Project Document

E-learning Repository Systems Research Watch

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REVISION	DATE	CHANGE	DETAILS
V1.0	20/06/05	TD	Draft Version
V2.0	09/08/05	RH	Changes and Technical Details
V2.1	09/09/05 and 12/09/05	JC	Incorporated SR's and JC's changes
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Related Documents

RELATED DOCUMENT	DETAILS
JORUM Report: Open Source Learning Object Repositories	November 2005 See http://www.jorum.ac.uk/docs/pdf/JORUM_osswatch_final.pdf

Contents

Executive Summary

This report considers developments in international e-learning repository initiatives and commercial systems that support these. The report was produced by the JORUM team in mid-late 2005. This is a rapidly changing area and some of this work may already be out of date, or have been superseded.

Section 1 provides an introduction to the report. The report is then divided into two main areas; e-learning repository initiatives and existing commercial repository solutions.

Key findings from a study of e-learning repository initiatives in Section 2 highlighted eight current trends which can be found in Section 2.4. In summary:

1. The majority of repositories are on-line metadata catalogues of web based resources and do not host actual learning objects.
2. Federated searching is beginning to emerge between large scale repositories.
3. Adoption of the Creative Commons licence is evident mainly within USA and Canadian based repositories.
4. Repositories are beginning to enforce some format of quality assurance of content.
5. An increasing number of repositories are based on Open Source Software solutions.
6. Support is growing for a de-centralised peer-to-peer architecture.
7. Repositories are beginning to deliver community support features such as developers toolkits, forums, training, best practice guides and publications.
8. Large scale repositories have adopted contribution incentive schemes to increase the number of resources being submitted.

Reflections of the impact of these trends on JORUM, and recommendations arising from this, are detailed in sections 2.5 and 2.6.

Section 3 of the report focuses on existing commercial solutions relevant to the application of e-learning repositories. It is important to note that the review of repository systems was carried out through desk research; evaluating products was not within the scope of this report. Key areas of interest, to JORUM, are highlighted in the following list (see Section 3.5).

1. **HarvestRoad Hive Explorer** has been integrated with the open source **RELOAD** tool and with the open source VLE, **Moodle**.
2. **HarvestRoad Hive Explorer's** approach to federated repository solutions.
3. **The BCcampus** initiative, which is probably closest in their requirements to JORUM, have implemented **The Learning Edge** repository system**.** The Learning Edge also has an authoring tool, BCAT which allows users to author content to integrate directly with the Blackboard VLE.
4. Learning content produced with the **Learn eXact** suite may be delivered by using traditional formats (DVD, CD-Rom and the Web) or also possibly on wireless, palmtop and wearable mobile devices.
5. The utilization of **DSpace** by **Luminas** in their Open Source repository solution.
6. The intuitive interface design of KaiNao's **K>Collector**.
7. **Sentient LearnBase and LearnBuild** integration using user familiar authoring tools
8. **KaiNao Ltd** authoring tool integration with MS Word.

This report clearly shows that the development and take-up in the use of repositories for the education sector is steadily increasing, including in the area of e-learning. The implementation of commercial and non-commercial systems to fulfill the broad range of roles for repositories is very apparent. Also evident is the vast range of system functionality and service models available, reflecting the wide range of requirements that need to be met.

It is clear that these wide scale developments will offer an insight into alternative service models, additional service components/activities that could be offered by JORUM in additional to specific system functionality that the JORUM community could benefit from. The following are a list of recommendations based on the work undertaken, that concludes this report.

Summary of Recommendations

1. Continue to provide minimal watch activities on emerging and developing repository services in the educational sector, both commercial and non-commercial throughout the world.

2. On the basis of the watch activity, identify for the JORUM team discussion aspects of other service models that the JORUM team may wish to recommend for implementation.

3. On the basis of the watch activity, identify for JORUM team discussion system requirements and specific functionality that JORUM team may wish to recommend for implementation.

4. Identify from the watch activity open source solutions and developments that the JORUM team may also wish to recommend for investigation/implementation.

1. Introduction

1.1 Background

The Joint Information Systems Committee (JISC) of the Further and Higher Education (F/HE) funding councils of the UK funded the JORUM project from October 2002 – July 2005 to establish a repository for learning and teaching materials for use by F/HE institutions in the UK[1]. The JISC are continuing to fund the JORUM to setup a service to the UK FE and HE community and R&D activities will be carried out as part of this work (JORUM Service in Development)[2].

This report forms part of the ongoing Research and Development (R&D) activity of the JORUM project and is a continuing watch on developments in the area of e-learning repository initiatives and projects, and the commercial systems that are used to underpin these. A related report is the JORUM R&D Report on Open Source Software/Free Software (OSS/FS), submitted to JISC in August 2005.

1.2 Report Objectives

The key objective of this report is to bring together developments in international e-learning repository initiatives and commercial systems. The report has two separate aims, which are:

1. Keep track of developments relevant to the JORUM project; look at the features provided by other systems and how they might influence the development of JORUM; consider what the JORUM service should be in 3 years time, based on the above;

2. Monitor commercial learning repository systems and consider their possible applications to the JORUM project.

The report covers e-learning repository initiatives and commercial learning repository systems; their background, objectives and functionality. It also highlights emerging trends within this area and discusses their possible application to the JORUM repository service in development.

1.3 Scope of the Report

The following issues fall within the scope of this report:

- Define the various types of e-learning repositories in the context of current global initiatives and projects
- Provide an overview of user expectations of a e-learning repository
- Provide a summary of the main e-learning repository initiatives relevant to JORUM
- Provide a summary of the main commercial learning repository products
- Highlight and discuss any emerging trends
- Provide recommendations with regard to the development of JORUM

The information presented within this report is a result of internet research and communications with repository initiatives and commercial vendors. The two main reports

[1] JORUM project website at http://www.jorum.ac.uk/research/archive/index.html
[2] JORUM Service in Development website at http://www.jorum.ac.uk

used to inform the work covered here were produced by the Academic ADL Co-Lab[1] in 2003 and 2004. The initiatives, projects and systems that were included were done so on the basis that the team considered they would be useful to inform the current and future JORUM service. We have attempted to cover as wide a range as possible of solutions and on-going work, but recognise that we may not have included all work that could inform the development of the JORUM service.

The systems and projects discussed within this report are therefore not intended to provide an exhaustive list of e-learning repository products or services. Nor is the report intended as a complete review of existing e-learning repository initiatives as there are restrictions to access to many of those systems, which would affect the conclusions drawn. Equally the report is not aiming to provide a complete review of commercial repositories lack of access to the repository software, and the scope of the report.

Consequently it outside the scope of this report to present an evaluation of systems or initiatives, nor do we suggest that the content of this report provides a basis for an in-depth technical study.

1.4 What do we mean when we say 'Repository'?

> Information technology has entered the world of learning and it is here to stay. From the use of computing technologies in the classroom to the creation and delivery of entire online courses, new technologies are changing the ways in which we think about and practice education. With the development of the Internet has come the ability to easily deliver educational materials in electronic form to anyone, anywhere, at anytime. With developments in educational technology comes the promise that educational resources in electronic formats can change the ways in which we teach and learn.
>
> [ADL 2003, p.4]

Despite inspirational and positive statements like this from 'The Academic ADL Co-Lab', reality would suggest that regardless of the rapidly growing number of quality electronic learning and teaching resources, there remains an inability to search, locate and retrieve these materials easily.

> This is why repositories, systems for the storage, location and retrieval of electronic content, are so essential to the further integration of information technologies and learning. They are the potential agents for breaking through many barriers to the use of new learning technologies. (Ibid.)

Within the content of this report we will examine the various learning repository initiatives around the globe that are bridging the gap between the creation of high quality resources and their delivery to the e-learning community. However when we refer to 'repositories' what do we actually mean?

The definition of a repository is as illusive as that of a learning object;

> While theorists have debated definitions, developers and administrators have created networks that allow learning materials to be located and retrieved. In creating these networks, which they sometimes label "repositories," these individuals often make do in a world shaped more by financial and institutional constraints than theoretical concerns. (Ibid.)

It is important that we define what is meant by a repository within the context of this report. As a starting point our strict definition will be: *a repository enables the storage, discovery and retrieval of metadata and/or electronic objects stored at a local or distributed level.*

[1] Academic ADL Co-Lab at http://www.academiccolab.org/

Using this definition as a basis, we can adopt the ADL's functional definition of a resource being referred to as a 'learning repository' if it is created in order to provide access to digital educational materials and if the nature of its content or metadata reflects an interest in those materials being used in educational context.' (Ibid.)

Despite the validity of the above definitions they simply provide a starting point and are in many ways too general for the variety of repository initiatives and projects within this report. To enable any sort of comparison or establish any emerging trends within the field is it important that we provide a series of definitions so that we can distinguish and categorise the various types of e-learning repository initiatives investigated within this report.

For the purpose of this report the following three definitions are thus proposed;

> *Online catalogue of educational web based resources* – an online database of metadata records that refer users to quality educational content available on the internet. This type of learning repository does not store any objects/content and is the most common type of learning repository.
>
> *Online Digital Object Repository* – an online repository that stores digital objects and their associated metadata. The purpose of this learning repository is to store academic or educational outputs such as research papers and materials, often for an institution.
>
> *Online Learning Repository* – an online repository system that stores virtual objects, digital objects and allows the import and export of standards based content packages[1].

Unlike JORUM, the majority of learning repositories described in section 2 of this report do not store actual content or learning objects. It is the intention of this report to highlight trends such as this, in contrast with user expectations and the issues associated with them.

1.5 Why the trend towards repositories?

1.5.1 The need for learning repositories

Serious investment has been committed in recent years, internationally, to repository development and deployment in the academic sector. For example, in July 2002, $9.4 million was invested in the eduSourceCanada e-learning program. In March 2005, the JISC put out a call for projects regarding digital repositories and committed up to £4 million to the venture[2]. This followed on from previous JISC programmes that included the X4L Programme[3] that funded the JORUM project. Such actions demonstrate the requirement for research into, and implementation of, effective learning repositories to aid in the storage and retrieval of learning resources.

What factors can explain this recent interest and requirement for learning repositories?

> More and more projects within the fields of e-learning and traditional education have identified a need for repositories. Repositories are very much in demand because educators of all kinds are developing digital educational content. Many content creation and educational projects are not satisfied with placing their products on isolated websites, to be discovered and used by users with only unpredictable search engines as their guides. The leaders of these projects hear that repositories can make these pieces of digital content accessible and reusable, providing a location on the Internet where

[1] A content package is an encrypted file containing content and metadata.
[2] JISC Circular 3/05: call for projects in digital repositories. See http://www.jisc.ac.uk/index.cfm?name=funding_circular3_05
[3] The JISC Exchange for Learning Programme. See http://www.jisc.ac.uk/index.cfm?name=programme_x4l

> these materials can be stored and discovered, and at times these leaders have made repositories into requirements for their initiatives' project plans or written them into their grants.
>
> [ADL 2004, p.1]

1.5.1 'Silos' of high quality resources

Over recent years the focus in terms of e-learning has been in the commercial production of high quality re-usable resources for the academic community. This has been co-ordinated with the drive to move away from traditional methods in the classroom, towards more technology based techniques in teaching and learning. This strategy has sometimes resulted in inaccessible 'silos' of high quality resources, and advanced software platforms such as virtual learning environments, not well used within institutions. With the increasing enthusiasm about learning repositories comes the hope of increasing the awareness of these 'silos' of content and more effective delivery methods between them and their target audiences.

