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Developing an effective, accessible and sustainable digital repository of OLT learning and teaching resources: Final report

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List of acronyms used

AAF	Australian Access Federation
AARE	Australian Association for Research in Education
ACEN	Australian Collaborative Education Network
AARNet	Australia's Academic and Research Network
ACER	Australian Council for Educational Research
ACDE	Australian Council of Deans of Education
ACODE	Australian Council for Online and Distance Education
ACT	Australian Capital Territory
ADA	Australian Data Archive
ALTC	Australian Learning and Teaching Council
ANDS	Australian National Data Service
ANU	Australian National University
AOASG	Australasian Open Access Strategy Group
APAIE	Asia-Pacific Association for International Education
APO	Australian Policy Online
APSR	Australian Partnership for Sustainable Repositories
ARC	Australian Research Council
ARROW	Australian Research Repositories Online to the World
ASCILITE	Australasian Society for Computers in Learning in Tertiary Education
ATED	Australian Thesaurus of Education Descriptors
ATEM	Association for Tertiary Education Management
ATN	Australian Technology Network
AUSGOAL	Australian Governments Open Access and Licensing Framework
AUTC	Australian Universities Teaching Committee
CADAD	Council of Australian Directors of Academic Development
CAUDIT	Council of Australian University Directors of IT
CAUL	Council of Australian University Librarians
CC	Creative Commons
CLOCKSS	Lots of Copies Keep Stuff Safe
COAR	Confederation of Open Access Repositories
CORE	Computing Research and Education Association of Australasia
COUNTER	Counting Online Usage of Networked Electronic Resources
CSU	Charles Sturt University
DC	Digital Commons
DCMI	Dublin Core Metadata Initiative
DOI	Digital Object Identifier
DVC	Deputy Vice Chancellor
DVCA	Deputy Vice-Chancellors Academic
edX	edX consortiums
EU	European Union

FAST	Faceted Application of Subject Terminology
HEA	Higher Education Academy (UK)
HERDSA	Higher Education Research and Development Society of Australasia
IEAA	International Education Association of Australia
IRs	Institutional repositories
IRU	Innovative Research Universities
ISSOTL	International Society for the Scholarship of Teaching & Learning
MERLOT	Multimedia Educational Resource for Learning and Online Teaching
NADLATE	Network of Associate Deans of Learning and Teaching in the Discipline of Education
NCSEHE	National Centre for Student Equity in Higher Education
NCVER	National Council for Vocational Education Research
NHMRC	National Health and Medical Research Council
NLA	National Library of Australia
NSW	New South Wales
NZ	New Zealand
OAI-ORE	Open Archives Initiative Object Reuse and Exchange
OAI-PMH	Open Archives Initiative Protocol for Metadata Harvesting
OAIS	Open Archive Information Systems
OCLC	Online Computer Library Center
ODLAA	Open and Distance Learning Association of Australia
OER	Open Educational Resources
OLT	Office for Learning and Teaching
OpenAIRE	Open Access Infrastructure for Research in Europe
OpenDOAR	Directory of Open Access Repositories
ORCID	Open Researcher and Contributor ID
QLD	Queensland
RUBRIC	Regional Universities Building Research Infrastructure Collaboratively
RUN	Regional Universities Network
RVA	Research Vocabularies Australia
SWORD	Simple Web-service Offering Repository Deposit
TEQSA	Tertiary Education Quality and Standards Agency
UA	Universities Australia
VET	Vocational Education and Training
VIC	Victoria
VOCED	Vocational Education and Training Research Database

Executive summary

This project aimed to provide the Department with a roadmap for its Resource Library, an online repository containing resources emanating from the projects funded by the OLT and its predecessors. The roadmap is to address both technical and management considerations in order to ensure the repository's sustainability and engagement with the higher education learning and teaching community in Australia and beyond.

The project conducted a literature review and prepared a briefing paper for participants in a nationwide consultation exercise around the future of the Resource Library. Over 70 leaders and experts in university learning and teaching, and in scholarly repositories, attended focus group sessions held in Brisbane, Canberra, Melbourne and Sydney, and online, while over 100 respondents took part in an online questionnaire survey.

The consultation confirmed that the higher education community wished to see the Resource Library collection remain freely accessible on an ongoing basis, to allow for the full return on the investments made by the OLT and its predecessors. There was less interest in a broader repository of learning and teaching resources, with concerns raised over quality control and duplication of effort.

The consultation also confirmed the expectation that the Resource Library offer standard repository features, which would entail a migration from its current platform. A list of specifications was drawn up, and included in this report for the basis of a work plan. In the absence of an OLT successor, the project team received expressions of interest in hosting and managing the migrated Resource Library from several organisations from within the Australian higher education community. It is recommended that the Department consider outsourcing the migration and hosting of the Resource Library. This may involve a commercial repository hosting service, and include a commitment to the professional indexing of the resources from OLT projects still to be completed.

The project recommends that the Department consider also funding an additional project to collect materials from the websites of past projects, to supplement the repository's content.

Further, collaboration between the department and one or more higher education organisations is important to implement the awareness and engagement plan outlined in this report, and appoint discipline and institutional champions to disseminate reports and other information about the repository. The Department or the organisation hosting the repository should hold regular face-to-face and online events that invite Fellows, grant recipients and project participants to meet, present their work, and contribute updated and value-added material for the repository, which should acknowledge its current name and brand.

The total cost of implementing the project's recommendations is estimated to be between $75,000 and $200,000, depending on the options selected.

Table of contents

Tables

Chapter 1 – Introduction

This chapter provides an introduction to the *Developing an effective, accessible and sustainable digital repository of learning and teaching resources* project, setting out the purpose, the background, the current context, and a brief description of the content of the existing Office for Learning and Teaching (OLT) Resource Library.

The project had two objectives:

1. to develop a costed proposal, addressing governance, information management and technical solutions, for a user-centred online repository of learning and teaching resources, positioned for maximum value to those within the Australian higher education learning and teaching sector; and,

2. to develop a communication plan to ensure the Australian higher education sector and key repository users are aware of, and engaged with, the repository.

Background

For many years the Australian Government has funded the OLT and its predecessor organisations to administer grants, fellowships and networks to enhance higher education learning and teaching practices. Products from these funded programs include research, learning and teaching resources, websites, project reports and collaborative networks. As with any asset, knowledge products must be managed. Physical assets require recordkeeping related to acquisition, storage, access and use. Digital information also requires description that enables it to be acquired, stored, accessed and used.

The resources generated by the projects funded by the OLT and its predecessors have been managed in several ways since the early 1990s. In 2007 Philip, Lefoe, O'Reilly, & Parrish outlined the need for a repository for these resources:

> '…there is no dedicated national repository or 'exchange' for teaching and learning resources in higher education catering to the diverse needs of educators in the sector. Nor is there a related community space for teaching and learning providing the required active online forums and work spaces. The Carrick Institute for Learning and Teaching in Higher Education aims to address this gap by developing the Carrick Exchange' (p. 844).

Two years later, Treagus (2009, p. 1) described the goals of the then Australian Learning and Teaching Council (ALTC) Exchange, as being to 'encourage the adoption of good practice in learning and teaching in the higher education sector, and provide resources to support the professional learning of educators.'

Table 1 provides a timeline illustrating the progressive development of this document store, from a list of reports on a website to a database to a collaborative resource exchange to a resource library.

Table 1 Timeline of document store

Year	Organisation	Name of online document store	Software / host	Focus
1992	Committee for the Advancement of University Teaching (CAUT)			
1997	Committee for University Teaching and Staff Development (CUTSD)			
2000	Australian Universities Teaching Committee (AUTC)	Publications list on AUTC website (2000)	DETYA/DEST website / Frontpage	Reports Separate project websites
2004	Carrick Institute	Carrick website	DSpace (EdNA) / education.au	Content (reports, websites, news) Grants, Awards, Fellowships Discipline-based initiatives Events
2007	Carrick Institute for Learning and Teaching in Higher Education	Carrick Exchange (2008)	Carrick Dspace / education.au	Content (reports, websites, news and events) Community (people, organisations and networks)
2008	Australian Learning and Teaching Council (ALTC)	ALTC Exchange (2009)	Drupal / education.au	Content (reports, websites, news and events) Community (people, organisations and networks)
2011	Office for Learning and Teaching	OLT Resource Library	Drupal / Office for Learning and Teaching	Content (reports, resources, links to websites)
2016	Department of Education and Training			

About the current repository

This project is informed by the recommendations of the *National learning and teaching resource audit and classification* report of Hider et al. (2015). Their first recommendation was 'that the current content management system used by the OLT [needs to be] replaced' (p.30). The report points to the need for the replacement to address issues around technical and information standards, information architecture, governance, usability, access, archiving, metadata management, sustainability and maintenance, as well as to reflect the priorities of users, repository managers and repository sponsors.

As of June 2016 the OLT Resource Library at www.olt.gov.au/resource-library contained 720 records, representing the projects funded by the OLT and its predecessors. Most records are

linked to a final project report; many also link to other resources emanating from the project, such as teaching materials, survey instruments and external websites. The vast majority of reports and other resources stored in the Resource Library are in PDF or Word format.

The project conducted by Hider et al. (2015) involved re-indexing the Resource Library using various controlled vocabularies. A total of 85 terms for different resource types were used, while the topics of the projects and resources in the collection were described using over 1,500 unique terms taken from the Australian Thesaurus of Education Descriptors (ATED). In addition, 84 terms from the Australian Standard Classification of Education (ASCED) were added to represent the various disciplines covered by the projects.

Chapter 2 – Literature review

A literature review was undertaken that focussed on the characteristics and development of digital repositories worldwide, including their standards, functionality and services, infrastructure, accessibility, usability, hosting, governance, funding and sustainability. The review also considers cultural and engagement aspects of a repository service, including advocacy, and stakeholder engagement in the dissemination of research outputs. A particular focus of the review was non-institutional repositories, including those with a national, regional or disciplinary scope, and those dealing with learning and teaching scholarship. An environmental scan of repository infrastructure currently in use in Australia was also conducted.

Digital repositories

Pinfield (2009, p.165) defines a repository 'as a set of systems and services that facilitate the ingest, storage, management, retrieval, display, and reuse of digital objects.' Repositories may be established by institutions, research organisations, governments, private organisations or other groups. Primarily, they are established to aggregate, manage and provide access to a variety of digital assets, including journal articles, theses, datasets, learning objects, conference papers and other resources.

Over the last 20 years, repositories have played an increasingly important role in information access, particularly in scholarly communication. In some cases they have been central to the fostering of communities of practice, developing networks and providing visibility and open access to research outputs. Indeed, repositories have changed the landscape of academic publishing. No longer are researchers solely dependent on subscription services to access scholarly outputs: repositories have enabled the research community to take back a degree of control over scholarly communication. Public funding bodies are at the same time adopting policies that further cultivate open access.

Repositories' scope

OpenDOAR lists as of May 2016 3,090 open-access repositories worldwide. Australia has 55 repositories registered with OpenDOAR consisting of 48 institutional repositories, two government repositories and five discipline-specific repositories. Analysis of repositories by Shearer (2015) indicates that while most repositories are institutional (83.7%), hosted and managed by research organisations and universities, there are also many repositories with a much broader scope, including national and even international repositories. Across the world, repositories currently harvest over 72 million records from over 3,000 sources. A number of national and disciplinary repositories have been created by governments to better track their country's research outputs.

Examples of broad-based repository services include OpenAIRE (https://www.openaire.eu), a network which aggregates the research outputs of European Community (EC) funded

projects. OpenAIRE currently aggregates the metadata from over 590 lower-level repositories across Europe. It also links these records with funding information from the EC and other European Union national funders. In North America, SHared Access Research Ecosystem (http://www.share-research.org) aims to collect, connect, and enhance scholarly metadata for the purposes of better understanding and tracking research outputs (Shearer, 2015, pp. 8-12). Similarly, LA Referencia (http://lareferencia.redclara.net), formed by several Latin American governments, maintains a centralised harvester and promotes common standards across South America.

