, Washington DC, viewed September 4, 2007, <<http://www.digitalpreservation.gov/formats/intro/intro.shtml>>

McGauran, Senator P 2003, *\$12 million for managing university information*, Department of Education, Science and Training, Canberra, viewed September 2, 2004, <<http://www.dest.gov.au/Ministers/Media/McGauran/2003/10/mcg002221003.asp>>

National Archives, 2005, *PRONOM*, National Archives, Washington DC, viewed September 4, 2007 <<http://www.nationalarchives.gov.uk/pronom/#>>

OCLC, 2005, Data Dictionary for Preservation Metadata: Final Report of the PREMIS Working Group, viewed January 15, 2008  
<<http://www.oclc.org/research/projects/pmwg/premis-final.pdf>>

Prime Minister's Science, Engineering and Innovation Council, 2006, *Data to Wisdom: Pathways to Successful Data Management for Australian Science*, PMSEIC, Canberra, viewed September 4, 2007,  
<[http://www.dest.gov.au/sectors/science\\_innovation/publications\\_resources/profiles/Presentation\\_Data\\_for\\_Science.htm](http://www.dest.gov.au/sectors/science_innovation/publications_resources/profiles/Presentation_Data_for_Science.htm)>

Public Knowledge Project, 2007, *Open Journals System*, Vancouver, viewed September 4, 2007, <<http://pkp.sfu.ca/?q=ojs>>