1.5.2 Inaccessible Resources

Improving the access to these silos of resources is dependent on the search and retrieval methods available to users. Traditionally when these resources are created they are delivered through a website or an alternative static mechanism. This means that their retrieval relies upon the efficiency of internet search engines, which is arguably decreasing due to the vastly growing number of web resources and commercial rating methods (such as sponsored links).

Through the implementation of a learning repository comes the ability to tag resources with high quality metadata.

> The most powerful tool currently available for describing and locating digital materials is metadata and a thorough metadata schema. By creating records and making them available for searching, the creator of metadata allows a resource to be discovered by a user who might not know in advance the specific resource they require. By creating metadata records that describe multiple attributes of the resource referred to, the creator of metadata allows a resource to be discovered using multiple searching techniques.
>
> [ADL 2003 p.8]

Quality metadata is the critical factor to the effectiveness of any search engine. However the availability of a good metadata schema within a repository is not directly linked to the quality of the record, which is mainly dependent on the repository strategy, its administrators and the underlying community (discussed in greater depth in section 1.5).

1.5.3 Contributing Resources

The strategy of commercially produced content is inefficient and in the long term, potentially self-defeating to the e-learning community. In the past if practitioners created their own resources, the storage, delivery and retrieval methods available were limited and the overall rewards and recognition were minimal. As institutions and practitioners become more adept at creating and repurposing electronic learning resources it is the existence of learning repositories that will encourage contributions. This will result in a self perpetuating strategy, where content available to the community is created by the community and vice versa.

1.5.4 The Google effect

With the rise of popular internet search engines came the promise of being able to locate quality resources within seconds. However the vast expanse of the web over recent years,

and the introduction of sponsored links, has resulted in the common scenario of millions of results returned from a search, with a rating system based on commercial gains. As a result online catalogues of web based resources have emerged that offer access to just educational resources and provide a more valid rating system such as peer review and star rating. Examples of these online catalogues of web based learning resources include MERLOT[1], the Resource Discovery Network[2] and EdNA Online[3] (also see Section 2 of this report).

1.5.5 Supporting a community

There are at least two scenarios regarding the creation of a learning repository to support a community.

The first is that a community exists and has a requirement for repository functionality. It may be the core functionality such as storage and retrieval, or it may be the additional functionality found with (most) learning repository initiatives such as discussion forums, mailing lists and authoring tools.

The second scenario is that a learning repository is implemented with the intention of building a community of users.

> Repositories are created in the hope that a community of practice will arise around them and that this community of practice will use the materials made available to it and, in many cases, improve the collection of those materials.
>
> [ADL 2003, p.5]

1.6 User Expectations of a Repository System

It is often the case that technology can drive the requirements, articulated as a solution in search of a problem. It is very important that learning repositories are built with a focussed strategy and purpose in mind. One of the most effective methods for this is awareness of the community that the repository aims to serve and support. By establishing the expectations and requirements of the users the intended goals and objectives of the repository can be established. This is not to suggest that users always know what they need; it is often stated that users didn't require Google before it was invented. However, establishing a community's expectations and their needs is a valid and important starting point.

In 2004 the Academic ADL Co-Lab conducted a series of informal surveys, surveying partners, project representatives, and interested parties regarding the functionalities they expected and preferred to find within a repository system [ADL 2004]. This section draws out the expectations of users resulting from this research and examines the associated issues arising from these requirements in relation to feasible implementations.

1.6.1 Main Requirements

The main user requirements covered in this section are metadata management, content management, interoperability and community support. Additional requirements are listed but form the subject of separate reports.

Metadata Management

[1] Merlot website at www.merlot.org
[2] Resource Discovery Website at www.rdn.ac.uk
[3] EdNA Online website at www.edna.edu.au

The research done by ADL suggests that users expect learning repositories to store metadata about the resources they contain. In addition users expect the metadata schema used to improve interoperability by conforming to a standard such as IMS or Dublin Core.

> Almost all respondents wrote that they expected repositories to store meta-data about the objects they contained. Further expectations that built upon this central expectation included conformance to specific meta-data standards such as the Dublin Core.
>
> [ADL 2004, p.4]

Encouragingly this suggests that users understand the importance of metadata in the retrieval of resources, raising several issues.

There is an ongoing debate about who should assume the role of metadata creator and the role of validating the quality of the metadata (see Currier et. al, 2004). Learning repositories may base their strategies on the more traditional library within an institution. The goals are often the same, with the primary goals being the storage and retrieval of knowledge. If metadata creation for library resources is carried out by trained information professionals, why is there such a debate about the requirement for an academic creator of e-learning content to be involved in the process of metadata creation at all; how can an author be expected understand the complexities of standard vocabularies or the classification scheme used within academia? In other words, why is there such a debate in the context of electronic learning repositories if their objectives are so similar to that of libraries?

The reasons seem to stem from factors such as, funding, quality of metadata and the introduction of workflow. There is a constant tradeoff between the author of the resource creating the metadata and qualified information professional. It is argued that the author of the resource is the most suitable metadata creator as they understand its contents and purpose, although at the same time the expertise required to catalogue a resource effectively is underestimated.

> Some collections that leave metadata submission open to the public suffer from blank fields and fields containing information that is ambiguous or of poor quality.
>
> [ADL 2003, p.15]

As the retrieval of resources depends on the search engine and inevitably the underlying metadata, the repository is dramatically affected. However, with the introduction of workflow has come the ability to share the metadata creation process between multiple roles. This has meant that a record can be split up and directed to the most appropriate person in the workflow. Often basic mandatory metadata fields such as title and description are left for the author of the resource and the remaining record is completed by a qualified cataloguer.

In the report [ADL 2004], additional expectations from users regarding metadata management included:

1. Metadata editing tools built into the repository interface
2. Metadata schemas based on Interoperability standards
3. Automatic metadata creation
4. Resource classification

As with all user expectations, the additional requirements above are restricted by issues such as choosing the right metadata standard to adopt, implementing the most appropriate classification schemes, and providing the maximum amount of automatic metadata creation without affecting the quality of the completed record.

In order to develop high quality metadata to meet the standards set out above JORUM is working with the Resource Discovery Network (RDN)[1]. The RDN is a JISC service to further

[1] Resource Discovery Network at www.rdn.ac.uk

and higher education. It is a collaborative network of subject based centres (the Hubs) hosted at academic institutions which identify and catalogue electronic resources available via the Internet in order to provide a quality assured Internet catalogue and other resource discovery services for the further and higher education communities.

By using its subject specific experienced cataloguers, the RDN is able to provide a bespoke and adaptive service to JORUM, which will result in sustainable creation of metadata permitting easy depositing and location of learning objects by JORUM users. The RDN is also working with JORUM to ensure that workflow and metadata application profile reflects the current standards within the sector, ensuring sustainability for the future repository environment.

The RDN is investigating with JORUM the best possible means of surfacing JORUM object metadata to ensure that the objects can be discovered by the widest possible audience.

Content Management

Results from ADL's research indicated that users expect to be able to upload and download materials from a learning repository. This is contrary to the emergence of many online catalogues of web based resources, which simply allow users to contribute a record of existing web sites. At present the drive seems to be to focus on producing catalogues of high quality web based resources to overcome the disadvantages associated with common search engines. However, learning repositories like these neglect the need for the repurpose and reuse of resources which is at the core of e-learning.

The number of learning repositories storing actual content will only increase once the community as a whole reaches an agreement on digital rights expression and management. At present learning repositories can be forced into a risk adverse strategy due to the complexities of the law and intellectual property rights. With the introduction of licensing models such as Creative Commons and expression languages such as ODRL (Open Digital Rights Language) that has been adopted by JORUM service in development, it is becoming possible for contributors to specify rights holder information and for learning repositories services to deliver resources with rights being expressed.

With respect to user expectations of resource type stored within a learning repository, the research presented in the ADL report suggests that if possible it should cover the maximum amount of subject classifications, or "type agnostic" as one respondent phrased it. It seems logical that users should be delivered a single repository or gateway that covers all subject areas, yet the feasibility of collecting a critical mass of content of that proportion is slim. However, with the development of harvesting technology and federated searching, learning repositories are collaborating to vastly increase the amount of resources they offer to their community.

From the mix of responses ADL collected, there was an expectation among them that a repository system should provide interfaces and tools that facilitate many aspects of the repository content management including:

1. Content Packaging and Metadata Standards
2. E-mail Alerts
3. Digital rights or licensing-related features
4. Individuals should be able to "create their own collections in unmediated ways," giving them powers to set and restrict access to those collections
5. Unique identifiers for content

Interoperability

In terms of Interoperability, ADL's research suggests that users foresee integration between both metadata and resources within globally distributed learning repositories.

> Many respondents expected a repository system to be conformant with content interoperability standards, as well as being conformant with, or providing crosswalks to, meta-data standards.
>
> [ADL 2004, p.5]

The interoperability of metadata within a learning repository is dependent on the adoption of an appropriate metadata standard. Additional factors include providing functionality to allow the mapping between different metadata schemas within the repository, and the ability to expose and harvest metadata. The most accepted metadata standard for learning and teaching resources within the UK is the UK LOM (Learning Object Metadata), which is an application profile for the IEEE LOM. Effective interoperability has allowed projects such as EdNA Online (Australia) and MERLOT in the US to provide a federated search for users between the two metadata repositories.

The implementation of metadata standards is a key element to support interoperability between repository projects, although it is important to remember that strict compliance with metadata specifications such as IMS can sometimes hinder contributions and in certain circumstances restrict the search and retrieval of resources.

> Compliance with metadata standards is obligatory if distributed repositories are to function. Thus discussions of metadata can frequently turn into discussions concerning *compliance* with metadata standards. Yet as these standards are encouraged in the interests of interoperability we must not forget the other functions of metadata — to describe and locate resources.
>
> [ADL 2003, p.23]

Interoperability with regards to of content within a learning repository is dependent on its ability to import and export standards based content packages. The main standards adopted with relation to content packaging are IMS and SCORM. Due to repository vendor's interpretation of the standards, the degree to which a repository implements a content packaging specification is so varied that interoperability of resources between learning repositories is extremely immature. In addition, at times progress seems to be hindered by repository vendors who adhere to the minimum amount of a specification in order to gain a competitive advantage in the marker, by stating the compliance of their system to the standards.

Community Support

Repositories are born in response to a community's growing requirements, or for the purpose of creating a community that currently doesn't exist.

> In some ways all learning repositories create a community of practice that did not previously exist. A repository project that hopes to draw upon a body of users for its content and metadata must of course create a practice that leads to the submission of both to that repository. But reports from learning repository administrators showed that some successful repositories develop from pre-existent communities of practice within which there was a desire for a repository to begin with.
>
> [ADL 2003, p.18]

Regardless of their reason for existing, users will always expect some degree of community support. Community support can be defined as a set of services, tools or functionality that is outside the boundaries of the physical repository. Evidence suggests that the more successful repository services put equal emphasis on supporting their community, as functionality within the repository.

> "Standards should not precede practice," or that repository practices, ranging from collection development polices to metadata standards, should not be

> developed in the absence of an awareness of user practice and user communities
>
> [ADL 2003, p.19]

However, how do repository administrators know what support the community requires? The Global Learning Repositories Summit report [ADL 2003] concludes that it is dependent on the repository's awareness of the community and how well they listen to their community. It is consequently important that the learning repository community as a whole develop more sophisticated techniques rather than simply asking a community what it needs.