In terms of learning and teaching repositories, MERLOT (https://www.merlot.org) is renowned for its collaborative model. Repository resources are contributed by authors or by members who wish to share useful resources with the wider community. The repository contains tens of thousands of discipline-specific learning materials, learning exercises, together with associated comments, and bookmark collections, all intended to enhance the learning experience. Another repository of note is provided by the UK Higher Education Academy, with its Knowledge HUB (http://www.heacademy.ac.uk/hub), specifically for university educators.

In Australia, the Federal Government has been instrumental in the development of research information infrastructure, including open access institutional repositories in universities. Three key government initiatives have enabled the development of institutional repositories, namely the Australian Partnership for Sustainable Repositories (APSR); the Australian Research Repositories Online to the World (ARROW); and the Regional Universities Building Research Infrastructure Collaboratively (RUBRIC) (Kennan & Kingsley, 2009). These projects identified and tested open source software and supported the development of interoperable institutional repositories. The Council of Australian University Librarians (CAUL) provides snapshots of repository development and management over time through its periodic surveys of institutional repositories (CAUL, 2014).

In short, global repository activity and open access policy by governments have stimulated the establishment of national and other broad-based repositories that not only track government funded research outputs, but also provide open access to such research. In Australia, universities through key government initiatives have been able to establish institutional repositories to aggregate, manage and provide access to their research outputs. However, on a national scale this is limited to Australian Research Online, which harvests into Trove (http://trove.nla.gov.au).

Repositories' content and objectives

Capturing and managing the intellectual capital of an institution is the key purpose and function of many repositories. Other benefits include long-term preservation of digital assets, standardisation of formats and exposing institutional academic outputs from a central location. Repository content is diverse and can include anything from research reports to journal articles, guides, datasets and images. According to Nicholas et al. (2013),

researchers support the use of repositories for the storage of non-article formats, such as datasets and video clips, whereas library staff tend to see journal articles and conference papers as the main content of repositories.

While repository development and application varies, it is important for any repository to observe good information management practices. This is reinforced in the Confederation of Open Access Repositories (COAR) report (2015), which concludes that it is essential to adopt standard practices for tracking and linking research publications with projects. Project funders and institutions are adopting common approaches to data usage which in turn allows them to reliably measure and compare the impact of research. The report also notes that research is becoming increasingly global with common issues being addressed by researchers all over the world. Access to such research should be openly available and repositories need to balance global access with local needs. This aspect of openness is further reinforced by Nicholas et al. (2013) in a review of digital repositories. Library directors were asked about the goals of their repositories and whether those goals were met. The directors highlighted as most important the need to provide open access to publicly funded scholarly research, followed by long-term preservation of research outputs (p. 7).

Repository infrastructure

The infrastructure of repositories covers both business aspects, which includes governance, roles and responsibilities, policy framework, and funding, and technical aspects such as information management, system infrastructure, and security.

Technical infrastructure

The technical functions of a repository are to ingest, manage and provide access to digital resources. OCLC's (2007) *Trustworthy Repositories Audit & Certification* document provides a useful framework, which classifies repository functionality into six categories based on the Open Archive Information Systems (OAIS) Reference Model. Specifically, they are to:

- Ingest – acquisition of digital content
- Preserve ingested material
- Document preservation strategies
- Archival and preservation maintenance
- Information management (metadata requirements)
- Access management (authorisation and authentication).

Fundamentally repositories have been developed to provide access to information and resources. Easy access to information and unambiguous navigational aids are essential features of a good repository. In order to achieve this considerable effort and costs are allocated to ensure end-user satisfaction. Focus group work and usability testing are key elements in the design of any repository interface. However, usability and storage of open access resources are not enough for repositories to remain relevant in this rapidly changing

environment; they must adopt a perspective of responsiveness, adaptability, and focus on developing services of value to the research community and other users (COAR, 2015, p. 7).

Repositories are increasingly used by governments, research organisations and institutions to monitor their investment in research outputs. In other words, funded research needs to be accessible and widely used to provide value for investment (COAR, 2015, p. 15). Repositories need to provide services and functionality expected by their communities of users. COAR's Roadmap, a significant document in scoping and developing digital repositories, outlines key functions and services that need to be provided by repositories (COAR, 2015, p. 8-18).

Metadata, used to describe and categorise digital objects in repositories, provides the platform for the delivery of a range of functions and services. Dublin Core based schemas are extensively used by repositories. Its associated metadata harvesting protocol (OAI-PMH) enables the exchange of metadata and facilitates access to assets via a number of online services (http://dublincore.org). The use of controlled vocabularies in metadata supports the controlled collocation of related topics and enhances discoverability. Hider et al. (2016), through mapping exercises of the selected terms used to describe the OLT Library resources, concluded that the Australian Thesaurus of Education Descriptors (ATED) was the most suitable vocabulary for the Australian higher education context. To support the automation of metadata records, tools such as FAST (Faceted Application of Subject Terminology) have been developed to streamline the selection of vocabulary terms.

The rapid growth of repositories over the last 15 years has been attributed to the introduction of OAI-PMH-compliant open source software (Pinfield et al., 2014, p.2; COAR, 2015, p.5). Pinfield reports that the most commonly used protocol by repositories is OAI-PMH (71%); indeed, most of the open source software repository packages come with OAI-PMH as standard (p. 24). Notwithstanding the importance of interoperability between document repositories, they are now also being integrated with research administrative systems and data repositories, connecting into other networks at national or local level, enabling researchers to work with content in new ways and enabling funders and institutions to track research outputs (COAR, 2012, p. 8).

An environmental scan of the repositories in use in Australian institutions revealed that open source software and commercial products popular with Australian universities include VITAL, DSpace, Fedora, EPrints, BePress and Drupal (Council of Australian University Librarians, 2014). A number of Australian universities are now starting to investigate and implement third-generation repository software such as Figshare (Monash University, 2016) and PURE (Benn & Mills, 2015). Amongst other features, these new-generation repositories are characterised by user-friendly workflows and out-of-the-box implementations that enable institutions to effectively measure the impact of their research outputs. Although significant improvements have been made to repository software, functionality limitations still remain. For example, improvements are needed to facilitate effective usage statistics,

enable user annotations and tagging, and support researcher and digital resource identifiers and faceted vocabularies.

Various hosting services are available for digital repositories, offering different levels of track record, service provision, flexible and scalable arrangements, and interoperability.

Repository management

Organisational attributes often influence a repository's performance, accountability, and sustainability. OCLC's checklist (2007, p.9) enumerates a range of considerations covering governance, organizational structure, mandate or purpose, scope, roles and responsibilities, policy framework, funding system and finance. The explicit policies and practices of repositories are as important as the technical aspects. They should include clear articulation of the mission statement, and compliance with community standards and with licence requirements.

Repository funders will influence the governance structure of the repository. In order to protect and ensure the sustainability of a repository, stakeholder participation is essential in its development and management. Possible structures include: a consortium, with a reference committee and advisory bodies; in-house management, with stakeholder advisory committees; and outsourced management, with reference and advisory bodies (Erway, 2012). An annual consultative forum can also facilitate input into future directions.

The staffing of a repository depends on its functions and services. Networking and online marketing skills, as well as information management expertise, are essential to provide a quality service and promote a repository nationally and internationally. Sterman (2014) notes that not every institution that maintains a repository has a dedicated repository manager. In some cases, a librarian manages the repository in addition to their other duties. Alternatively, a team within the institution shares management responsibilities.

The repository sponsor must provide explicit documentation of its requirements, decisions, development, and actions to ensure long-term preservation and access to digital content. Information management policies and metadata requirements need to be specific to internal organisation practices. Policies, procedures and mechanisms are required for review, update, and development of the repository as it grows and as technology and community practice evolve. Processes to ensure that feedback from producers and users is sought and addressed in a timely manner need to be in place. Most importantly the organisation needs processes in place to document changes to its operations, procedures, software and hardware that, where appropriate, is linked to relevant preservation strategies.

Many elements combine to achieve sustainability within both technical and socioeconomic aspects. According to Rieger and Warner (2010), at the heart of sustainability is the ability to secure the right technologies and expertise, have policies in place, a vision for the service, and the standards needed to deliver the service. An instance of a highly successful

repository is arXiv, internationally acknowledged as a pioneering digital archive and open-access distribution service for research articles. Under the management of Cornell University Library, a model was established for arXiv based on specific sustainability principles.

Challenges of engagement

Building a quality service with associated functions is not enough in itself to entice a community of users. Problems with getting buy-in from users were described in an article by McKay (2007), who said 'Institutional repositories (IRs) are less frequently implemented, harder to find, and less visible than their advocates would hope or expect' (p. 1). The author also pointed out that little is known about the users of institutional repositories. According to Cullen and Chawner (2010), New Zealand academics were slow to embrace the concept of institutional repositories, and displayed little interest in using them. Librarians and university administrators appear to favour institutional repositories, but they seem to have failed to gain traction with their user base, the academic community (p.133). Copyright issues and depositing processes put in place for academics are sometimes viewed as a hindrance (Nicholas et al., 2013). There may also be a marketing and promotional issue in that not enough has been done to inform the academic community about the existence and value of repositories. Furthermore, a point of difference needs to be articulated – in what way does it meet a need that cannot currently be accommodated by Google Scholar and other academic search engines? Thus a key challenge is to achieve a change in the attitudes of the research community so that repositories are used to the extent that they should be.

For a national, cross-institutional repository these challenges are magnified. Beyond mandated deposit by a funding body, it can be difficult to attract interest from potential contributors, and even more challenging to maintain a level of connection and engagement beyond the initial deposit.

Chapter 3 – Consultation questions

This chapter provides an overview of the issues identified for consideration in the consultation phase of the project. A short options paper was developed, informed by the literature review and the expertise of the project team and reference group.

Repository purpose

Determining the value proposition for a repository centres on the question of how it will align with its organisation's mission and objectives. In his 2015 report Professor Milbourne recommended four objectives for the OLT's successor.

To provide leadership in learning and teaching in higher education by:

- leading the national and international conversation on student-focused learning and teaching
- brokering strategic partnerships with major stakeholders: the Australian Government, the higher education sector and its students, business and the community, and international institutions
- providing strong advocacy across its stakeholder groups
- enabling, connecting, communicating and disseminating in support of learning and teaching.

These objectives, with their focus on conversation, partnerships, advocacy and connection, need to be front of mind when reviewing best practice and mapping the future direction for the Resource Library.

While those receiving OLT grants benefit from having their expertise recognised within their institution and beyond, the priority must be to transfer knowledge from the individual or project team to the sector as a whole. Visibility and discoverability of content are key to the challenge of knowledge transfer. In order for the sector to benefit from a funded activity, it is imperative that the findings of that project, and any resources created from it, are readily available and discoverable by those for whom they are relevant. Ultimately a grant is successful in the extent to which it contributes to improved learning by students in the higher education sector – particularly in Australia, but also more widely.

Repository models

Three broad models for a repository were sketched to guide discussion about what form a national learning and teaching repository should take post-30 June 2016, as summarised in Table 2. There are questions and themes that run across each of these three options such as standards, hosting, infrastructure, governance and sustainability, as well as stakeholder engagement. The models are not mutually exclusive in all respects; rather they are presented as a means of teasing out priorities and preferences.

Table 2 Repository models

Model	Archive	Cog	Engine
			
Focus	**preservation**	**collaboration**	**integration**
Content focus	**OLT**	**Global**	**OLT**
Priority	**discoverability**	**interoperability**	**usability**
Impact	✔	✔ ✔ ✔	✔ ✔
Setup cost	$	$ $	$ $ $
Maintenance cost	$	$ $ $	$ $
Out of the box	✔ ✔ ✔	✔ ✔	✔
Complexity	x	x x x	x x x
Visibility	✔	✔ ✔ ✔	✔ ✔
Scalability	+	+ + +	+
Sustainability	✔ ✔	✔ ✔	✔ ✔
Community	✔ ✔	✔ ✔	?

The archive

The archive model provides a branded, open access repository that is a secure and well-described store of public access documents. It is a best-of-breed, out-of-the box preservation repository that holds a record of the work of the OLT and its predecessors and can readily accommodate new documents. The archive works to ensure all these documents are highly discoverable globally.