> Such techniques include use case analyses, and surveys of the repositories potential user groups in order to gather sets of expectations form these groups
>
> [ADL 2003, p.20]

As of the time the report was written many repository projects were working with a very limited vocabulary for discussing their community's needs and solutions. Projects that have expanded their vocabulary, and developed techniques for assessing user needs have not formalized them in a format that can be transferable and interoperable with other initiatives. It remains to be seen how this changes with the growing number of learning repository users.

Once these issues have been tackled effectively, and learning repositories are able to establish a community's specific requirements, there are many benefits to that repository?

1. Sustainability is achieved through the loyal support of a community and through the potential of new sources of support, such as payment once a resource has proven its worth.
2. Awareness of the repository through the informal communication networks that communities already have in order to encourage awareness of their materials.
3. Feedback and direction from the community is invaluable to the development of the repository and its contents.
4. Identification of existing cultures of sharing within the community.

What types of community support do users of learning repositories require? A repository has to provide support for both new and existing users, and it is important that a good balance is achieved. If there is too much focus on existing users then new users will feel alienated and be discouraged from joining. However, if there is too much support emphasis on new users, then existing users won't receive a sense of community belonging and appreciation, and therefore will be reluctant to contribute.

Types of Community Support offered to both new and existing users include:

1. Support – Helpdesk accessible by email or telephone.
2. Training and Documentation – Training materials in multiple formats, best practice guides, introduction materials for new users, etc.
3. Shared Information Services – Details of repository content outside of the service, news via technology such as RSS Feeds, etc.
4. Newsletters
5. Discussion / Mailing Lists
6. Support Forums
7. Tools – Authoring Tools, Metadata Tagging Tools, etc.
8. Events – User Days, Conferences, etc.

JORUM will be taking part in a new JISC funded project – CD-LOR (Community Dimensions of Learning Object Repositories[1]) which will help to inform this work.

1.6.2 Additional Requirements

[1] http://www.jisc.ac.uk/index.cfm?name=project_cdlor

It addition to the main user expectations discussed in section 1.5.1, further requirements specified by users included long term preservation of content[1], open source repository software[2], version control, user interface and authentication[3].

[1] JISC, July 2005, 'Preservation Watch Report'
[2] JISC, July 2005 'Report on Open Source Learning Object Repository Systems'
[3] These are included in the JISC ELF Project http://www.elframework.org/

1.6.3 Conclusions

Evidence suggests there is widespread acknowledgement within existing learning repositories of the user expectations and requirements discussed in this section. However it appears that because of the associated issues and current constraints such as repository immaturity and limited communities, individual initiatives are focusing on a subset of the requirements.

> A review of the materials and resources currently available online shows that many repository projects implemented successful policies regarding some of these domains, but few in all. Some have excellent systems of outreach and peer review but mixed collections of materials. Others have extremely good content but are not well known. Some hold fast to their metadata schema, applying it well and consistently, but lack a large collection of materials.
>
> [ADL 2003, p.6]

There is also evidence to suggest that regardless of what requirements a learning repository initiative focuses their efforts on, the degree to which the project is a success differs dramatically. This is an indication of the vast number of factors that affect the community uptake of a repository and its predicted life span.

> In the last few years, learning repositories (digital repositories containing resources used for training and education) have been developed to meet the needs of many various populations. They have met their user's needs with varying degrees of success and faced challenges common to all in differing and innovative ways.
>
> [ADL 2003, p.3]

Regardless of the issues associated with metadata, content and interoperability, it seems sensible to assume that if repository initiatives collaborate and work towards high user expectations as discussed in this section, the community will witness seamless resource sharing between not only learning repositories, but also learning management systems and globally distributed portals.

This section has provided definitions of repositories used throughout the remainder of this report, briefly looked at the learning repository trend as whole and detailed user expectations of repository initiatives as a result of research undertaken by the ADL. The next section details existing repository initiatives, their background, objectives, goals and features.

2. E-learning Repository Initiatives

2.1 Introduction

The aim of this section is to consider nineteen international repository initiatives that are operational, considering how they emerged, who they are aimed at, what services they offer, what they have achieved to date and consideration of their technical architecture. Some conclusions will be drawn from these findings with regards to the trends that are emerging from the area as a whole and their possible influence on JORUM as it develops as a service. This will help inform the development of the JORUM short and long term strategy, for the JORUM Service in Development phase which started in August 2005.

2.2 The JORUM Initiative

The requirements for the JORUM service repository system were made clear in the tender documents issued through the EU procurement process which was carried out between January and July 2004.

The JORUM project was tasked to procure a repository system for a JISC-funded learning and teaching repository service for the whole of the HE/FE sector in the UK. After a thorough evaluation period, JORUM awarded the three-year contract to Intrallect Ltd for the IntraLibrary product. Further information on the JORUM Service in Development (the phase JORUM has now entered following on from the JORUM project) can be found at the JORUM website[1].

After an extensive set of scoping studies which resulted in a series of documents[2], looking at a range of relevant issues (including metadata, the JISC IE, licensing and workflow) the JORUM project produced a list of requirements for the JORUM learning repository. The final specification for the initial version of the system is available on the archived JORUM project site[3]. The basic technical requirements can be summarised as:

The repository needs to:

- Enable interoperability between services/systems in the JISC Information Environment[4].
- Be standards based.
- Be platform independent for the user.

The following features/functionality should be available:

- Upload and storage of learning resources[5].
- Preview and download of learning resources.
- Support for UK LOM Metadata and additional application profiles.
- Role-based authorisation.
- Content Packaging, in accordance with the IMS specification.
- Workflow management.
- Basic and Advanced metadata search.
- Import of metadata.
- Harvesting of metadata.

[1] JORUM Service in Development website at www.jorum.ac.uk
[2] See http://www.jorum.ac.uk/research/archive/research/publications.html
[3] JORUM Repository Requirements Specification: http://www.jorum.ac.uk/research/archive/docs/pdf/JorumSpecification.pdf
[4] http://www.jisc.ac.uk/index.cfm?name=ie_home
[5] In the context of this report a learning resource describes either a web based resource, a single digital file or a content package.

- Exposure of metadata.
- Peer review and star rating system.
- Provision of Digital Rights information.

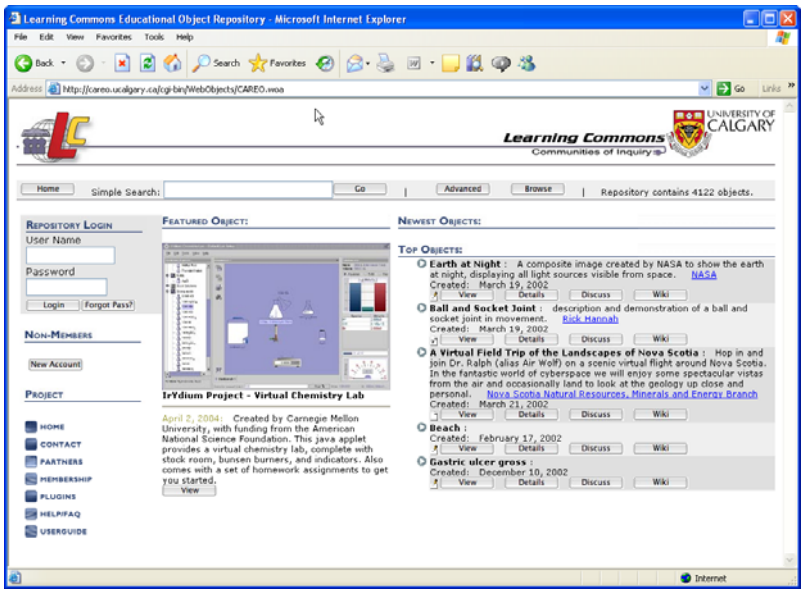
The JORUM project team has worked closely with the supplier to obtain a customised learning repository that meets the vast majority of requirements, with further development work planned.

2.3 International Repository Initiatives

The nineteen repository initiatives included in this section were discovered through desk research. Consequently it was not always possible to ascertain certain information, e.g. lack of, or inclusion of, functionality or features in the repository initiative; the report states where this is the case.

For each initiative a web site is given. Much of the information contained in this section of the report was taken directly from these web sites.

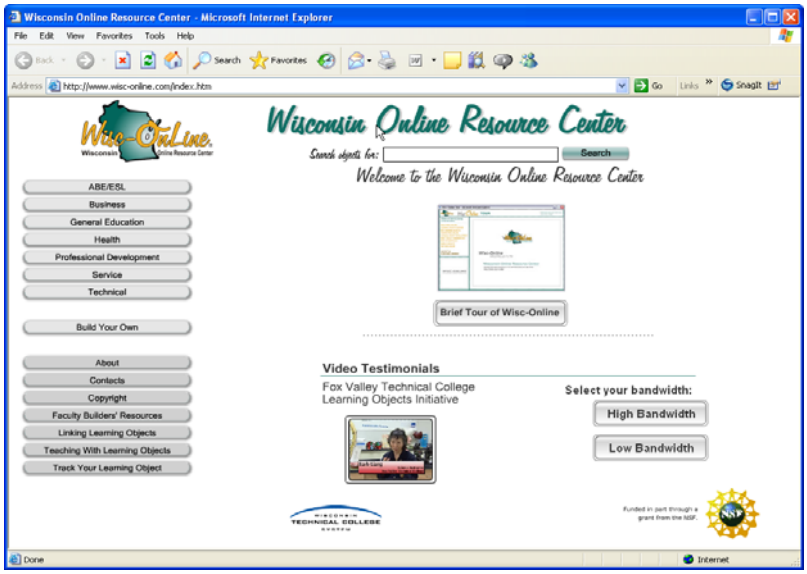
2.3.1 CAREO (Campus Alberta Repository of Educational Materials)



Lead	University of Calgary, Alberta Learning, eduSource
Origin	Canada
Background	Established in 2001, the University has an educational development team that are developing their e-learning systems called Learning Commons. The repository system was developed in conjunction with Alberta Learning and CANARIE. The project benefits from a separately funded project ALOHA which has is designed to accommodate any type of markup, and to allow searching and sharing of those objects.The repository purports to have over 4,000 objects in it.
URL	http://careo.ucalgary.ca/cgi-bin/WebObjects/CAREO.woa/wa/Home?theme=default
Aims and Objectives	• To create a searchable, web-based collection of multidisciplinary teaching materials for educators provincially and nationally to realize distance education needs • Allow for joint contributions, sharing and communication between members of community with similar interests • Development through four basic principles: 1. Reuse of modularized educational resources or learning objects 2. Organization of resources through metadata 3. Provision of access to resources through a distributed repository architecture 4. Continued development and enhancement of these resources through quality control, peer review, reward and support practices • Professional recognition for teaching staff engaged in the development or delivery of educational resources • Maximization of investments in staff and course development • Achievement of effective quality control for learning content used in teaching
Metadata Standards	IMS, CanCore and IEEE LOM
Content Packaging	None

Features	• Currently 3900+ metadata records • A comprehensive service that is now syndicating itself to other institutions • Promotes peer review • Utilises ALOHA a metadata tool • digital rights (unable to find information at time of writing) • quality control (unable to find information at time of writing) • RSS functionality • Internal Unique Identifiers

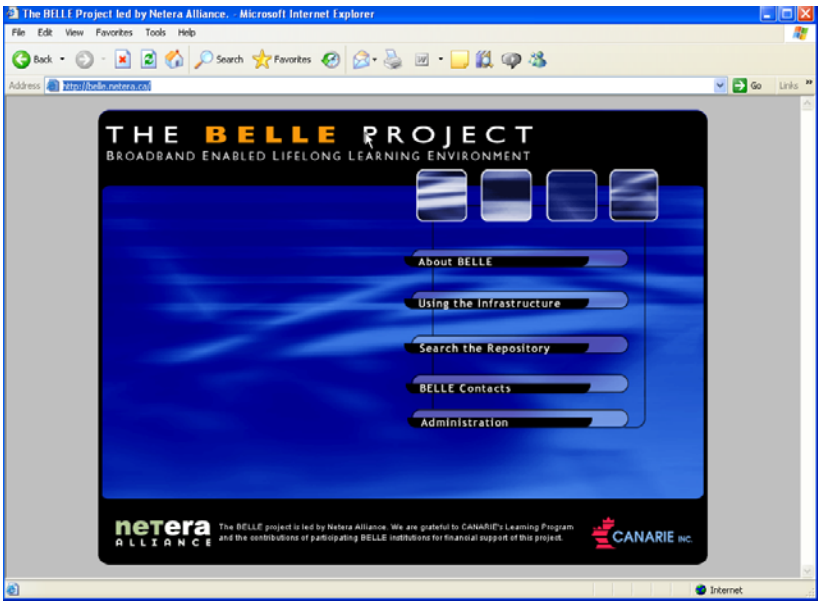
2.3.2 Wisconsin Online Resource Center



Lead	Wisconsin College,
Origin	Canada
Background	The project has received two major grants (Fund for the Improvement of Post-secondary Education (FIPSE) followed by a National Science Foundation Grant totaling $2.7 million starting in September, 1999. It's a College based system and includes 16 Wisconsin Technical Colleges.
URL	http://www.wisc-online.com/index.htm
Aims and Objectives	The Wisconsin Online Resource Center project is a web-based teaching, learning, and assessment resource center for instructors to use when designing or revising online courses. The goals of the project are to accelerate the development of quality online courses while, at the same time, minimizing the cost of course development by identifying and sharing best practices. Faculty from throughout the WTC System create "learning objects" (activities, text, animation, graphics…) for each competency within the General Education courses of Communication Skills, Social Studies, Math, Science, and Adult Basic Education. The WORC collection is made up of over 1000 interactive browser based educational materials. The contents are interactive, browser based educational material. A customized repository hosted by Wisc-Online is available at $25,000 for initialization and the first-year license with an annual hosting and maintenance cost of $5,000. 1914 Objects Online, 180 Objects Under Development (as of 12 Sept 2005) Learning objects are designed and developed by a team of instructional designers, editors, technicians, and student interns.
Metadata Standards	unable to find information at time of writing
Content Packaging	unable to find information at time of writing

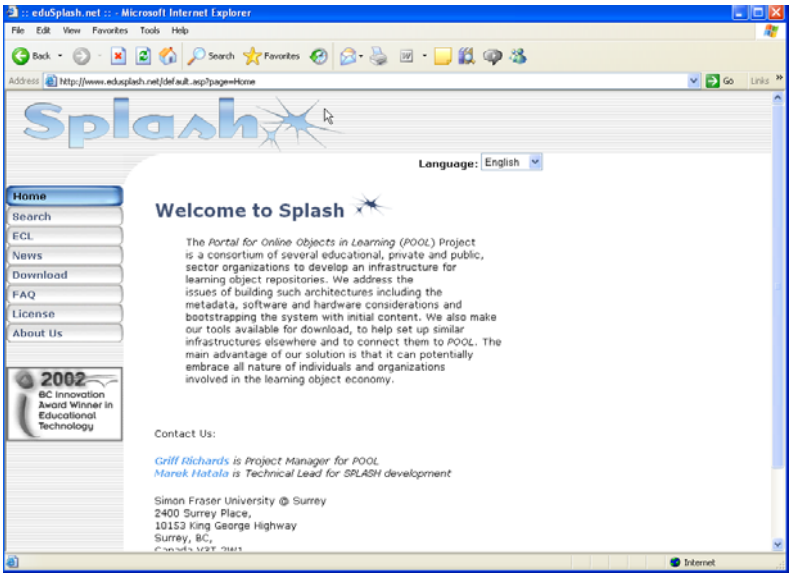
Features	• The project was conceived as a partnership of 16 colleges at start • Sense of identity through Wisconsin geographical area • The project has a well developed quality control system by applying a 13 point quality policy and then scores objects on a 1 to 5 scale • Provides plenty of support learning material about how to use the repository • Content is well designed and professional looking • There appears to be little encouragement to involve a wider group of users to create content, reliance on technicians to do this • 900+ Resources • Downloads (unable to find information at time of writing) • Standalone client for access required • digital rights (unable to find information at time of writing) • There is no use of a Creative Commons type license, therefore restricting reuse by those outside of the 16 college network. • The site states Educators and educational institutions may link this site or the learning objects in this repository without full-permission and copyright recognition. • interoperability standards (unable to find information at time of writing) • unique identifiers (unable to find information at time of writing) • versioning (unable to find information at time of writing) • RSS (unable to find information at time of writing) • Materials classified by subject

2.3.3 BELLE (Broadband Enabled Lifelong Learning Environment)

	
Lead	Netera Alliance (see list of partners below)
Origin	Canada
Background	This is really a two year R & D $3.4 million shared-cost project funded under the CANARIE Learning Program. It builds upon the successful work of CAREO project, as the University of Calgary are key members of the project's partnership. BELLE's objective is to develop a prototype educational object repository. It is a partnership led by Netera Alliance that includes: Banff Centre for the Arts, McGill University, Faculty of Medicine, Northern Alberta Institute of Technology (NAIT), Seneca@York, Sheridan College, University of Alberta, University of British Columbia, University of Calgary Faculty of Medicine, University of Calgary Learning Commons, University of Lethbridge, Vancouver Film School. The actual repository being used is actually CAREO re-branded as Alexandria, it can be found at: http://careo.ucalgary.ca/cgi-bin/WebObjects/CAREO.woa?theme=alexandria
URL	http://belle.netera.ca/
Aims and Objectives	BELLE is investigating four interconnected aspects of establishing this repository, these are as follows: **1. Creating and Cataloguing Educational Objects** BELLE is cooperating with other Learning Program projects to develop the "Canadian Core", a set of standards to describe the content of educational objects so that the repositories can be effectively searched. In cooperation with the Learning Commons at the University of Calgary, BELLE is creating tools and methods for automatically generating metadata and optimizing the digital content creation and repurposing process. **2. Pedagogical Models and Peer Review** Tim Buell at the University of Calgary is leading the investigation into the pedagogical approaches that are required to establish peer reviewing and quality assessment of educational objects. This is designed to give academic merit to the production of educational learning objects. **3. Evaluation and Support** Under the direction of Terry Anderson of the University of Alberta, BELLE is developing a comprehensive set of evaluation tools to assess the value and impact of its components. Netera is also developing a comprehensive structure for the support and dissemination of information about the project. This includes demonstrations, presentations, articles, and support via telephone and email. **4.Testbed Infrastructure** Finally, Netera Alliance is working with all its partners to establish a testbed infrastructure of Client Learning Environments, servers and Content Repurposing Facilities. Client Learning Environments are mobile

	workstations that turn any classroom with a broadband connection into a distance learning centre with H.323 video conferencing, application sharing and multimedia content. Content is served from a variety of servers from companies such as SGI, Callisto and Apple. Content Repurposing Facilities are used to digitize and tag content. BELLE has been asked to share this work with other Learning Program projects through a subcommittee that is investigating the technical requirements of object repositories. The aim of BELLE is to weave these four areas together to make a prototype for an educational object repository. While this prototype will not be a fully functional or complete repository, it is intended to test, evaluate and document the key components of such a structure.
Features	• This is an ambitious but well funded programme that supports the work of the CAREO project and makes available with a wider group of project partners. The four areas of development are of significant interest and should be closely monitored. • BELLE is working with other Learning Program projects to share resources and expertise. In particular, BELLE has aligned itself with the POOL (Portal for Online Objects in Learning) and LearnCanada to cooperate in areas such as metadata and infrastructure. • Developing a set of metadata core may appear exclusive to Canada alone, we trust it will incorporate international standards; • Not actually a new repository, see note in background above.

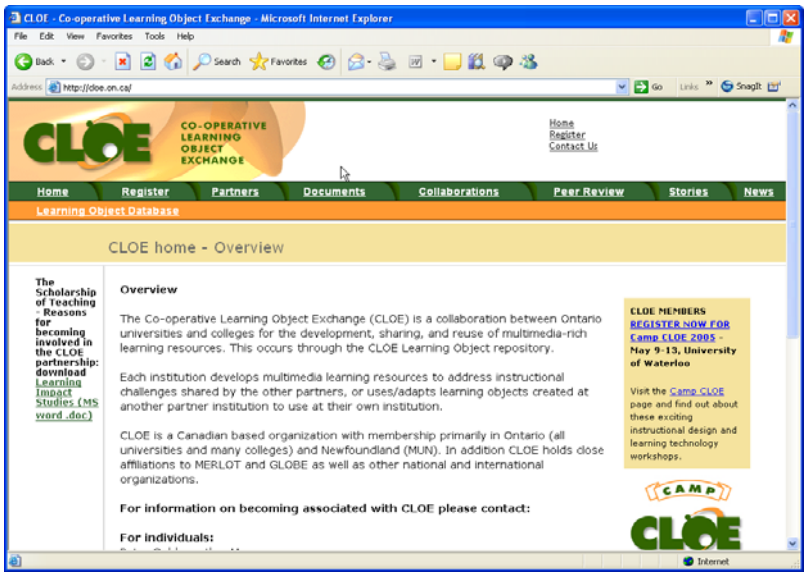
2.3.4 POOL (The Portal for Online Objects in Learning)



Lead	Simon Fraser University
Origin	Canada
Background	POOL is a consortium of Canadian educators private and public sector organisations who are working together to create the Portal for Online Objects for Learning (POOL). We are funded in part by the CANARIE E-Learning Program. POOL, POND and SPLASH is the metaphor we use to describe our architecture - SPLASH is for individuals, POND is for communities, and POOL Central is a way to speed up and hasten the search process. The partners in POOL are: NewMIC - the New Media Innovation Centre Foundation in Vancouver is a non-profit research and development centre for high-tech media; TL-NCE - the TeleLearning Network of Centres of Excellence is a national network of researchers looking into technology and education; TechBC - the Technical University of British Columbia, the technical lead of POOL, POND and SPLASH; NBDEN - the New Brunswick Distance Education Network runs TeleCampus, the worlds largest portal to online courses; UNB - the Electronic Text Centre at the University of New Brunswick, a main developer of the IMS-conformant CanCore metadata profile; TelesTraining Inc. is a private sector developer and trainer for on-line learning; C2T2 - BC's Centre for Curriculum, Transfer and Technology; OLA - BC's Open Learning Agency
URL	http://www.edusplash.net/default.asp?page=Home
Aims and Objectives	• SPLASH uses "peer to peer" technology so every user can have their own mini-repository on their computer, but these are all linked together so you can search all the POOL sites from your SPLASH application. • We address the issues of building such architectures including the metadata, software and hardware considerations and bootstrapping the system with initial content;
Metadata Standards	CanCore
Content Packaging	(unable to find information at time of writing