Benefit: The archive model's major benefit is its simplicity of management. There are a number of repository platforms available that would be ready to facilitate this option.

Community: There is a strong community of repository managers within the university sector who are very experienced in this area, and who contribute to software enhancements.

Disadvantage: This model may have reduced ability to build a community. It is OLT-centric and holds its own content exclusively. As such it is very small and its contents may be overshadowed by larger repositories locally and globally. This limits its ability to fulfil the objective around international impact.

Cost: It is low cost, a once-off purchase or affordable annual licence. The hosting and management could be outsourced rather than maintained internally. If there is limited new material being added there are lower ongoing maintenance and staffing costs.

The cog

The cog model envisages the repository as a recognised part of Australia's higher education and research infrastructure. It is built on a future-focussed linked data architecture which supports interchange of metadata, content and community with other services. This model recognises that its users do not necessarily come to a single place to find resources and that exposing content to indexes, institutional repositories, national and global discovery services and search engines can ensure maximum discoverability.

Benefit: The cog model's benefit is increased visibility, coherence and connection to where the higher education sector is already operating. This model provides potential for greater impact across the sector as it reaps the benefit of scale as part of its connection with larger repositories. A focus on re-use of content and analytics supports the organisation's reporting of impact.

Community: This model is all about connection to the community. It uses controlled vocabularies common in the sector and prioritises the interchange of data. This model implements Hider et al.'s recommendations *f* (DOIs) and *g* (author identifiers, e.g. ORCID), as well as *q* and *r* which affirm the importance of having repository content indexed or harvested by Australian and international academic discovery services, and the use of linked data (Hider et al., 2015).

Disadvantage: There is less opportunity to implement an out-of-the-box solution and more time technical and information managers will need to work closely together to scope and build the required connectors.

Cost: The cog model has a cost in terms of standards compliance, complexity of set up and ongoing maintenance to ensure it maintains interoperability as scholarly publishing changes. The time commitment in developing partnerships with others in this space may require external assistance.

The engine

The engine model goes beyond a traditional repository towards a next-generation grants management workflow engine with end-to-end integration of OLT operations. This bells and whistles option breaks down the website / database / repository divide and supports users from the grants application process, through peer review of grants, to project management, publishing, reporting and measuring impact.

Benefit: The major benefit of this model is the efficiencies it affords, particularly in terms of user input, and effort spent moving data between applications. It enables tracking by researcher, institution and project management functionality including timelines and alerts. The model implements Hider et al.'s recommendations *c* and *d,* that the fields in the Resource Library system are automatically linked to the applicable fields in the grant management system, and that the project summary is entered as a separate component of the final project submission, so that it can automatically feed into the Resource Library

system. It also covers recommendation *o,* by including related materials, such as projects in progress, upcoming events, and successful award and grant applications, and to review the demarcation between the different databases on the OLT website.

Community: It may be possible to purchase an existing research management solution, or to work with other grant-making bodies, e.g. the Australian Research Council (ARC), to share infrastructure costs and reduce further the number of systems that academics and their instructions need to interact with.

Disadvantage: There is a possible lack of scale in this model, unless it incorporates the interoperability aspects of the infrastructure cog option above through partnership with other grant-making bodies with similar requirements.

Cost: There is increased cost involved in scoping a more complex technical project, especially as the project requires varying levels of authentication and permissions and the migration of different types of data. This model may be best managed internally, but a cloud-hosted solution would be highly desirable.

Key questions

1. What content should the new repository contain?
2. What standards should the new repository comply with?
3. What are the functional elements of most value in the repository?
4. How should the repository be managed?
5. How can the repository become sustainable?
6. How can the repository be promoted to the sector and foster engagement?

Chapter 4 – Community consultation

Consultation methodology

Focus groups and an online questionnaire survey (see Appendix C) were used to ascertain the views of the Australian higher education community on the future of the Resource Library. The consultation focussed on key questions of this future repository, including the collection's value, and the value that might be added by other resources, management considerations, such as governance, hosting and funding, and technical issues, such as the repository's functional requirements. It also sought feedback on how best to promote its use and content within the community.

Following the granting of ethics approval through the Charles Sturt University Faculty of Education Human Research Ethics Committee, four face-to-face focus group sessions were conducted by the project team members, in Brisbane, Canberra, Melbourne and Sydney. An interactive webinar targeted stakeholders from other cities and regions. The online questionnaire survey also covered some more detailed and technical questions, as well as providing another opportunity for those unable to attend the focus groups to participate.

Invitations to the focus groups and for the survey were emailed to individuals based on their position, knowledge and expertise within the sector, and included academics, senior administrators, librarians, repository managers and other higher education professionals. The consultation was also advertised through higher education lists and relevant websites.

Focus group participants

Table 3 details the location, the number of personal invitations issued and the number of participants attending each of the focus group sessions.

Table 3 Consultation schedule for focus groups

Date	Time	Location	Personal invitations issued	Participants
Wednesday 6 April 2016	10.00-12.00pm	ACER Conference Room, South Brisbane, QLD	82	17
Thursday 7 April 2016	2.00-4.00pm	Cliftons, Canberra, ACT	20	12
Tuesday 12 April 2016	12.30-1.30pm	Webinar: Adobe Connect	56	12
Wednesday 13 April 2016	10.00am-12.00pm	ACER Keeves Room, Camberwell, VIC	89	10
Thursday 14 April 2016	2.00-4.00pm	Cliftons, Sydney, NSW	84	20

A high level of interest in the project was expressed by invitees, as was demonstrated by the level of attendance at these sessions, at fairly short notice. Invitees conveyed a desire to be kept informed of the project's progress and offered their assistance in promoting the consultation, and providing written feedback if they were unable to attend in person.

A briefing paper was developed to provide background information and explore a range of options for consideration. This was sent, along with a program outline, to focus group participants prior to their session.

Participants at the face-to-face focus group sessions were divided up into several smaller groups of 5-6 participants, with each group led by a member of the project team. The facilitators recorded the groups' discussions using an audio app on a mobile device; the groups also recorded summaries of their discussions on paper, which they presented to the other groups. Both the groups' verbal and written responses were later analysed and are presented in summary below.

The webinar participants were encouraged to use the chat facility to type responses, as only one participant could use the microphone at any one time; in any case, the discussion format was modified (e.g. with the use of polls) to fit into the shorter duration of the session.

Online survey respondents

A total of 108 respondents participated in the questionnaire survey during the month of April 2016. Of those, 97 indicated their institutional affiliation, as shown in Table 16 (see Appendix D Survey responses), which indicates that most Australian universities are represented in the survey, along with several other educational institutions. Survey respondents were also asked how long they had been working in higher education. Table 17 (see Appendix D Survey responses) shows that most respondents have extensive experience in the sector.

Survey respondents were then asked to describe their current occupation. The results are shown in Table 18 (see Appendix D Survey responses). Similar numbers of discipline-specific academics and higher education learning and teaching specialists are represented; significant numbers of professional staff, such as librarians and repository managers, also completed the survey.

Respondents who identified as discipline-specific academics were asked to indicate their 'discipline group', out of those listed in Table 19 (see Appendix D Survey responses). Although about a quarter hailed from Education, a wide range of other disciplines are represented.

Over half (60.7%) of respondents indicated that they had previously received an award of some type from the OLT and/or one of its predecessors, suggesting that interest in the OLT

repository and its future was particularly keen amongst those with resources deposited there.

The following commentary, organised into key themes, combines analysis from the focus groups and survey.

Value of a national repository

In examining the value of the repository to the sector, participants were asked to consider the type of content and services that would be important to stakeholders. Perhaps not surprisingly, most respondents to the online survey were of the view that a 'national repository specifically for higher education learning and teaching resources' would be 'very useful'. Fewer than 7% of respondents thought it would be only 'moderately useful' or 'not particularly useful', as Table 4 shows.

Table 4 Value of a national repository for survey respondents

Value of a repository	**%**	***n***
Not particularly useful	1.0	1
Moderately useful	5.7	6
Useful	25.7	27
Very useful	67.6	71

An initial exercise in the in-person focus groups was to develop an 'elevator pitch'. This solicited some rapid fire summaries of the key value represented by a national repository. Examples of pitches include

> *The repository holds foundational knowledge in learning and teaching. It is leading edge content showing Australia as an educational leader.*
>
> *Government funding for an OLT repository provides value for money and resources for foundational teaching, and builds on previous research*
>
> *The repository is part of our sector memory, building on the knowledge, the foundation, and the communications that have come out of this work. It contributes by creating networks, connections and vibrant communications across institutions.*
>
> *The OLT repository offers value for beginning teachers, showing best practice. It makes this freely available, not behind a paywall, and enables all to learn from the best.*
>
> *Repository resources are unique, respected and authoritative.*
>
> *The repository recognises educational research which is not otherwise published or 'counted'. The definition of research at our university is what goes in the annual report.*

Key themes coming out of the elevator pitch exercise included that of efficiency, and on not wasting the existing heavy investment in learning and teaching projects and research of the OLT and its predecessors. Frustration was expressed repeatedly in the focus groups that so much had already been invested: it was inconceivable and unacceptable that the intellectual assets developed with this investment could be placed at risk. Protection of the existing investment was the most common call to be made in these discussions; many participants

pointed out the danger of duplication of effort, the collection's economic value, and that it was created through public funds.

The importance of a national repository that aggregates work from all Australian universities was also stressed. Furthermore, the repository was seen to have global reach, potentially, in a time when Australian higher education is looking to position itself on the international stage.

The role of a repository in providing support to grant seekers and examples of best practice was raised frequently. Those preparing grants search the repository as part of their literature review to find what has been done in their field, and then build upon this rather than replicating existing projects. Likewise, the Resource Library provides models of successful projects for academics to learn from, and to re-use.

I search often for previous projects - most recently all course leadership projects - for lessons learned (NSW).

The conversation around the repository's value was filled with statements about the value of the repository in terms of impact, influence, best practice, brand, competitive advantage, industry, innovation, national interest and reputation. Questions were asked about the use of the current Resource Library. There was concern that this data is not available and participants stressed the need for best-of-breed analytics to validate past and future investment. The project team were also asked to explore any existing repository infrastructure that might allow for economies of scale.

Repository content

Across the focus group sessions there were 76 references to the value of the existing repository's content and resources. Reference to this as 'unique content' was common. There were also a small number of focus group participants who advocated for a new repository to go beyond being an 'institutional repository for the OLT' and to encompass external content as well. An even smaller number felt the vocational education sector had similar needs in terms of learning and teaching, and that there was no need to limit the scope of the repository to universities. The expansion of formats was suggested by a number of the focus group participants, who advocated for the inclusion of datasets, multimedia content, infographics, conference papers, presentations and posters. One participant argued for consideration to be given also to material that has not (yet) been digitised.

The survey respondents also clearly valued the materials coming out of the OLT projects, as demonstrated by Table 5, with two thirds deeming a repository of them 'very useful'. There was, in fact, unanimous support for ensuring the current OLT project reports are preserved and archived.

Table 5 Value of OLT/non-OLT material types (% of survey respondents)

Value	OLT materials	Non-OLT papers, etc	Non-OLT learning objects
Not particularly useful	1.9	3.8	5.8
Moderately useful	4.8	16.2	11.5
Useful	27.6	33.3	37.5
Very useful	65.7	46.7	45.2

According to survey respondents, materials from other learning and teaching projects were not considered quite so useful for a future repository, with slightly fewer than half respondents regarding them as 'very useful', though a large majority thought their inclusion would be desirable. From the free-text comments, the leading reason *why* a repository should store such materials is that it serves as a 'clearinghouse', saving users time and increasing their chances of finding the best resources. However, respondents also noted that an *effective* clearinghouse needed to be 'curated' so that only quality materials are provided, with a need, perhaps, for peer review. The OLT resources were generally considered by respondents to represent 'quality' and be 'authoritative'; additional quality control would need to be done if non-OLT resources were to be added. The sharing of learning objects could be a focus, whereas academic papers that could be readily found elsewhere would add less value. If the repository was to expand its content, the need to link up with other databases was pointed out (rather than relying on individual deposit). An effective repository, it was likewise noted, also needed to be easy to search and be harvestable by major aggregators such as Trove.

In line with their strong interest in OLT materials, survey respondents considered international content less useful than Australian-focused content for the repository, including non-OLT Australian content (see Table 6). Some respondents thought the inclusion of international content would make the repository 'unwieldy', though the option of adding Australian content to an existing international database, such as MERLOT, was also suggested. If international content was to be included, tags to identify Australian/OLT materials were proposed. If it were excluded, there could still be links to key international databases. In general, Australian materials were deemed the 'priority'.

Table 6 Value of Australian/international content (% of survey respondents)

Value	Australian content	International content
Not particularly useful	1.9	1.9
Moderately useful	6.7	17.5
Useful	23.1	39.8
Very useful	68.3	40.8

Survey respondents were also asked about the utility of links to closed content and of descriptions of learning and teaching experts available for consultation (e.g. by discipline).

They rated such information considerably lower than they had actual resources, though both links and expert details were deemed either 'useful' or 'very useful' by a majority (see Table 7). Respondents pointed out that they already had ready access to the mainstream scholarly literature, and that the links would need considerable ongoing updating. It was more the 'grey literature' that was of interest and would add value. Some respondents also expressed an interest in the suggested 'experts' scheme, though it was noted that the identification of experts would be a somewhat subjective exercise.

Table 7 Value of other information sources (% of survey respondents)

Value	Links to closed content	Expert consultant details
Not particularly useful	13.5	6.7
Moderately useful	19.2	28.8
Useful	29.8	33.7
Very useful	30.8	30.8

A frequent observation made in the focus groups was that many OLT (and predecessor) projects had developed websites to hold learning and teaching resources which were often more valued and in more danger of being lost than the project reports. Finding a sustainable solution for these resources was prioritised by eleven of the focus group tables.

> *Bits and bobs are the most important aspect of OLT, even more valuable than the reports (ACT).*
>
> *Our project website has received 6,500 page views, and an academic funds this project website. What happens if he wants to retire (QLD)?*
>
> *Longevity of auxiliary project websites is uncertain - agreed they would be maintained for 5 years. Websites maintained by universities if lucky (VIC).*

The Creative Commons licensing of the current content is seen as a positive in terms of the long-term value of the content. Open access and open licensing were taken as a given by all participants: the content should consist of Open Educational Resources. Clearly participants saw value in the ability to re-use materials. It is thus assumed by all participants that in any new repository scenario, the content will continue to be available as open access.

> *The value is in the open educational resources that are buried in many of the reports (Webinar).*

The branding of the content in the repository, however, was raised as a concern in the focus groups. The present Resource Library is clearly branded as the repository of the OLT, and it also displays the logo of the lead institution alongside each search result. It was felt that the OLT provided a 'neutral' (as well as respected) brand that promoted a level of sharing and re-use not possible with university-branded resources. In a new repository it was seen as important to retain the OLT branding, and to maintain the OLT resources as a clearly defined collection. This complicated the situation for those advocating for inclusion of a broader range of content from beyond the OLT.

> *There is a dilemma in building other content versus diluting the brand by adding external resources, peer reviewed learning and teaching resources (NSW).*

When I move universities I can't use my own stuff because it is too heavily branded, and would need to be de-branded. OLT is valuable because it represents cumulative work with many teams (VIC).

Four focus groups discussed the concept of the repository as a networking developer, connecting people and networks through the resources. Participants valued the ability to identify people in a particular area of research who could be approached for advice, to present at conferences, or for collaborative projects. Currently the repository does not provide any way to link to researchers' profile pages on their university sites or in public sites such as ORCID, LinkedIn, or Twitter. While the OLT website contains a page of learning and teaching network groups, this is not integrated with the repository.

The repository is not just for reports; we are able to identify key people and networks (VIC).

Features of a national repository

The focus groups and survey respondents included librarians, technologists and academics with a high level of expertise in the area of institutional repositories. There were also plenty of end-users who had high expectations of how a repository should work. They mentioned a long list of features, functionality and services that could add value to the content.

The survey respondents were asked to rate particular features for a repository from the point of view of their own use (see Table 20-23 in Appendix D Survey responses). All suggested features were rated at least 'important' by a majority of respondents, but only an easy-to-use search interface and a safe and stable storage capacity were considered 'critical'. Other characteristics that were deemed either critical or 'very important' by a clear majority were:

Easy upload functionality
Full-text searching option
Persistent identifiers to content
Save or share content by email/print
Stable links to further information about people and projects
Automatic addition of linked data
Choice of copyright licence
Detailed usage statistics
Detailed bibliographic information
Citation tracking and altmetrics

The importance assigned to usability was reflected in several comments in favour of a full-text search capability. Respondents tended to expect the standard features of a search engine or database system. Some pointed out that features such as citation tracking and usage statistics could add status to the repository's content, thereby increasing interest in it (and in contributing to it). Social media features received mixed comments, however.

Usability was also seen as a key criterion amongst the focus group participants, who expressed a desire for the repository to take advantage of recent technological innovation

and go beyond the first generation style repository interfaces currently found in most Australian universities. Repository benchmarking standards were noted, and qualified staff to support a repository was seen as essential.

It is no surprise that the ability to *discover* content was raised as a fundamental criterion for a repository by both the survey respondents and the focus groups. There were twenty references to search among the focus group discussions, as well as some conversation around the metadata required to optimise discovery by researcher, institution, and subject or topic areas. Browse navigation was also requested. Of particular priority was the aggregation of resources emanating from each particular project.

The cross-institutional nature of the material in the Resource Library was one reason why participants highlighted interoperability as another important requirement. Across universities there exists a range of repository systems, library systems, content management systems and identity systems which need to be accommodated if users, metadata and content are to be shared readily.

Those survey respondents who worked with another repository (about two dozen in number) were asked about specific features that might be important for interoperability purposes. No feature was considered 'critical' by a majority of respondents, but a clear majority rated the following either 'very important' or critical:

Preservation and archiving
Search engine optimization
Author identification systems
Broader data export functions
Linked data
Downloadable citation formats
Usage statistics
Integrates persistent identifiers

Several focus groups stated that they assumed support for Linked Open Data would feature in any new-generation repository platform. They also expected repository functionality to include harvesting of metadata, and the ability to import and export content, both in batches and as individual objects. Analytics were seen as a key feature by eight of the groups, which lead to certain requirements around authentication, for example.

Sites such as academia.edu were mentioned as 'doing dissemination better than traditional repositories'. Four groups prioritised functionality that supported a program of content dissemination. They suggested the repository display concise summaries of projects, infographics and short videos, and to explore all features that might support the promotion of the repository's content. They felt strongly that social media integration should be a core part of the solution.

Of those survey respondents who indicated the need for particular standards (*n*=82), a majority wanted to see standards pertaining to author ID, persistent identifiers, usage and metadata (see Table 24 in Appendix D Survey responses).

Management options

Participants were asked to consider the sustainability requirements for the repository with respect to governance, hosting and funding.

A large percentage (61%) of survey respondents put the OLT's successor, were there to be one, as first choice for the repository's governing body (see Table 8), although a consortium was considered a better choice than the government department. Respondents suggested that the government would not be sufficiently independent (assuming the repository would perform more than an archival function), whereas a consortium would offer a range of views and more likely foster innovation. However, the most important consideration was stability.

Table 8 Governance options ranked by survey respondents

Governance option	**1**	**2**	**3**	**4**	***Mean ranking***
OLT's successor	55	23	11	1	1.53
Consortium	21	36	25	7	2.20
Department of Education	10	20	30	28	2.86
Independent agency	5	10	21	49	3.34

Focus groups participants were a little less enthusiastic about a single organisation governing the repository, with concerns expressed such as 'leaving the repository in the hands of one university is not a good idea (ACT).' It was pointed out that in principle a consortium offers the widest representation possible and could accommodate the interests of a large number of different stakeholders. Consideration should be given to a structure that included a board made up of Deputy Vice-Chancellors, served by an advisory group or steering committee with membership from outside as well as inside the universities. In one session the potential interest and involvement of private providers and academics from both higher education and the VET sector was highlighted. Involvement of industry representatives in governance was recognised as having potential to enhance commercialisation.

There were also several recommendations around a self-governing body made up of OLT Fellows, with award and grant recipients as members. Others suggested governance by learning and teaching function, provided by a collective of deans, directors, or DVCs. Several established groups were suggested as having the capacity for and/or interest in governance, including the existing Universities Australia DVC-Academics committee, the Council of Australian University Librarians (CAUL) and the Australian Council for Online and Distance Education (ACODE). There was little interest, however, in handing sole governance over to a commercial organisation.

While there was debate about how light or heavy a touch a governing body should have on a future repository, there were several activities identified as needing oversight by somebody. The following areas of governance were seen as vital to the quality of the repository:

- Determining and enforcing the publishing obligations of grant winners
- Ensuring content meets standards for higher education teaching
- Coordinating peer review
- Making decisions on metadata schema, and ensuring data integrity
- Governing content in a shared authorship cross-institutional environment and setting policies to support interoperability
- Authorising the appropriate branding of content
- Implementing up-to-date technology and processes
- Ensuring technical platform is funded and support is available
- Leading national engagement

A majority of survey respondents considered OLT's successor (should there be one) as the best option to host the repository (see Table 9). The need for 'stability' and 'sustainability' was cited as the biggest factor in respondents' choices, though this lead to different conclusions: the government department was likely to have a greater longevity, but also to be more fickle. An 'independent' and well-established body such as the Higher Education Research and Development Society of Australasia (HERDSA) was suggested as another option. Other solutions (including commercial ones) might offer more 'value for money', however. Respondents could see benefits in the governing body also being the host.

Table 9 Repository hosting options ranked by survey respondents

Hosting option	**1**	**2**	**3**	**4**	***mean***
OLT's successor	51	23	14	5	1.71
Department of Education	19	37	24	11	2.30
Third-party agency	18	19	26	26	2.67
Individual university	5	12	26	47	3.28

Focus group participants identified a number of issues associated with attempting to propose a hosting option without knowing the governance model, or what the repository would look like. Hosting options suggested included a new organisation, an individual university, the Education Department, an external agency or a commercial entity. Several other specific hosting options suggested included Academia, ARC, the Australian Government's Digital Transformation Office, EduGAME, edX consortia, Google Scholar, National Library of Australia, JORUM and ResearchGate.

A large majority of survey respondents expected the Federal Government to fund the repository, as Table 10 shows. However, a majority also thought that the higher education institutions could make a co-contribution if necessary. Far fewer thought that commercial solutions were both realistic and appropriate.

Table 10 Funding options favoured by survey respondents

Funding option	%	*n*
Federal government funding	87.5	84
University subscriptions	59.4	57
Commercial sponsorship	16.7	16

In the focus groups some participants suggested the new institute (if there was to be one) should fund the development and management of the repository: it should be funded to provide all the functions required and to achieve its objectives. However, scepticism was also expressed regarding the provision of funding to the new institute.

There were positive and negative responses regarding the possibility of the government continuing to fund this service directly. Some participants argued that government should provide seed funding, after which a consortium of universities could continue to support the repository through subscriptions. It was pointed out that subscriptions have been successfully implemented for services such as MERLOT and the HEA hub. Other possible funding mechanisms suggested included advertising and commercial sponsorship or partnership. There were also a few participants who advocated a self-funding (as well as self-governing) model. They suggested that services (e.g. analytics) could be charged according to use, or that a premium level of membership could be introduced. However, in considering the option of commercial funding, other participants warned that the sector may not support commercial sponsorship and that the repository should retain its independence from commercial interests.

Repository community engagement

Participants were convinced that the success of the future repository hinges on a strong network of support around it. In looking at previous management models, participants suggested that not enough funding had been spent on the development of this network.

The focus groups offered almost 100 suggestions to help promote the use of the Resource Library. These have been used to develop an engagement plan proposed in Chapter 7 – Engagement

Key findings

In general, the Australian higher education community expressed the following views through the consultation exercise.