Features	• Create and edit metadata records • View metadata • Local Metadata search • Global 'Pool' metadata search • Management and workflow tools • Peer-to peer technology is worth watching in the case of repository use, the growth of use could be faster due to its openness (if its reputation goes before it); • Allows federated search of peer person repositories and larger managed repositories • Unsure of recent developments as latest additions to website are dated 2002

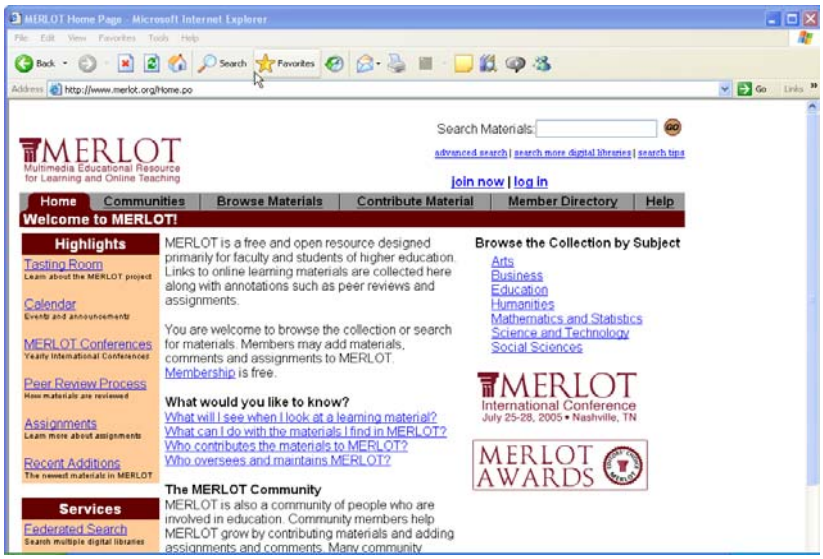
2.3.5 CLOE (The Co-operative Learning Object Exchange)



Lead	EduSource Canada (Key Sponsor)
Origin	Canada
Background	This project is a collaboration between Ontario universities and colleges for the development, sharing, and reuse of multimedia-rich learning resources. It is funded by CANARIE Learning Program. In addition CLOE holds close affiliations to MERLOT and GLOBE as well as other national and international organizations.
URL	http://cloe.on.ca/
Aims and Objectives	The major innovation is the co-operative exchange mechanism. The motivation for the co-operative exchange is threefold: 1. Increase e-learning opportunities, by making high quality resources more widely available. 2. Increase the return on investment for development of learning resources, by compensating institutions whose resources by used by others. This also promotes high quality in the resources, since learnware objects which are re-used by others return more value. 3. Accelerate the growth of effective communities of practice for e-learning development. In keeping with the university cultures, these will be discipline-based. We are already experimenting with support for such communities in early stage design reviews, to insure that resources can be more easily re-used and to build 'buy-in' for re-use. All materials are interactive and browser based, combining various media into the learning experience. Assets or non-interactive materials may be "components of the learnware objects in the database."
Metadata Standards	unable to find information at time of writing
Content Packaging	unable to find information at time of writing

Features	• The projects inception was very much about an 'exchange' and co-operation, therefore the understanding of the way in which users are to use the resource was clear from start • It has a strong peer review process requires the involvement of two kinds of reviewers: instructional design experts and subject matter experts. • The project has 26 universities listed as project partners • Each partner has two directors responsible for the development of CLOE development • Users must complete a object deposit form for each resource uploaded • Users must complete a object download form for each resource taken • A structured peer review process • No mention of an editing tool • Compliancy to standards is unclear • It is unclear what the 'learnwise' objects are, in terms of size. • openness (unable to find information at time of writing) • No digital rights • Requires stand alone client for access • Built using Zope • No Interoperability Standards and Specifications supported • versioning (unable to find information at time of writing) • RSS (unable to find information at time of writing) • Contributors produce the metadata • Controlled vocabulary used for classifications • metadata specification (unable to find information at time of writing)

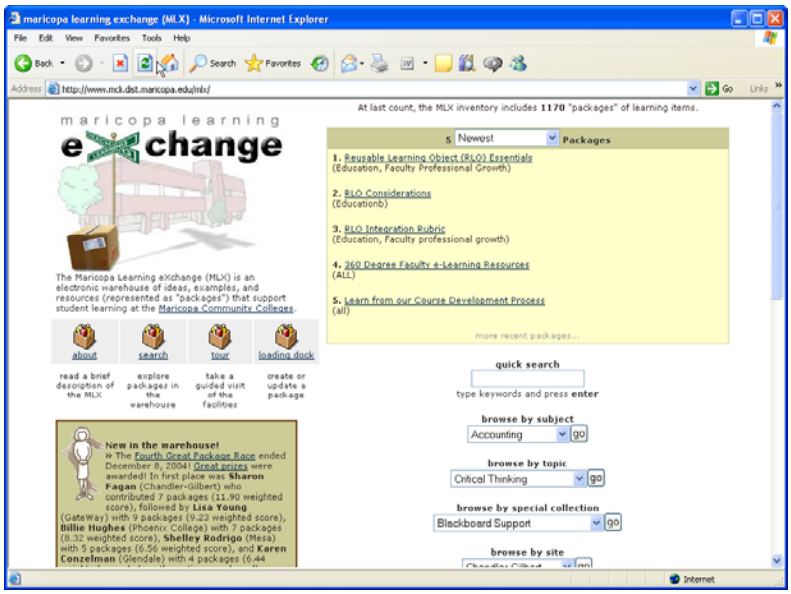
2.3.6 MERLOT



Lead	MERLOT Consortium
Origin	U.S.A
Background	Since 1997, the California State University Center for Distributed Learning (CSU-CDL at www.cdl.edu) has developed and provided free access to MERLOT. The project came about from a NSF funded project, "Authoring Tools and An Educational Object Economy (EOE)". Another significant milestone in its development included 23 systems and institutions of higher education becoming Institutional Partners of MERLOT in 2000. Each Institutional Partner contributed $25,000 and in-kind support for eight faculty staff and a project director (part-time) to coordinate MERLOT activities. Since then it has grown with help of additional grants and sponsorship. It now supports an affiliation programme, syndicating its content across the world and an International Annual Conference.
URL	http://www.merlot.org/Home.po
Aims and Objectives	MERLOT is a free and open resource designed primarily for faculty and students of higher education. The repository is based on HTML links to online learning materials are collected here along with annotations such as peer reviews and assignments. In that spirit, MERLOT allows access to its site and the materials there-in for personal and non-commercial uses as laid out its IPR policy (it retains copyright on everything). • Content is organised into categories: Simulation, Animation, Tutorial, Drill & Practice, Quiz/test, Lecture/Presentation, Case Study; Collection, Reference Material • It also available through 15 different subject sections • There is also subject specific communities to share good practice • Peer-review system clear and easy to use • Able to do federated searches across other repositories including EdNA Online - Education Network Australia and ADRIENE Foundation for the European Knowledge Pool; MERLOT has approximately 12705 resources including its partners
Metadata Standards	IEEE LOM
Content Packaging	unable to find information at time of writing

Features	• It is a strong growing community that supports communication amongst users • Has an extensive collaboration programme • Syndicates its material to many other major repositories which must help with the creation of content • They have an affiliation scheme with all the main VLE vendors; • Able to do federated searches across other repositories including EdNA Online - Education Network Australia and ARIADNE Foundation for the European Knowledge Pool; • Peer reviews and internal recommendations i.e. 'Editors Choice' is easy and comprehensive; • Ability to create your own personnel collection of resources • Doesn't store actual learning objects; • Doesn't encourage re-use; • editing tool (unable to find information at time of writing) • Supports IEEE LOM for metadata • Contributors Award Scheme • OAI-PMH • version control (unable to find information at time of writing) • Materials classified by subject • Metadata completed by contributors and peer review process • Open access

2.3.7 Maricopa Learning Exchange



Lead	Maricopa College
Origin	U.S.A
Background	A project that started off very much as an electronic database via the web. The product created, the Library of Classroom Technology, allowed searches by keywords or a hierarchy of subject categories that could be browsed. Each entry included details on the use of a technology, how long it took to develop or integrate, and optional information on the results of using the technology.
URL	http://www.mcli.dist.maricopa.edu/mlx
Aims and Objectives	The Maricopa Learning eXchange (MLX) is an electronic warehouse of ideas, examples, and resources (represented as "packages") that support student learning at the Maricopa Community Colleges. The key to MLX is it being a place for exchange of ideas. Anyone from anywhere can browse and search the warehouse. Each "package" is represented by a descriptive "packing slip" that includes the name of the package creator, college(s) that were involved in developing it, contact information, a description, links to web sites associated with the package, and a collection of media attachments that include images, documents, spreadsheets, movie clips, etc.
Metadata Standards	IMS based metadata
Content Packaging	IMS Content Packages
Features	• Users may add their comments to records describing resources; • Seems to be a very early 'home-grown' web based system; • It's a closed system in so far as materials are submitted from within the Maricopa community college network only • RSS functionality • 1232+ objects • Creative commons based licensing

2.3.8 GEM (Gateway to Educational Materials)

Lead	U.S Department of Education
Origin	U.S.A
Background	Founded in 1996, GEM established and developed the architecture, software, and training materials necessary to build and maintain The Gateway to Educational Materials which was introduced in 1997. This project has been funded at least in part with Federal funds from the U.S. Department of Education. Consortium members range from government agencies, both federal and state, educational institutions, non-profit and commercial organizations. As of May 2004, educators can access over 40,000 records from over 600 Consortium member collections by searching or browsing The Gateway. GEM uses a new, advanced retrieval engine named Seamark from Siderean Software. The engine is built around a search technique called "faceted searching".
URL	http://www.thegateway.org/
Aims and Objectives	The aim is to expand educators' capability to access Internet-based lesson plans, instructional units and other educational materials in all forms and formats. GEM's goal is to improve the organization and accessibility of the substantial collections of materials that are already available on various federal, state, university, non-profit, and commercial Internet sites. The Gateway to Educational Materials℠ is a Consortium effort to provide educators with quick and easy access to thousands of educational resources found on various federal, state, university, non-profit, and commercial Internet sites. GEM uses a new, advanced retrieval engine named Seamark from Siderean Software to help you find resources that meet your needs. The engine is built around a search technique called "faceted searching". Faceted searching combines the processes of searching for specific words somewhat as one does in Yahoo!® and Google® with browsing descriptions of resources based on what are called "facets." The result is a powerful new interface that supports exploration as well as discovery of resources.
Metadata Standards	Dublin Core
Content Packaging	unable to find information at time of writing