1. The content in the existing OLT Resource Library, and the materials that have been produced by OLT projects more broadly, should be protected and freely accessible as a specific collection on an ongoing basis. The materials are considered unique, authoritative, and valuable to the academic community at large, and need to be promoted if the government's investment over the years is to be fully returned.

2. Other materials for a national repository of expanded scope could also be included, but not if they were readily available elsewhere or were not of the same quality. The additional resources required to curate an expanded repository would be considerable and the added value was not very clear.

3. Access to the OLT content should be provided through a sustainable solution, independent of changes of government policy.

4. The OLT content should continue to be branded as such.

5. A repository for the OLT content should include a full range of features and services found in modern systems, including full-text searching, support for automated input and output of content, and usage statistics. The repository's functionality should also support the indirect dissemination of content e.g., through downloadable citation outputs and links to social media.

6. The repository should, above all, be user-friendly and stable.

7. The repository should be supported by the appropriate level of technical and professional staff.

8. The repository should apply a range of standards for discovery, interoperability and management, including persistent and researcher identifiers.

9. The repository should preferably be managed, governed and hosted by the OLT's successor. It is not clear who would be best placed to perform these roles if the OLT is not to have a successor, but possible partnerships with organisations such as UA and HERDSA should be explored.

10. Governance should be focused on the interests of end-users, though funds also need to be spent effectively.

11. The federal government should financially support the ongoing solution, perhaps in combination with contributions from the universities.

12. Discipline champions should be developed to build networks around the repository.

Chapter 5 – Technical specifications

A set of draft technical specifications were constructed from features and requirements noted in the literature review, features suggested by participants in the consultation exercise, and by the project's Reference Group. They represent what may be considered the basic requirements and desirable features of an archival model, which emerged through the consultation phase as the most likely model for the Resource Library's future direction. Organisations that host other repositories in Australia were identified (e.g. in the OpenDOAR directory) and invited by the project team to comment on their capacity to meet the specifications. Several representatives from these organisations were also interviewed.

Six detailed responses were ultimately received. They indicate that the specifications could generally be met if the migration and hosting were outsourced to any of these service providers. The responses are summarised in Table 11 and 12.

Table 11 Response to technical requirements

Technical requirements	**1**	**2**	**3**	**4**	**5**	**6**
Infrastructure and security						
Repository is hosted in a secure, reputable location and available via web interface to both administrators and end-users	**X**	**X**	**X**	**X**	**X**	**X**
URL for hosted repository can incorporate the organisation's domain name or repository name		**X**	**X**	**X**	**X**	**X**
Operates with well-established infrastructure / software	**X**	**X**	**X**	**X**	**X**	**X**
Incorporates satisfactory backup functionality	**X**	**X**		**X**	**X**	**X**
Has effective mechanisms to detect bit corruption or loss and reports incidents to administrator	**X**	**X**	**X**		3rd party	**X**
Has defined processes for storage media and/or infrastructure change	**X**	**X**			**X**	**X**
Enables access to collections, files, objects by user type with granular administration permissions	**X**	**X**	**X**	**X**	**X**	**X**
Supports assigning of roles (e.g. different creation and editing rights) and access permissions.	**X**	**X**	**X**	**X**	**X**	**X**
Data management functionality						

Technical requirements	**1**	**2**	**3**	**4**	**5**	**6**
Supports creation, editing and versioning of data	**X**	**X**	**X**	**X**	**X**	**X**
Supports deletion and archiving of records	**X**	**X**	**X**		**X**	**X**
Supports Dublin Core metadata elements set including the principles of extensibility and repeatability	**X**	**X**	**X**	**X**	in part	**X**
Supports customisation of metadata elements	**X**	**X**	**X**	**X**	**X**	**X**
Supports Digital Object Identifiers	**X**	**X**	**X**	**X**	in part	**X**
Supports researcher identifiers (e.g. ORCID)	**X**	**X**	**X**			**X**
Supports collection-level metadata				in part	in part	**X**
Supports in-built controlled vocabulary and relation elements	**X**	**X**	**X**	**x**	customis ation	**X**
Allows specification of mandatory fields	**X**	**X**	**X**			**X**
Supports versioning of datasets and history of changes		**X**	**X**	**X**	**X**	**X**
Supports metadata for open access licensing protocols including Creative Commons	**X**	**X**	**X**	**X**	**X**	**X**
Optimised for search engines including Google Scholar	**X**	**X**	**X**	**X**	**X**	**X**
Ingest functionality						
Supports ingest of metadata records and full-text files in bulk from delimited or csv file	**X**	**X**	**X**	**X**	**X**	**X**
Supports email notifications at key points during deposit and editing	**X**			**X**	**X**	
Supports review and editing of submissions prior to approval	**X**		**X**	customis ation	**X**	**X**
Supports range of file types including text, pdf, presentation, spreadsheet, video, audio and still image	**X**	**X**	**X**	**X**	**X**	**X**
Indexes full-text of uploaded files		**X**	**X**	**X**	**X**	
Export functionality						
Supports harvesting and exporting of metadata using OAI-PMH	**X**	**X**	**X**	**X**	**X**	**X**

Technical requirements	**1**	**2**	**3**	**4**	**5**	**6**
Offers update alerts, including email and RSS feeds	x	x	x	x	x	
Supports export of results in particular citation formats	x	x	x	x		x
Is able to export files/objects in bulk, to enable migration in the future	x	x	x	x	x	x
End-user interface						
Supports IE, Firefox, Safari and Chrome browsers (including on Mac OS)	x	x	x	x	x	x
Is optimised for use on mobile devices and browsers	x	x	x	x	x	x
Submission interface is intuitive and easy-to-use	x	x	x	x	x	x
End-user search and download interface is intuitive and easy to use	x	x	x	x	x	x
Supports both metadata and full-text searching	x	x	x	x	x	
Provides field-based and faceted search as well as simple search	x	x	x	x	x	x
Supports browsing by institution, year, discipline/topic	x	x	x	x	x	in part
Allows for specification of elements to be indexed for search	x	x	x	x		x
Allows for specification of which elements to display in search results	x	x	x	x		
Offers brief and full levels of record display in search results	x	x	x		x	x
Offers search result display sorting by: relevance, date, title, author	x	x	x	x	x	
Allows for configuration of ranking algorithm	x	x	x			
Has built-in help text which is customisable	x	x	x	x	x	customisation
Provides for organisational branding and look and feel is customisable	x	x	x	x	x	in part
Reporting and analytics						

Technical requirements	1	2	3	4	5	6
Provides usage statistics on collection by a range of variables, e.g. downloads, use by domain, country of users, date, type, author	X	in part	in part		X	in part
Generates on-demand reports configurable by administrator	X	X	X		X	X
Offers usage analytics for specific objects	X	X	X	X	X	X

Table 12 Response to desirable functionality

Desirable functionality	1	2	3	4	5	6
Supports real time updating and indexing	X	X	X		X	X
Offers automated link checker	X	X	X			
Displays search results at both project and resource level		X	customisation			X
Supports thesaurus browsing in search results		X	customisation			
Supports customisation of search options	X	X	X		X	
Supports predictive text in searching			customisation			
Offers 'recommender' functionality		X	customisation			
Offers user annotation and tagging capacity	X		customisation			
Accommodates visual elements in search results, e.g. logos, favicons or badges	X	X	customisation			X
Supports/interfaces with linked data services	X		customisation			X

Chapter 6 – Evaluation of management options

The consultation exercise reported in chapter 4 confirmed the community's strong desire for the current content of the Resource Library to remain publicly available on a long-term basis. While there was some interest in the *cog* model (see Table 2), it was recognised that an *archival* model is the most realistic option for the future repository, with a focus on preserving access to the OLT collection rather than attempting to build a much larger collection beyond scope of the OLT (and predecessor) projects. Nevertheless, the OLT collection would still be added to as and when resources from current projects are submitted over the next two years, and this would need to be taken into account. Furthermore, the consultation exercise pointed to considerable interest in safeguarding and aggregating other resources from completed OLT (and predecessor) projects that are not currently in the Resource Library and instead dispersed amongst a large number of project websites. It is therefore recommended that the Department undertake to ensure the continued public access to the existing content of the Resource Library and to content submitted as deliverables of current projects, and also to consider calling for additional materials from past projects to be submitted for possible inclusion in the collection.

On the basis of the above recommendations, this chapter evaluates the ways in which the department might implement an archival model for the future repository, at the management level.

Scenarios

To ensure continued public access to the Resource Library, the relevant recommendation, i.e. *a,* from the OLT commissioned project led by Hider (2015, p.29) is accepted: 'That the current content management system used by the OLT is replaced by a system that accommodates the recommendations listed below and that only the new, cleaned-up data is migrated across to it.' Essentially, this migration could occur through four possible scenarios, based on two fundamental decisions to be made about the hosting of the repository. Firstly, there is the question of whether the repository is to be hosted inside the Department (as it is currently) or by an external organisation. If the hosting is to be outsourced, there is a second decision to be made around whether the repository is to stand alone, or be added as a collection to a larger discovery system. These decisions represent the four scenarios shown in Table 13. It should be noted that these scenarios are not necessarily mutually exclusive.

In order to explore the feasibility of these scenarios, prospective external hosts of the repository were identified and contacted. A list of bodies associated with Australian higher education, and thus with a professional interest in the repository, was drawn up, using the consultation data and reference sources. The bodies were contacted by the project team to ascertain their interest and capacity to host and manage the repository. Six expressions of interest were received in response, from: the Higher Education Research and Development

Society of Australasia (HERDSA), Universities Australia (UA), Council of Australian Directors of Academic Development (CADAD), Australian Council for Educational Research (ACER), Education Services Australia (ESA) and Open and Distance Learning Association of Australia (ODLAA). It would appear that none of these organisations currently has a platform suitable for hosting the Resource Library and would require the assistance of a third party. Given appropriate funding each of these organisations could be interested in managing the new repository project.

Table 13 Scenarios for repository hosting

Hosting	**1** **Content and metadata hosted outside the Department**	**2** **Content hosted inside the Department**
A **Stand-alone repository**	(A1) Resource Library's content and metadata is migrated to a new stand-alone repository hosted and curated outside of the Department	(A2) The Resource Library's content and metadata is migrated to a new stand-alone repository hosted and curated by the Department
B **Added to an existing repository**	(B1) The Resource Library's metadata and content is migrated to a larger content management system as a discrete dataset	(B2) The Resource Library's metadata is migrated to a larger database as a discrete dataset with links to content remaining on a government server

Established repositories and discovery systems hosted by other organisations were considered for their suitability with respect to scenarios B1 and B2 (Table 13). Two were identified, namely Australian Policy Online (http://www.apo.org.au), and the NLA's Trove.

Costs

The six companies providing hosting services that responded to the technical specifications survey reported in chapter 5 were also invited to provide cost and time estimates for the various technical phases of the project. Three companies provided detailed cost and/or time estimates as shown in Table 14. The correlation between the providers' costings allows for a fair degree of confidence in their reliability.

Table 14 Costs and timeframes of repository stages

	Phase	Notes	Company A estimated timeframe	Company A cost estimate	Company B estimated timeframe	Company B cost estimate	Company C cost estimate
1	Metadata mapping and preparation	Review of metadata added post-Hider project (2015) and mapping of elements to new system	5 days	$5,000	40 hours	$4,000	$7,260
2	Ingesting of metadata and objects to new system		2 days	$2,000	20 hours	$2,000	$7,260
3	Repository setup	Set up of required data structures, incl both project & resource elements, addition of values for additional elements (Appendix F Recommended metadata schema)	5 days	$5,000	50 hours	$5,000	$7,260
4	Repository design and branding		5 days	$5,000	30 hours	$3,000	
5	Repository hosting	Hosting of the repository for 5 years, providing continuous access	5 years	$8,040	5 years	$5,000	$18,150
6	Ingesting of new objects	Prepare and ingest up to 1,000 additional objects and their metadata from outstanding projects	-	$3,000	-	$8,333	$10,636

	Phase	Notes	Company A estimated timeframe	Company A cost estimate	Company B estimated timeframe	Company B cost estimate	Company C cost estimate
7	Reporting on use and impact	Provision of reports on use and content to support ongoing activities to promote awareness and use of the repository	-	$2,000-$8,040	-	$7,500	
		TOTAL		**$36,080**		**$34,833**	**$50,566**

In addition to these elements of the repository project, professional indexing of the new resources from the outstanding projects would cost in the region of $6,600 (about $30 per project, based on the costs of the professional indexing carried out in the previous re-indexing project, according to the guidelines set out in Appendix G, for an estimated 220 projects).

A total cost for the outsourcing of the migration and hosting of the Resource Library, for an initial five years, is therefore estimated to be in the region of $50,000. Since the estimates were submitted without any sampling of the files from the OLT content management system, however, actual costs and charges may differ significantly, and so it would be prudent to allow a budget of up to $80,000.

Additional website content

If additional materials from the websites of completed projects were also to be added, this would entail extra ingestion and indexing costs. We shall assume that quality control could be undertaken by a panel of experts from one or more higher education bodies *pro bono.* A sample of 25 websites for projects completed in the past ten years yielded 693 resources for potential submission and inclusion, though it is likely that considerably fewer would actually be submitted and accepted – probably somewhere between 3,000-5,000. With ingestion estimated at $5 an object, and indexing estimated at $15 an object (half of the per project charge), the Department would need to allocate up to an additional $100,000, if it wished to expand the coverage of the Resource Library with other materials from the project websites. Identifying, evaluating, capturing and indexing website content would be a complex undertaking, particularly given the wide range of materials that would need to be processed.

Discussion

The outsourcing in scenario A1, whether or not the website materials are added, could be done either directly with a commercial repository hosting service or through an appropriate higher education body, such as one of those that have already expressed an interest.

Scenario A2, in which the Resource Library is migrated to a new system in-house, will need further assessment by the department to determine the cost effectiveness of hosting the resources. .

Scenario B1 is an option using the Australian Policy Online Collections service (http://apo.org.au/collections). In this case the OLT content would be a collection within a larger repository that covers a number of fields besides education. The service provides experienced curatorial staff, and benefits of scale which aids discovery. However, sharing a repository may dilute the brand and distract visitors.

The NLA's Trove would likely accommodate the repository's metadata, allowing for the B2 scenario. However, this would not be entirely satisfactory as the *only* solution, as it would

still be dependent on the Department's servers hosting the content, potentially reducing retrieval performance and reliability, and would necessitate the use of the advanced search feature on Trove for *within*-collection searching.

Given the manageable cost estimates for both scenarios A1 and B1, it is recommended that the Department consider outsourcing the migration and hosting of the Resource Library according to the specifications drafted in chapter 5, which allow for the automated harvesting of the repository metadata by key aggregators such as Trove and for the exporting of the content to archival systems such as CLOCKSS (https://www.clockss.org) and Archive-It (https://archive-it.org).

It is further recommended that the Department consider inviting proposals from higher education bodies such as HERDSA, UA, CADAD, ACER, ESA and ODLAA, which could leverage their respective positions and status within the Australian higher education community, and existing traffic to their website and use of their own learning and teaching resources (where applicable). If the Department wishes to add project website resources to the collection, these organisations also have capacity, potentially, to provide quality control and curation. However, such proposals may well need to be supported by a commercial hosting service.

Chapter 7 – Engagement plan

Dissemination of project activity has been recognised as a priority throughout the OLT's grants program (Hinton, 2014), and it is important that the future repository builds on this work to maximise engagement. The goals of the proposed engagement plan outlined below are to ensure the Australian higher education sector, and key repository users, are:

1. aware of the repository, and
2. engaged with the repository.

The plan is sufficiently generic at this stage to accommodate any of the possible scenarios outlined in the chapter 6 of this report. It identifies the audience segments with a potential interest in the repository, outlines the requirements and priorities of each group of users, and proposes strategies to develop firstly, awareness of a new repository, and subsequently engagement with the repository and its content.

There is no point in establishing and populating a repository if those for whom it is designed do not access its content. Attracting users to the repository and helping them find relevant materials means knowing how academics discover research and new resources in their field. It is important to build engagement strategies into whichever repository solution is adopted. This is less of a technical challenge than a human challenge, and underscores the importance of appropriate repository support.

A challenge for an archival repository is maintaining the relevance of its content. In the case of the OLT repository, there will be new project reports coming into the repository over the next two years, but it is difficult to generate the same level of interest in the bulk of the content that has been available for some time. A compelling case can be made for value-adding to the written reports in the repository by harvesting suitable content from existing project websites. This will bring material scattered across the web into the one place, and also provide fresh content for the repository, some of which is multimedia. Another valuable strategy is to encourage professional associations and publishers to re-purpose the content for specific audiences, to keep it fresh and to share the load in marketing.

For an academic repository there is a need to find ways of creating promotional material that goes beyond simply advertising. Encouraging project teams to find innovative ways of reporting project outcomes could be difficult post-project, but some may see the value in creating short videos in the style of a TEDtalk or a 3 minute thesis, to engage with a target audience. It is important also to be alert to opportunities for the reuse and contextualisation of repository content, whether across different disciplines or more broadly as the following comment from one institution indicates: 'our Vocational Education and Training (VET) staff use the resources all the time off the OLT'. There was a recognition in the consultation that engagement would have more likelihood of success if it tapped into authentic demand and natural conversation by academics, staff and even students.

Audience segments

Based on the consultation the project team found the audience for the existing OLT Resource Library can be broken down into at least six discrete groups, each with differing motivations for coming to, and using, the repository.

Table 15 Repository audience segments and strategies

Audience segment	Looking for	Priority	Content	Dissemination and social media	Events	Potential repository champions
Teaching and learning practitioners and academics interested in the scholarship of learning and teaching	research and resources from a **cross-disciplinary** perspective	****	Promote good practice guides Web resources Video vignettes Summary slides	Email alerts Twitter posts Content in SOTL journals, news	Network events Conference Webinars	Professional excellence networks Librarians Professional organisations
Researchers, administrators, publishers and event managers	**people** with expertise in particular domains	***	What's hot/whose hot Where are they now Video vignettes	Email alerts RSS Twitter posts	Conference Online show and tell	Professional organisations
Project participants and authors	**evidence of the impact** of their own work	***	Project of the week feature Where are they now	Download, hits and citation reports Posts to Linkedin, other academic profile sites	TEDTalk or 3 minute thesis online Conference	Fellows Librarians

Audience segment	**Looking for**	**Priority**	**Content**	**Dissemination and social media**	**Events**	**Potential repository champions**
Academics	**discipline-based** learning and research and resources	**	Promote good practice guides Web resources Present digestible form of reports, e.g. executive summary Video vignettes	Posts in professional organisation news Twitter and LinkedIn	Conference Professional development Webinars	Uni grants office staff Uni learning and teaching teams Librarians
Government, institutions, media, students and the community	evidence of **quality and value**	**	Highlight journal articles, conference papers coming from grant work Infographics	Email alerts to new items, events Media releases Twitter and LinkedIn posts	Conference Local show and tell	Higher education branch repository advocates Education
Grant seekers	**previous projects** been funded and completed	*	Exemplars / innovative reports Theme/discipline featured items	Alerts to new grants, projects Tips on searching	Networking How to sessions Writing workshops	Grants office staff

Engagement strategies

Invest in engagement partners

Consultation participants were clear that in looking back at previous funding models, not enough priority had been given to engagement. The money and, most importantly, time spent on dissemination was not sufficient to raise awareness of the organisation, the research outputs or the impact of funding across the sector, and certainly not within the wider community. This strategy requires funding one or more organisations with strong, trusted networks across the sector – not just within the existing teaching and learning community.

Target new entrants to the field

Getting to the mainstream academic, particularly the new and mid-career practitioner, is key.

Partner with a larger, well-established organisation for social media impact

Scale is a challenge for a small repository that is essentially a document archive. Funding an existing, dynamic and active partner to showcase the repository is more likely to be successful in driving traffic and interest to the repository than trying to build new, dedicated social media channels or online communities.

Partner with organisations that can value-add to existing content

While there will be some new project reports coming into the repository over the next two years, it is difficult to generate the same level of interest in the existing content. One strategy is to encourage professional associations and publishers to re-purpose this content to keep it fresh and easier to market.

Highlight impact

Ensure that impact of the repository content can be readily recognised through reports of downloads, citations, re-tweets, mentions, links to authors and institutions, and related or subsequent work building on a particular project. If this data is not available for public view, at least ensure those contracted to implement the engagement strategy have access to raw data that they can repackage in promotional material.

Retain the name and brand

Avoid any further confusion and loss of brand awareness and understanding. Add a banner and notes indicating it is an archive if necessary, but do not attempt to build yet another name or brand.

A list of potential engagement partner organisations is listed in Appendix E. The cost of this function is estimated to be around $5,000 a year for five years.

Chapter 8 – Recommendations

The project makes the following recommendations for the Department's consideration.

1. The Department ensure that content of the Resource Library remains freely and readily accessible online for the benefit of the higher education community on an ongoing basis.

2. The Department arrange for the existing content of the Resource Library to be migrated to a new repository system as a priority.

3. The Department maintain the Resource Library at its present website until its migration has been completed and it is accessible from a new, dedicated webpage that retains the OLT branding.

4. The Department assess any plans for the migration and hosting of the repository against the specifications set out in Chapter 5 – Technical specifications.

5. A commitment to host the repository for five years in the first instance.

6. A commitment to index all resources added to the collection post-migration according to the guidelines proposed in the previous re-indexing project conducted by Hider et al. (2015).

7. The Department ensure that all quality assured resources emanating from OLT projects completed post-migration are submitted to the repository for indexing and ingestion.

8. The Department consider calling, post-migration, for additional materials from past projects to be submitted for possible inclusion in the collection, as part of a separately funded project, to supplement the repository's content, and to preserve and aggregate these materials presently dependent on the longevity of a multitude of servers.

9. The Department invite the National Library of Australia to harvest the repository metadata exposed by the new repository.

10. The Department work collaboratively with one or more organisations with established reputations and connections with the higher education learning and teaching sector to implement an awareness and engagement plan for the repository for at least 5 years.

11. Discipline and institutional champions be appointed by the Department or the host organisation to disseminate reports and other information about the repository.

12. The Department or the organisation hosting the repository hold regular face-to-face and online events that invite Fellows, grant recipients and project participants to meet, present their work, and contribute updated and value-added material for the repository.

13. Maintain recognition of the existing name and brand of the repository .

The total cost of implementing these recommendations is estimated to be between $75,000 and $200,000, depending on the options selected.

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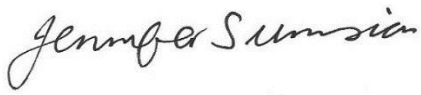
Appendix A Certification by Deputy Vice-Chancellor

Certification by Deputy Vice-Chancellor (or equivalent)

I certify that all parts of the final report for this OLT grant/fellowship (remove as appropriate) provide an accurate representation of the implementation, impact and findings of the project, and that the report is of publishable quality.



Name: Professor Jennifer Sumsion

Acting Deputy Vice-Chancellor (Research, Development & Industry)

Date: 5 July 2016

Appendix B Project participants

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Appendix C Survey questions

Toward a National Learning & Teaching Repository Questionnaire

This survey is part of an Office for Learning and Teaching (OLT) project that aims to present the OLT with a costed proposal for a national learning and teaching repository based on, but not limited to, the content of the existing OLT Resource Library at http://www.olt.gov.au/resource-library. The OLT will cease operations on 30 June 2016 and it is anticipated that its responsibilities will be transferred to a new institute (not yet announced) from July. The new repository will support the work of the new institute. Currently, the Resource Library comprises materials emanating from projects funded by OLT and its predecessor institutions (ALTC, Carrick Institute, etc.).

You have been invited to respond to this questionnaire as a prospective end-user and/or contributor to the new repository, and/or a manager of a potentially related service (such as another repository), and as an expert in this area. You will be asked up to 20 questions; the survey should take you 10-15 minutes to complete.

Participation is voluntary and the survey is anonymous. It can be exited at any time and uncompleted surveys will be discarded. All the information collected during the course of the project will be stored for seven years after the last publication that uses any of the information in password-protected files and then destroyed.