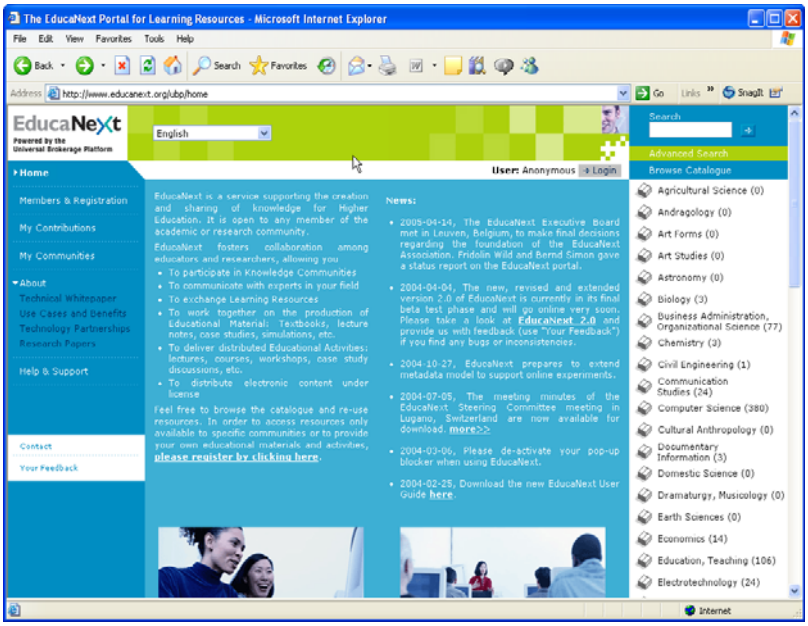
Features	• Educators do not need to be members of the Consortium to search for educational resources or use the services provided by GEM. • Metadata based on Dublin Core • Metadata based links to resources as opposed to objects • No authoring tool mentioned • Unsure of licensing • Single rights management field in metadata • RSS (unable to find information at time of writing) • object versioning (unable to find information at time of writing) • GEM has its own controlled vocabulary for subject classifications. • Metadata produced by member collections using GEMCAT, a Java tool provided by GEM

2.3.9 Connexions

Lead	The William and Flora Hewlett Foundation, Rice University, and the Hewlett-Packard Corporation
Origin	U.S.A
Background	The Connexions Project was launched at Rice University in 1999 to challenge both modes of teaching and learning as well as how knowledge is developed and shared. The cost to develop Connexions is being paid by individuals, institutions, and foundations that sponsor the project. Sponsors include the William and Flora Hewlett Foundation, Rice University, and the Hewlett-Packard Corporation.
URL	http://cnx.rice.edu/
Aims and Objectives	Connexions is a rapidly growing collection of free scholarly materials and a powerful set of free software tools. It has two primary goals: • To convey the interconnected nature across disciplines, courses, and curricula; • To move away from centralised, solitary authoring, publishing and learning process to one based on connecting people into global learning communities and share knowledge. A fundamental aspect of Connexions is an emphasis on free content that is open licensed to facilitate sharing, easy re-use and easy re-contextualisation. The free software tools also foster the development, manipulation and continuous refinement of the materials by diverse communities of authors and teachers. The aims are to encourage: • *authors* to publish and collaborate • *instructors* to rapidly build and share custom courses • *learners* to explore the links among concepts, courses, and disciplines. They use the Content Commons license which allows for small "knowledge chunks" they call modules that can be reused to connect into courses. Thanks to the Creative Commons open license, anyone can take their materials, adapt them to meet their needs, and contribute them back to the Commons. To start viewing content, one can just search or browse — no login is required. There is a content creation tool 'Course Composer', which can be used to build a free custom course using modules from the Content Commons and publish it on the web or in print.

	Connexions is internationally focused, interdisciplinary, and grassroots organized. More than one million people from 157 countries are tapping into over 2,300 modules and 80 courses developed by a worldwide community of authors in fields ranging from computer science to music and from mathematics to biodiversity. Modules and courses are also being translated into several languages, including Chinese, Thai, and Japanese.
Metadata Standards	Dublin Core
Content Packaging	unable to find information at time of writing
Features	• Creative commons open licence • Promote sharing and reuse • Use Open Source Software • The use of Connexions is free to any student or instructor who has Internet access. • Connexions allow you to import files into a module in the author interface. • Provide a content creation tool • Materials may be browsed by Author, Title, Keyword, or Courses • Currently focusing on a limited community to gain experience and expertise

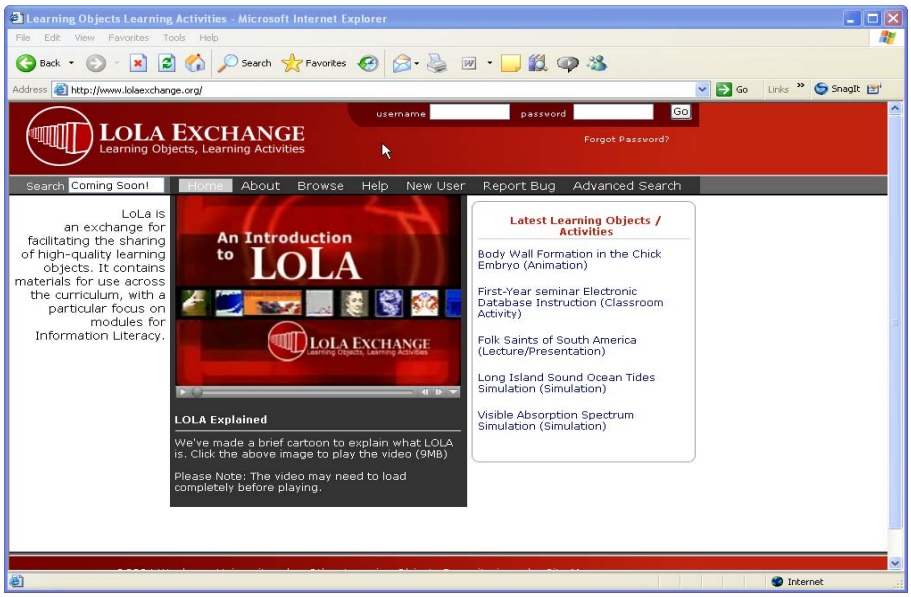
2.3.10 EducaNext



Lead	Consortium of HE Institutions (See below)
Origin	Austria (European Partners)
Background	EducaNext is an academic exchange portal service supporting the creation and sharing of knowledge for Higher Education. It is open to any member of the academic or research community. The EducaNext portal resides in a distributed multi-lingual, web-based, learning content management system, called the Universal Brokerage Platform (UBP). Built from open-source components, the UBP was developed and is currently maintained by the UNIVERSAL consortium, who include: RWTH Aachen (De), BearingPoint Infonova (At), BIT: Bureau for International Research and Technology Cooperation (At), Eidgenössische Technische Hochschule (Ch), Hautes Etudes Commerciales (Fr), Hellenic Open University (Gr), Helsinki University of Technology (Fi), Iceland Telecom (Is), Institut Jozef Stefan (Si), Institut National des Télécommunications (INT, Fr), NCSR Demokritos (Gr), T-Systems Nova GmbH (De), Universidad Politecnica de Madrid (Es), Université Libre de Bruxelles (Be), University of Cyprus (Cy), University of Lancaster (UK), Wirtschaftsuniversität Wien (At), Warsaw University of Technology(Pl). EducaNext has been continuously evaluated against its objective. From these evaluations the following conclusions can be drawn: • *Content is key.* One primary motivation for using a portal like EducaNext is to get access to a wide variety of high-quality knowledge resources. • *Community is important.* It serves as glue between the knowledge media and its user, reducing user fluctuations and providing an audience for "representative measures" such as giving knowledge away for free to a large audience. • *Usability of the software tools must be high.* In the ideal world knowledge media are information systems, which require zero learning time. Usability has many aspects, usability of the navigation design, screen design aesthetics, labelling of concepts and commands, workflow usability, system performance and reliability.
URL	http://www.educanext.org/ubp

Aims and Objectives	The primary mission of EducaNext is to serve and support all individuals in the academic community, who are dedicated to increasing the excellence of higher education and research through distributed collaboration by providing wide access to its academic exchange portal. More specifically, EducaNext will allow users to • Participate in Knowledge Communities; • Communicate with other experts in a field; • Exchange Learning Resources, such as electronic textbooks, recorded lectures, presentations, lecture notes, case studies, quizzes, etc. • Deliver distributed Educational Activities, such as distributed courses, lectures, tutoring sessions, etc. • Distribute electronic content under license; • Work together on the production of Educational Material ; • Collaborate on knowledge resources: collaborative content production projects, integrated informal knowledge, etc There are approximately 189 HEIs registered users from around the world, many from Austria, Germany, France and 7 from the UK. The UBP is a modular software programme designed in alignment with existing metadata standards, including open interfaces based on the W3C Web Service standards, for the incorporation of existing Learning Management Systems
Metadata Standards	unable to find information at time of writing
Content Packaging	unable to find information at time of writing
Features	• The project is ambitious with rich media formats which takes it beyond a typical repository set up. • Available in English, Deutch, Slovenian and Spanish. • EducaNext co-ordinates peer review of online content on two levels – formal and informal. • A team of evaluators with different backgrounds, including experienced instructional designers, media designers, domain experts, programmers, and end users, are invited to take part in a forum to analyse and discuss the strengths and weaknesses of online courses. • EducaNext have published a document entitled “Metadata Quality Guidelines” which is available on the EducaNext website. • EducaNext retain copyright on all material • Unsure of size of collection • compliance to interoperability standards (unable to find information at time of writing)

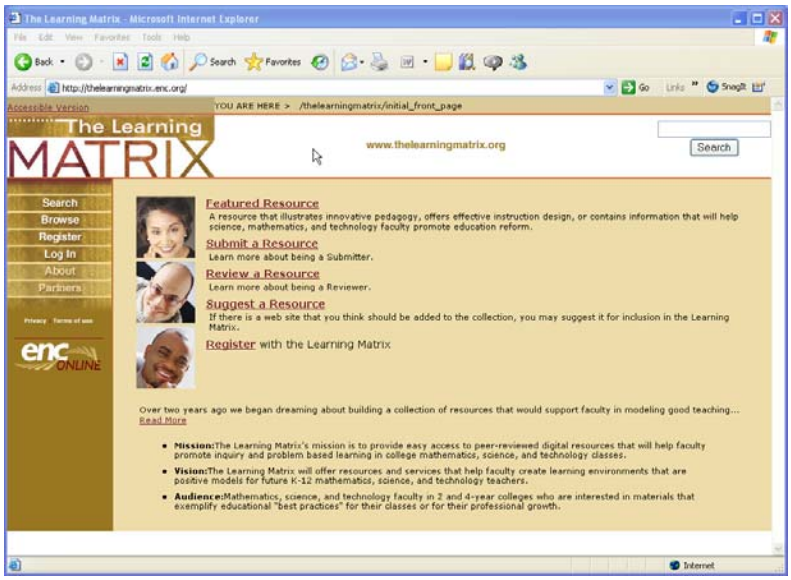
2.3.11 LoLa



Lead	Wesleyan University
Origin	U.S.A
Background	LOLA serves multiple purposes. At its home at Wesleyan, it serves as a way for them to keep track of the Learning Objects that are developing as part of their Learning Objects project. The intention is to use LOLA to present their Learning Objects rather than having to make a container for each object by hand. It will also allow for the discovery of materials developed by other faculties. Within the context of the group of schools participating in this project, it will make visible a wider group materials that would otherwise not be available
URL	http://www.lolaexchange.org/
Aims and Objectives	LoLa is an exchange for facilitating the sharing of high-quality learning objects including animation and other rich media. It contains materials for use across the curriculum, with a particular focus on modules for Information Literacy which they are developing as part of a collaborative Information Literacy Project that Wesleyan, Trinity, and Connecticut College. To facilitate this aspect of the project, LOLA allows for the creation of customized metadata schemes that allow the basic metadata schema to be extended to meet local needs. The aim is to make content available to other national repositories through federated search capabilities or metadata harvesting methods.
Metadata Standards	Mapping between Dublin Core, IMS and CanCore
Content Packaging	unable to find information at time of writing

Features	• Online catalogue or web based resources • Lola adheres to emerging standards for learning object metadata (Dublin Core, IMS, CanCore); • Aims to share content with other repositories; • Will include actual learning objects • Unsure of licensing • digital rights (unable to find information at time of writing), although all resources are free for none commercial use • Metadata exposure and harvesting • Browse by discipline • User Comments

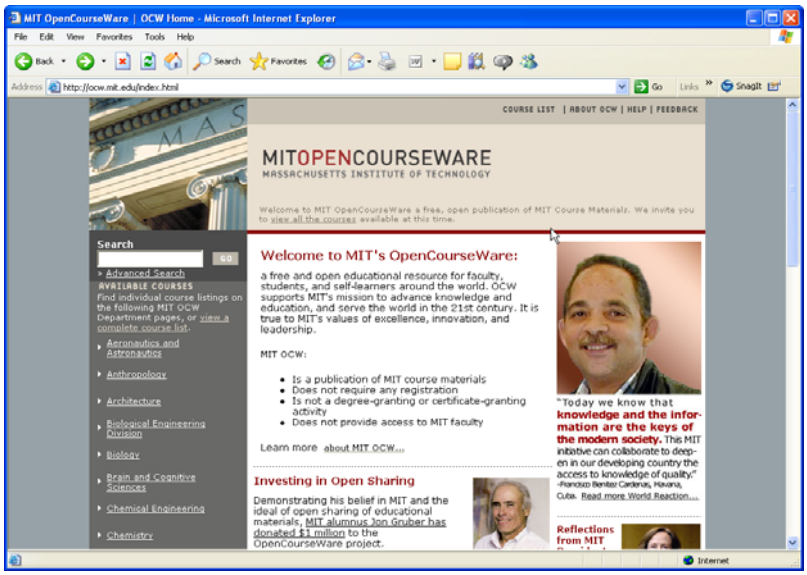
2.3.12 The Learning Matrix



Lead	National Science Foundation
Origin	U.S.A
Background	The Learning Matrix is funded, at least in part, by the National Science Foundation through the National Science, Mathematics, Engineering, and Technology Education Digital Library (NSDL) program. The Learning Matrix is a project of the Eisenhower National Clearinghouse (http://enc.org) for Mathematics and Science Education at The Ohio State University. The project provides access to 2000 plus science and mathematics courses, either through their use in the classroom setting or by providing resources with which those teachers can develop their pedagogical skills.
URL	http://thelearningmatrix.enc.org
Aims and Objectives	**Mission:** The Learning Matrix's mission is to provide easy access to peer-reviewed digital resources that will help faculty promote inquiry and problem based learning in college mathematics, science, and technology classes. **Audience:** Mathematics, science, and technology faculty in 2 and 4-year colleges who are interested in materials that exemplify educational "best practices" for their classes or for their professional growth. **Vision:** The Learning Matrix will offer resources and services that help faculty create learning environments that are positive models for future K-12 mathematics, science, and technology teachers. This project targets High School/ College level
Metadata Standards	Dublin Core and IEEE LOM
Content Packaging	unable to find information at time of writing)

Features	• There is a mechanism to append comments to individual resource descriptions • Uses Dublin Core, IEEE LOM metadata • actual objects (unable to find information at time of writing) • community of sharing (unable to find information at time of writing) • creative commons licence (unable to find information at time of writing) • Users are informed of any copyright restrictions • Supports OAI-PHM • Uses a commercial content management system called Vignette • Metadata is created by a combination of authors and online staff

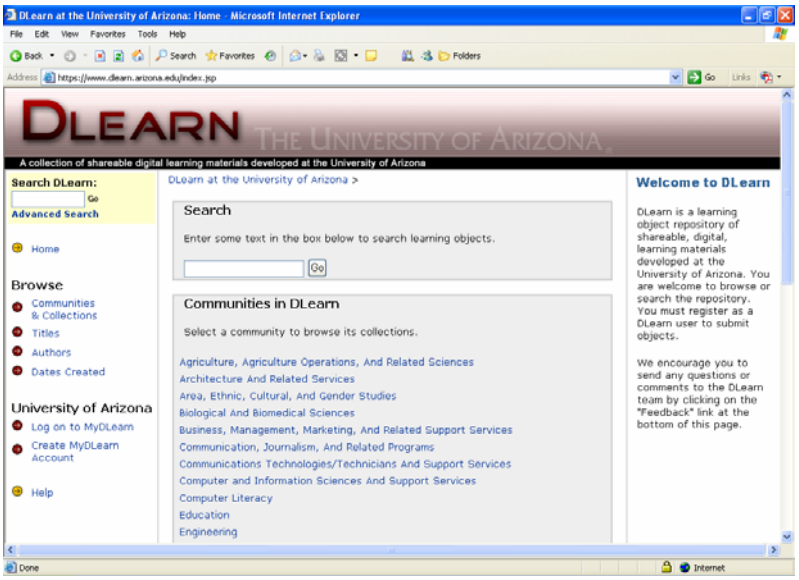
2.3.13 MIT OpenCourseWare



Lead	Massachusetts Institute of Technology
Origin	U.S.A
Background	The idea behind MIT OCW is to make MIT course materials that are used in the teaching of almost all undergraduate and graduate subjects available on the Web, free of charge, to any user anywhere in the world. MIT OCW is an unprecedented institutional effort of a much broader magnitude, as the goal is to provide the course materials free and open to the world. With 900 course Web sites now offered by MIT OCW, nothing of this scale has ever been attempted before.
URL	http://ocw.mit.edu/index.html
Aims and Objectives	The underlying premise and purpose of MIT OCW is to make course materials used in MIT courses freely and openly available to others for non-commercial educational purposes. Through MIT OCW, MIT grants the right to anyone to use the materials, either "as is," or in a modified form. There is no restriction on how a user can modify the materials for the user's purpose. Materials may be edited, translated, combined with someone else's materials, reformatted, or changed in any other way. However, there are three requirements that an MIT OCW user must meet to use the materials: 1. Non-commercial: Use of MIT OCW materials is open to all except for profit-making entities who charge a fee for access to educational materials. 2. Attribution: Any and all use or reuse of the material, including use of derivative works (new materials that incorporate or draw on the original materials), must be attributed to MIT and, if a faculty member's name is associated with the material, to that person as well. 3. Share alike (aka "copyleft"): Any publication or distribution of original or derivative works, including production of electronic or printed class materials or placement of materials on a Web site, must offer the works freely and openly to others under the same terms that MIT OCW first made the works available to the user. Faculty retain ownership of most materials prepared for MIT OCW, following the MIT policy on textbook authorship. MIT retains ownership only when significant use has been made of the Institute's resources. If student course work is placed on the MIT OCW site, then copyright in the work remains with the student
Metadata Standards	IMS, IEEE LOM
Content Packaging	unable to find information at time of writing

Features	• Online Digital Object Repository • In accordance with the terms of the MIT OCW Creative Commons license, you must give credit to MIT and the faculty author of the course materials anytime you use MIT OCW materials. • Vast amount of courseware available; • Compliancy to interoperability standards; • Courseware as opposed to granular objects, a big job to disaggregate it;

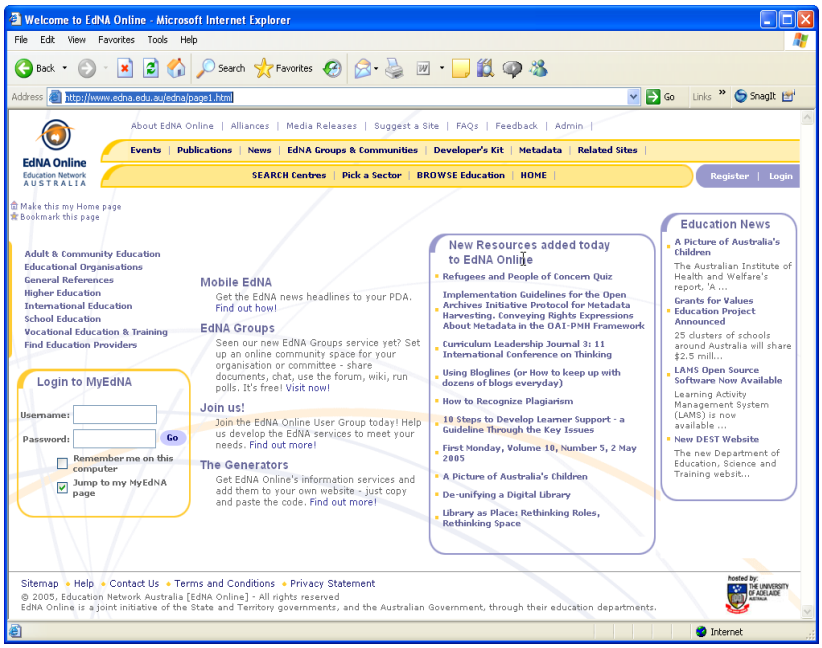
2.3.14 DLearn



Lead	The University of Arizona
Origin	The University of Arizona
Background	DLearn is a learning object repository of shareable, digital, learning materials developed at the University of Arizona that is based on the DSpace model. The University of Arizona has re-tooled DSpace as a LOR to become "DLearn." They retained Dublin Core (DC) metadata in favour of IEEE LOM. Like other repositories following the DSpace model, DLearn content is organized around communities which correspond to University of Arizona administrative entities such as schools, departments, labs and research centres. Within each community there can be an unlimited number of collections. Within each collection there can be an unlimited number of items. Content will consist of lectures, journal articles, book chapters, syllabus, music recordings and data sets in various digital formats.
URL	https://www.dlearn.arizona.edu/index.jsp
Aims and Objectives	Not specified
Metadata Standards	Dublin Core
Content Packaging	unable to find information at time of writing

Features	▪ Built on DSpace open source software ▪ Online Digital Object Repository