The survey closes on 30 April 2016.

For further information about the project, please contact its principal investigator, Prof Philip Hider, Faculty of Education, Charles Sturt University, Locked Bag 588, Wagga Wagga, NSW 2678, Australia. Email: phider@csu.edu.au.

Other members of the project team include Pru Mitchell and Helen Galatis from the Australian Council for Educational Research.

Thank you for your valuable input.

NOTE: Charles Sturt University's Human Research Ethics Committee has approved this project. If you have any complaints or reservations about the ethical conduct of this project, you may contact the Committee through the Executive Officer:

The Executive Office
Human Research Ethics Committee
Telephone (02) 6338 4628
Email ethics@csu.edu.au
Any issues you raise will be treated in confidence and investigated fully and you will be informed of the outcome.

Q1. Which of the institutions below is your main employer?

<Drop down list of universities, including Other/please specify>

Q2. How long have you been working in higher education?

Less than a year
1-4 years
5-9 years
10-14 years
15-19 years
Over 20 years

Q3. Which of the following *best* describes your current occupation?

Discipline-specific academic (including teacher education)
Higher education learning & teaching specialist / leader (e.g. sub-dean of learning & teaching)
Administrator (e.g. manager of an organisational unit)
Data manager / repository manager / librarian
ICT support / technical specialist
Other (please specify)

Q4. If you answered 'Discipline-specific academic' above, then please indicate which of the following discipline groups best describes your teaching area. Otherwise, please skip to the next question.

Natural and Physical Science
Information Technology
Engineering and Related Technology
Architecture and Building
Architecture, Environmental and Related Studies
Health
Education
Management and Commerce
Society and Culture
Creative Arts
Food, Hospitality and Personal Services
More than one of the above

Q5. Have you ever received an award, grant, citation etc. from the OLT or from any of its predecessors (such as the Australian Learning and Teaching Council (ALTC) or the Carrick Institute)?

Yes
No

Please answer the remaining questions from the perspective of your current professional role.

Q6. How useful would a national repository specifically for higher education learning and teaching resources be?

Not particularly useful
Moderately useful
Useful
Very useful

Q7. How useful would you find the following types of content for the repository? (The materials in the OLT Resource Library currently comprise final reports and other outputs from the projects funded by the OLT and its predecessors.)

	Not particularly useful	Moderately useful	Useful	Very useful
Materials from the OLT Resource Library				
Other, non-OLT papers and reports about higher education learning & teaching				
Other, non-OLT resources for actual practice				

Please comment on your ratings above

Q8. How useful would you find the following types of content for the repository?

	Not particularly useful	Moderately useful	Useful	Very useful
Australian-focused content				
International content				

Please comment on your ratings above

Q9. How useful would you find the following types of content for the repository?

	Not particularly useful	Moderately useful	Useful	Very useful
Open access content				

	Not particularly useful	Moderately useful	Useful	Very useful
Links to closed scholarly literature				
Details of experts (by discipline) for consultation				

Please comment on your ratings above

Q10. How important in your view would be the following discovery characteristics for the repository? (Please skip any rows you're not sure of.)

	Of no importance	Moderately important	Important	Very important	Critical
Easy-to-use search interface					
Use of thesaurus to help formulate precise search queries					
Detailed bibliographic information					
Full-text searching option					
Persistent identifiers to content					
Stable links to further information about people and projects					
Update alert options					

	Of no importance	Moderately important	Important	Very important	Critical
Citation index					

Please comment on your ratings above

Q11.How important in your view would be the following output and networking functions of the repository? (Please skip any rows you're not sure of.)

	Of no importance	Moderately important	Important	Very important	Critical
Save or share content by email/print					
Citation advice/output (e.g. into EndNote)					
Annotation (to post comments, etc.)					
Social tagging and bookmarking					
Impact analytics (altmetrics)					
Dynamic building of sub-collections, saved collections or views					
Filter by copyright status					
Networking with colleagues (e.g. 'email author')					

Please comment on your ratings above

Q12. If you are a potential contributor to the proposed repository (such as a researcher in university learning and teaching), please indicate how important in your view the following characteristics of the repository would be. Otherwise, please skip this question.

	Of no importance	Moderately important	Important	Very important	Critical

	Of no importance	Moderately important	Important	Very important	Critical
Easy metadata feeds (including re-using existing data)					
Easy upload functionality					
Automatic addition of linked data					
Provision of peer-review option					
Detailed usage statistics (e.g. download counts)					
Stable and safe document storage					
Persistent identifiers to content					
Harvestable by aggregators (e.g. OAIster)					
Citation tracking and altmetrics					
Choice of copyright licence					

Please comment on your ratings above

Q13. If you manage a repository or similar service that may be a potential importer or exporter of data to/from the repository, please indicate how important in your view the following characteristics of it would be. Otherwise, please skip this question.

	Of no importance	Moderately important	Important	Very important	Critical
Customised alerts to new and modified repository content					

	Of no importance	Moderately important	Important	Very important	Critical
Supports a range of citation formats for download					
Supports broader data export functions					
Supports author identification systems (e.g. ORCID)					
Supports search engine optimization					
Supports export of bibliometric data					
Integrates different persistent identifiers					
Validates repository metadata					
Supports standard sector authorisation and authentication protocols					
Exposes usage statistics					
Supports deposit protocol					
Supports linked data					
Support machine-readable copyright licences					
Supports long-term preservation and archiving					

Please comment on your ratings above

Q14. Which of the following types of standards would you want to see supported by the repository? (Check all that apply.)

- ☐ Metadata (e.g. Dublin Core)
- ☐ Import/export/harvesting (e.g. OAI-PMH)
- ☐ Usage statistics (e.g. COUNTER)
- ☐ Deposit protocol (e.g. SWORD)
- ☐ Researcher / author identifiers (e.g. ORCID)
- ☐ Persistent identifiers (e.g. DOI)
- ☐ Collection level metadata (e.g. OAI-ORE)
- ☐ Preservation (e.g. OAIS)

Others, please specify

Q15. Please rank the following hosting options for the repository in order of your preference.

	1	2	3	4
Outsourced to a third-party agency (e.g. a repository vendor or national infrastructure provider)				
Hosted in-house, i.e. by the new institute replacing the OLT				
Hosted by an individual university				
Hosted by the Federal Government's Department of Education				

Q16. Please comment on your rankings above.

Q17. Please rank the following options for the repository's governing body in order of your preference.

	1	2	3	4
New national institute (i.e. OLT's successor				
Consortium -- with reference committee and advisory bodies				
Department of Education -- with stakeholder advisory committees				
Independent agency -- with reference and advisory bodies				

Q18. Please comment on your rankings above.

Q19. Which of the following ongoing funding arrangements do you think would work best for the repository? Please check more than option if you would prefer to see a combination of them.

	Federal government funding
	An annual contribution by each higher education institution
	Commercial sponsorship
	Other (please specify below)

Q20. Please note in the space below any other important considerations that you think the plan for a national repository of learning and teaching resources needs to address.

Thank you for participating in this survey.

Appendix D Survey responses

Table 16 Institutional affiliations of survey respondents

Institution	*n*
Australian National University	5
Queensland University of Technology	5
University of New South Wales	5
University of Technology Sydney	5
Deakin University	4
La Trobe University	4
Macquarie University	4
Monash University	4
University of Melbourne	4
University of Queensland	4
University of Southern Queensland	4
Bond University	3
Charles Sturt University	3
Flinders University	3
James Cook University	3
RMIT University	3
Swinburne University of Technology	3
University of Adelaide	3
University of Tasmania	3
University of the Sunshine Coast	3
Curtin University	2
Griffith University	2
Murdoch University	2
Self employed	2
University of Sydney	2
University of Western Australia	2
University of Wollongong	2
Western Sydney University	2
Australian Access Federation	1
Australian Catholic University	1
Avondale College of Higher Education	1
Batchelor Institute	1
Blackboard (NetSpot)	1
Charles Darwin University	1
Eastern College Australia	1
Edith Cowan University	1
Holmesglen Institute	1
Monash College	1
The Chinese University of Hong Kong	1
University of Auckland	1
University of Canberra	1
University of New England	1
University of Newcastle	1
University of South Australia	1
Victoria University	1
Central Queensland University	0
Federation University	0
Southern Cross University	0
Torrens University	0
University of Notre Dame	0

Table 17 Industry experience of survey respondents

Years	%	*n*
Less than a year	0.0	0
1-4 years	2.8	3
5-9 years	8.4	9
10-14 years	15.9	17
15-19 years	17.8	19
Over 20 years	55.1	59

Table 18 Occupation of survey respondents

Type	%	*n*
Higher education learning & teaching specialist / leader	32.4	35
Discipline-specific academic	31.5	34
Administrator	13.9	15
Data manager / repository manager / librarian	10.2	11
Other	10.2	11
ICT support / technical specialist	1.9	2

Table 19 Discipline of survey respondents

Discipline group	%	*n*
Education	24.3	9
Health	13.5	5
Society and Culture	13.5	5
More than one of the above	13.5	5
Information Technology	10.8	4
Natural and Physical Sciences	8.1	3
Architecture and Building	5.4	2
Management and Commerce	5.4	2
Engineering and Related Technologies	2.7	1
Food, Hospitality and Personal Services	2.7	1
Agriculture, Environmental and Related Studies	0.0	0
Creative Arts	0.0	0

Table 20 Discovery characteristics (% of survey respondents)

Discovery feature	Of no importance	Moderately important	Important	Very important	Critical
Easy-to-use search interface	0.0	0.0	6.9	23.8	69.3
Full-text searching option	0.0	3.0	19.8	29.7	47.5
Persistent identifiers to content	2.2	8.8	20.9	29.7	38.5

Discovery feature	Of no importance	Moderately important	Important	Very important	Critical
Stable links to further information about people and projects	4.0	14.0	18.0	34.0	30.0
Detailed bibliographic information	1.0	10.9	27.7	30.7	29.7
Update alert options	5.9	23.8	25.7	25.7	18.8
Citation index	5.9	15.8	26.7	33.7	17.8
Use of thesaurus to help formulate precise search queries	8.0	25.0	30.0	22.0	15.0

Table 21 Output/networking characteristics (% of survey respondents)

Output/networking feature	Of no importance	Moderately important	Important	Very important	Critical
Save or share content by email/print	5.1	7.1	22.2	38.4	27.3
Citation advice/output	4.2	18.8	27.1	33.3	16.7
Impact analytics	13.3	22.4	30.6	17.3	16.3
Filter by copyright status	15.2	23.9	29.3	18.5	13.0
Networking with colleagues	9.1	30.3	22.2	26.3	12.1
Annotation	13.5	33.3	29.2	14.6	9.4
Social tagging and bookmarking	21.5	26.9	25.8	18.3	7.5
Dynamic building of collections	10.4	15.6	33.3	33.3	7.3

Table 22 Input characteristics (% of survey respondents)

Input feature	Of no importance	Moderately important	Important	Very important	Critical
Stable and safe document storage	0.0	2.6	11.5	24.4	61.5
Easy upload functionality	0.0	3.8	17.9	39.7	38.5
Persistent identifiers to content	1.4	9.9	14.1	36.6	38.0
Choice of copyright licence	2.7	8.0	26.7	42.7	20.0
Detailed usage statistics	3.9	16.9	18.2	41.6	19.5
Citation tracking and altmetrics	8.1	17.6	16.2	39.2	18.9
Automatic addition of linked data	0.0	12.0	25.3	44.0	18.7
Easy metadata feeds	1.4	13.9	33.3	33.3	18.1
Provision of peer-review option	9.2	13.2	32.9	30.3	14.5
Harvestable by aggregators	9.7	16.1	22.6	38.7	12.9

Table 23 Inter-repository characteristics (% of survey respondents)

Inter-repository feature	Of no importance	Moderately important	Important	Very important	Critical
Preservation and archiving	3.8	0.0	15.4	34.6	46.2
Author identification systems	0.0	8.3	25.0	25.0	41.7
Search engine optimization	0.0	3.8	23.1	34.6	38.5
Authorisation and authentication protocols	7.7	7.7	34.6	15.4	34.6
Downloadable bibliometric data	7.7	11.5	26.9	23.1	30.8
Downloadable citation formats	11.1	7.4	22.2	33.3	25.9
Usage statistics	3.7	7.4	29.6	33.3	25.9
Linked data	4.2	12.5	20.8	37.5	25.0
Integrates persistent identifiers	4.2	4.2	33.3	37.5	20.8
Validates metadata	4.0	4.0	44.0	28.0	20.0
Customised content alerts	3.6	10.7	32.1	35.7	17.9
Machine-readable copyright licences	4.3	4.3	43.5	30.4	17.4
Broader data export functions	4.0	8.0	24.0	48.0	16.0
Deposit protocols	0.0	13.0	39.1	39.1	8.7

Table 24 Repository standards wanted by survey respondents

Standard type	%
Researcher / author identifiers (e.g. ORCID)	81.7
Persistent identifiers (e.g. DOI)	76.8
Usage statistics (e.g. COUNTER)	67.1
Metadata (e.g. Dublin Core)	63.4
Import/export/harvesting (e.g. OAI-PMH)	36.6
Deposit protocol (e.g. SWORD)	30.5
Preservation (e.g. OAIS)	30.5
Collection level metadata (e.g. OAI-ORE)	22.0

Appendix E Organisations

The following organisations were identified during the project as having an interest or expertise in Australian higher education teaching and learning, or repositories. They are potential partners in dissemination and engagement activities.

Organisation	Acronym	URL
Asia-Pacific Association for International Education	APAIE	https://www.apaie.org/
Association for Tertiary Education Management	ATEM	http://www.atem.org.au/
Australasian Council of Online and Distance Education	ACODE	http://www.acode.edu.au/
Australasian Open Access Strategy Group	AOASG	https://aoasg.org.au/
Australasian Society for Computers in Learning in Tertiary Education	ASCILITE	http://ascilite.org/
Australia's Academic and Research Network	AARNet	https://www.aarnet.edu.au
Australian Access Federation	AAF	aaf.edu.au
Australian Association for Research in Education	AARE	http://www.aare.edu.au/
Australian Collaborative Education Network	ACEN	http://acen.edu.au/
Australian Council for Educational Research	ACER	http://www.acer.edu.au
Australian Council of Deans of Education	ACDE	http://www.acde.edu.au/
Australian Data Archive ANU	ADA	https://www.ada.edu.au
Australian Governments Open Access and Licensing Framework	AUSGOAL	http://www.ausgoal.gov.au/
Australian National Data Service	ANDS	http://www.ands.org.au
Australian Policy Online	APO	http://www.apo.org.au
Australian Research Council	ARC	www.arc.gov.au/
Australian Technology Network	ATN	http://www.atn.edu.au/
Charles Sturt University	CSU	http://www.csu.edu.au
Computing Research and Education Association of Australasia	CORE	http://www.core.edu.au/
Council of Australian Directors of Academic Development	CADAD	http://www.cadad.edu.au/
Council of Australian University Directors of IT	CAUDIT	https://www.caudit.edu.au
Council of Australian University Librarians	CAUL	www.caul.edu.au/
Creative Commons	CC	https://creativecommons.org/
Deputy Vice-Chancellors Academic	DVCA	https://www.universitiesaustralia.edu.au
Digital Commons	DC	http://digitalcommons.bepress.com/
DSpace	Dspace	http://www.dspace.org/
Education Services Australia	ESA	http://www.esa.edu.au
edX consortiums	edX	https://www.edx.org/
Eprints	EPrints	http://www.eprints.org
Higher Education Academy	HEA	https://www.heacademy.ac.uk/
Higher Education Research and Development Society of Australasia	HERDSA	http://herdsa.org.au/
Innovative Research Universities (IRU)	IRU	http://www.iru.edu.au/

Organisation	Acronym	URL
International Education Association of Australia	IEAA	https://www.ieaa.org.au/
International Society for the Scholarship of Teaching and Learning	ISSOTL	http://www.issotl.com/issotl15/
Intersect		http://www.intersect.org.au/
JORUM	JORUM	http://www.jorum.ac.uk/
LH Martin Institute		http://www.lhmartininstitute.edu.au
Multimedia Education Resource for Learning and Online Teaching	MERLOT	https://www.merlot.org/merlot
National Centre for Student Equity in Higher Education	NCSEHE	https://www.ncsehe.edu.au/
National Council for Vocational Education Research	NCVER	https://www.ncver.edu.au/
NCVER's international research database	VOCED	http://www.voced.edu.au/
National Health and Medical Research Council	NHMRC	https://www.nhmrc.gov.au/
National Library of Australia	NLA	https://www.nla.gov.au/
Network of Associate Deans of Learning and Teaching in the Discipline of Education	NADLATE	http://www.acde.edu.au/networks-and-partnerships/nadlate/
OCLC	OCLC	http://www.oclc.org
Open and Distance Learning Association of Australia	ODDLA	http://odlaa.org/
PubMed Commons	PubMed	http://www.ncbi.nlm.nih.gov/pubmedcommons/
Regional Universities Network (RUN)	RUN	http://www.run.edu.au/
Research Vocabularies Australia	RVA	http://www.ands.org.au/online-services/research-vocabularies-australia
Tertiary Education Quality and Standards Agency	TEQSA	http://www.teqsa.gov.au/
Universities Australia	UA	https://www.universitiesaustralia.edu.au

Appendix F Recommended metadata schema

The following is the recommended metadata schema of the OLT repository.

Element (* = not existing)	**Indexed**	**Displayed in**	**Repeatability**	**Mandatory / Optional**	**Sample value**
Project ID*	Y	Full record only	NR	M	SP13_3268 *[Needs to be added]*
Project title	Y	Brief/full record	NR	M	Linuxgym: A Sustainable and Easy-to-Use Automated Developmental Assessment Tool for Computer Scripting Skills
Project acronym	Y	Full record only	R	O	WAND
Author	Y	Brief/full record	R	M	Andrew Solomon, Jenny Edwards, Raymond Lister, Judy Kay, John Shepherd *[NB: this data needs to be parsed]*
Author ID	Y	Full record only	R	O	*[Needs to be added]*
Lead institution	Y	Brief/full record	NR	M	University of Technology, Sydney
Partner institution	Y	Full record only	R	O	The University of Sydney University of New South Wales
Funding body*	Y	Full record only	R	M	Australian Learning & Teaching Council *[Needs to be added]*
Grant type	Y	Full record only	NR	M	Projects
Project summary	N	Full record only	NR	M	The project focuses on the adaptation, further development and dissemination of LinuxGym, a system for improving IT students' scripting skills through automated developmental assessment and feedback. Linuxgym will be both a desktop application and an online library of clearly categorized questions.
Year	Y	Brief/full record	NR	M	2008
Topic	Y	Full record only	R	M	Learning analytics Student attrition
Discipline	Y	Full record only	R	M	Information Technology – Computer Science
Project website	N	Full record only	R	O	http://linuxgym.sourceforge.net/
Resource type	Y	Resource record	R	M	Final reports
Resource title	Y	Resource record	NR	M	Final Project Report
ISBN*	Y	Resource record	NR	O	978-1-76028-463-3 *[Needs to be added]*
DOI*	N	Resource record	NR	M	*[Needs to be created for each resource and added]*
Rights*	N	Resource record	NR	O	http://creativecommons.org/licenses/by/2.5/au/. *[Needs to be added]*

Appendix G Indexing guidelines

Those responsible for indexing new resources should be provided with the following indexing guidelines developed for the OLT repository, and be trained in their application, including in the use of the Australian Thesaurus of Education Descriptors (ATED).

Field	***Instructions***
Name (project title)	Use name of project as recorded in system, including any subtitle, but amend to title case where necessary. Use a colon to introduce a subtitle (e.g. Nice Project: A Very Nice Project); otherwise use existing punctuation, but omit any final periods.
Short Title (acronym)	Enter any acronyms used prominently in resources and that do not occur in project name (above).
Attachments	Enter a title for each specific resource as presented on the resource's title page or title page substitute. Enter a descriptive title that is significantly different from the project title followed by any generic designation (e.g. "final report") as a subtitle, using the same style as for the Name field above (e.g. Nice Resource: Final Report). However, if any descriptive title is the same as the project title or an abbreviation of it, omit it, and use only the generic designation (e.g. Final Report). If variant titles are presented, prefer the one presented more prominently. If no title is presented, construct one that briefly describes the nature of the resource.
Site (URL)	Enter URLs for project websites as indicated in resources, after verifying them.
Year	Use year the resources were deposited (usually current year).

Field	*Instructions*
Author/s	Enter in order presented on the title page or title page substitute of final report, and then add the names of any other authors given on the title page or title page substitute of each of the other resources. Enter only the name of those indicated, or interpreted, to have had intellectual input into the content of the resource. If a name is presented on title pages in more than one form, enter the fuller form. Enter name as first name(s) and/or initial(s) followed by surname (do not invert). Do not use titles (e.g. Mr, Dr, or Professor). For example: Belinda Tynan, Phan Le Ha, Marnie Hughes-Warrington. Work in the Meta section is not always retained if the record is not saved before moving on to working in the Vocabularies section. If entering long lists of names, it may be worthwhile saving the record immediately after entering them.
Discipline	Identify the academic discipline or disciplines that the project supports, that is, the discipline(s) of *application.* For example, assessment of physics students = physics. In many cases, the discipline will not be education. In some cases, there may not be a specific discipline supported, in which case, choose the term "non-disciplinary". For each discipline identified, use, and only use, the term for the code in the Australian Standard Classification of Education (ASCED), 2001 (http://www.abs.gov.au/ausstats/abs@.nsf/0/E7779A9FD5C8D846CA256AAF001FCA5C?opendocument) that most closely matches. More than one term may be entered, in cases of multiple disciplines, by holding the CTRL button while selecting multiple terms. Include disciplines (usually as ATED terms) in the keywords listing as well as in this field.
Institutions (Lead institution)	Use the name for the lead institution, officially identified as such, as it appears on the list at http://www.olt.gov.au/eligible-institutions, if applicable. Otherwise, use the name as it appears in the system. Only one institution to be entered in this field.

Field	*Instructions*
Partner Institutions	Use the name for each partner institution, officially identified as such, as it appears on the list at http://www.olt.gov.au/eligible-institutions, if applicable. Otherwise, use the name(s) as it appears in the system. Multiple institutions may be chosen by holding the CTRL button while selecting institution names from the system.
Grant type	From the information provided in the resources, identify the applicable grant type from those below: • Projects • Fellowships • Networks • Other Enter one type for each project; or no type if inadequate information is provided

Field	*Instructions*
Keywords	Index the subject(s) of the project, as indicated by the resources. Use the *Australian Thesaurus of Education Descriptors* (ATED) at http://cunningham.acer.edu.au/multites2007/index.html. Index to the most specific term available for each concept. Also add corresponding "Used for" terms (synonyms) from ATED, where appropriate, and terms for any concepts, such as proper nouns, not covered by ATED. Terms for concepts not covered by ATED but within its scope (i.e. educational concepts that aren't proper nouns) should also be sent to ACER for consideration as new ATED terms or references. Do not index for the format of the resource here (e.g. case studies, templates, teaching guides): format is covered by the Resource Type field below. Further instructions on selecting ATED terms can be provided by Cunningham Library staff, Australian Council for Educational Research (ACER). Enter terms using initial caps and separate multiple terms with a comma. For example, "Avatars, Biology teaching, Capacity building" It may be convenient to copy and paste terms from ATED into Notepad, format them, and then copy and paste into the OLT system. This may assist with consistency in use of terms and avoid spelling errors. The ATED thesaurus is also available as an Excel file.
Type of Resource	Identify the resource type(s), as listed in the taxonomy available from Cunningham Library, Australian Council for Educational Research (ACER), which apply to a significant amount of the content of each of the resources. Use all the specific descriptors that apply. However, in contrast to the use of ATED, do not enter non-preferred terms. Enter each term with an initial cap and separate multiple types with commas. For example, "Final reports, Websites, Case studies"