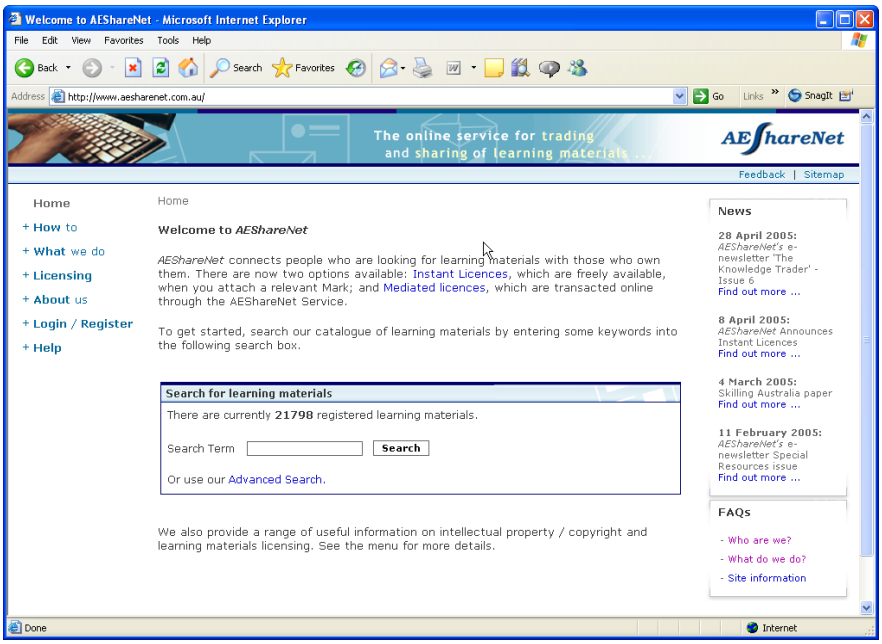
2.3.15 EdNA Online



Lead	education.au limited
Origin	Australia
Background	EdNA Online is managed by ***education.au limited***, a non-profit company limited by guarantee and owned by the Australian education and training Ministers. The project started off as a Search-able Metadata repository "refer-atory" (manual entry and harvested) of online web educational resources (webpages). The implementation of Education Network Australia (EdNA) provides a useful case-study of diverse educational communities coming together to achieve common outcomes aimed at maximising the benefits to education of information and communications technologies.
URL	http://www.edna.edu.au/edna/page1.html
Aims and Objectives	EdNA Online is a service that aims to support and promote the benefits of the Internet for learning, education and training in Australia. It is organised around Australian curriculum, its tools are free to Australian educators, and it is funded by the bodies responsible for education provision in Australia - all Australian governments. As an information service, EdNA Online provides two key functions: • A directory about education and training in Australia. • A database of web-based resources useful for teaching and learning. As a communications service, EdNA Online aims to promote collaboration and cooperation throughout the Australian education and training sectors and facilitate the growth of networks of common interest and practice. It appears that EdNA Online has developed into a sophisticated service that performs wider functions then just access to its own repository. EdNA Online's major customers are educational institutions not end users i.e. they provide educational resources not technologies. • They provide discovery services not a digital repository • They enable online communities rather than provide forums, chat and mail lists • They integrate these services with existing institution's systems

Metadata Standards	Dublin Core
Content Packaging	unable to find information at time of writing
Features	• Online Catalogue of web based resources • Provides federated searching for ABC Online, Culture and Recreation Portal, GEM, MERLOT, PictureAustralia, VOCED, VLORN • Facility to allow for redesign of material (unable to find information at time of writing) • Uses standard copyright for material in repository • Metadata produced by both users and onsite staff • Materials are classified using a controlled vocabulary drawn form the organizational structure of Australian education. • No login required • Basic quality assurance process against appropriateness of resources • Mailing lists • RSS Feeds • Developers Kit • News, Events and Publications

2.3.16 AEShareNet



Lead	Australian Ministers of Education and Training
Origin	Australia
Background	The project is owned by The Australian Ministers of Education and Training. *AEShareNet's* primary business is to help you obtain licenses for copyright materials.
URL	http://www.aesharenet.com.au/
Aims and Objectives	The focus of the web site is to allow you to discover and trade *licences* for learning materials so resources can be used with greater flexibility than simply purchasing **a single copy**. They also provide information on copyright law as well as management of licence fees, including invoicing and collection of fees. There are currently **21798** registered learning materials (at time of writing). **How do the licence transactions work?** Licences are completed online. AEShareNet brings the concept of manual, paper-based licence contracts into the online world through our transaction system. The basic steps for a negotiated licence agreement are as follows: • licensee locates a product of interest on the AEShareNet catalogue • licensee requests licence • licensee is notified by email of the licence request • licensor offers a 'draft' licence to the licensee based on negotiations/pre-determined pricing model • licensee is notified by email of the draft licence generated • licensee accepts the licence contract online • licensee and licensor notified by email of the acceptance of the licence • tax invoices generated and distributed to both parties by email

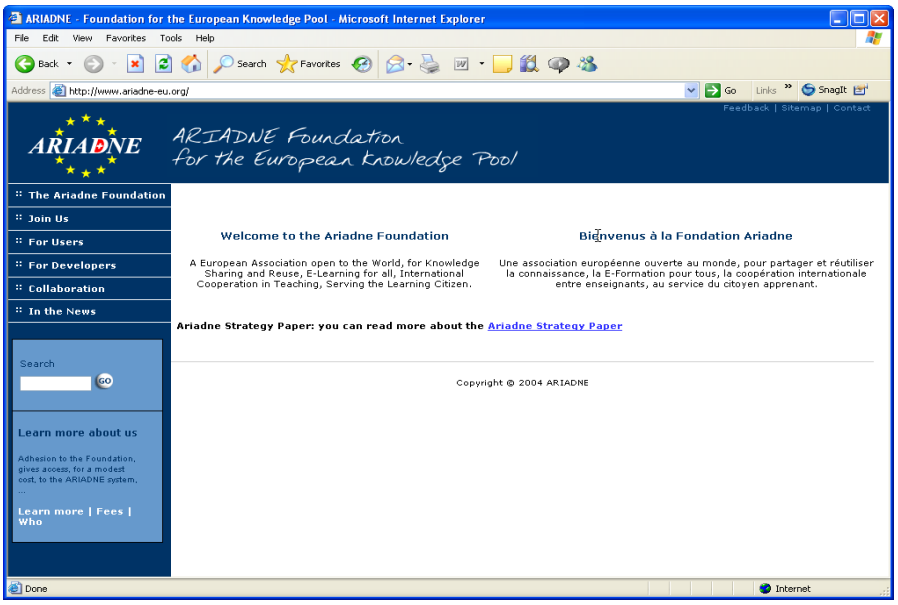
Features	• This is an interesting variation on the repository theme and an acknowledgement that for some materials there is a fee to be paid or permission to be granted for use. • Similarities to JORUM are very few, although it may be worth considering a sub-service similar to AESharenet as part of the JORUM service.

2.3.17 LionShare

Lead	Penn State University
Origin	U.S.A
Background	The LionShare project began late 2003 as an experimental software development project at Penn State University to assist faculty with digital file management. The project came about after a study made by Visual Image User Study was tasked with assessing how academic communities use digital images for teaching research and service. The study also identified the types of tools and services most desired in a digital image system. A new application was needed that provided more flexible user-controlled tools for expanded capabilities for the discovery, management and sharing of multimedia files. The project has now grown to be collaborative effort between Penn State University, Massachusetts Institute of Technology Open Knowledge Initiative, researchers at Simon Fraser University and the Internet 2 P2P Working Group. A $1.1 grant from the Andrew W. Mellon Foundation will be used to fund the first two years of the project.
URL	http://lionshare.its.psu.edu/main/
Aims and Objectives	Lionshare is an academic–orientated, peer-to-peer (P2P) networking technology that merges secure and expanded electronic file-exchange capabilities with information gathering tools into a single, open source application. Thus, the LionShare project team foresees this project having four major components: 1. It offers a secure, authenticated environment in which users are known to their institution and to each other. Personal collections and community collections can be shared with the efficiency of a P2P network without the threat of unauthorised access or undesired content 2. Lionshare peer servers provide a persistent mirror for content to ensure that designated files can be available for sharing when a personal peer, such as an instructor's laptop, is disconnected 3. Lionshare incorporates international interoperability protocols that provide access to a growing mass of content stored in networks of learning object repositories around the world 4. Lionshare allows publishers to describe their resources using a relevant metadata schema (e.g. IEEE LOM etc) and allows searchers to query against metadata.
Metadata Standards	IEEE LOM
Content Packaging	unable to find information at time of writing

Features	• A legitimate identity is required before sharing takes place, this identity will be attached to the meta-data; • Lionshare will not be a closed system, users will be able to do a federated search of multiple national and international repositories outside of the Lionshare network; • Lionshare is an open source application allowing for improvement and customization of it; • The contents will include Metadata and Learning Objects (digital images, audio video, text); • P2P networks can be quickly adopted if users feel that there is a real benefit to their use, which can help with accelerating the use of reusable objects. • Supports federated searching of other ECL compliant repositories. • LionShare employs a shared library approach for displaying shared files. Users simply add files to be shared directly from their host system to their Shared Library • Users can specify access control to resources based on roles and groups • Collaboration and Chat functionality.

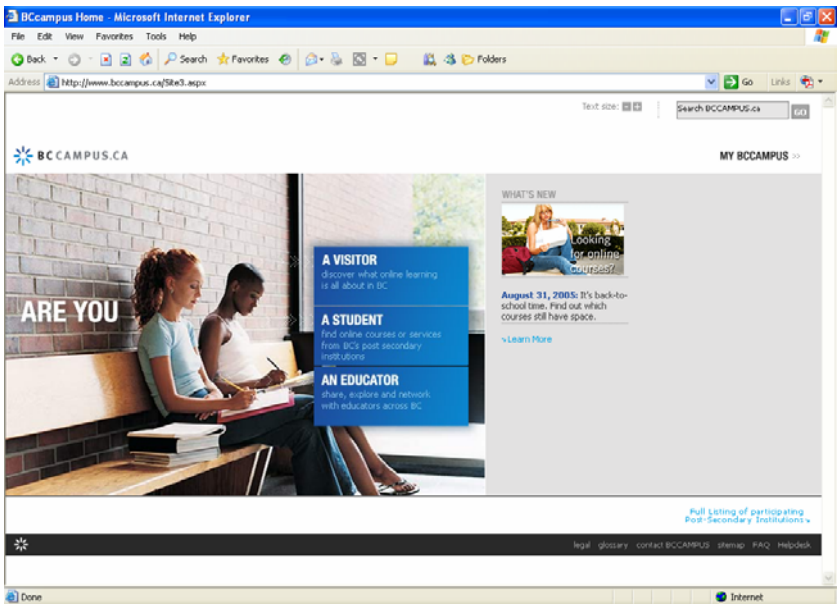
2.3.18 ARIADNE (European Knowledge Pool System)



Lead	European Commission's Telematics for Education and Training Program
Origin	Europe
Background	The ARIADNE Foundation was created to exploit and further develop the results of the ARIADNE and ARIADNE II European Projects, which created tools and methodologies for producing, managing and reusing computer-based pedagogical elements and telematics-supported training curricula. Validation of the tools and concepts took place in various academic and corporate sites across Europe and was encouraging enough to go ahead with this idea of non-commercial exploitation. The underlying results stem from a huge R&D effort (approximately 100 man-years invested in the two phases of the EU Project, ended in June 2000, much of which was supported financially by the European Union and the Swiss Government). Continued maintenance and training in the use of ARIADNE's best tools, as well as their further development will consolidate and augment the Users Community that emerged around some simple ideas and common ideals.
URL	http://www.ariadne-eu.org/
Aims and Objectives	Ariadne is a not-for-profit Association - 'the ARIADNE Foundation' for short - which endorses a few key societal objectives: • Foster cooperation between educational bodies through the set-up and exploitation of a truly European Knowledge Pool. • Keep social and citizenship aspects dominating Education, combat an evolution towards making it a mere marketable item. • Uphold and protect multilingualism and the use of national/regional languages in education. • Define by international consensus what aspects of ICT-based formation should be standardized and what should be left local. The Association works for the widespread adoption of educational technologies by the European Society at large, in their best state-of-the-art and - as far as possible - platform-independent practices. This entails a very low profile and modest approach, given the acute national and regional sensibilities and preferences in all that relates to education. The ARIADNE approach and tools, given their generally neutral pedagogical character, are well suited as a starting, practical point, to such an ambitious purpose.

	The following educational technologies and methodologies are immediately available to Members: • Learning objects multilingual indexation. • Learning objects capitalization, sharing and reuse. • Learning objects authoring (courseware-type-specific authoring). • Capture of socio-geographical learners' data. • Design of socio-geographically targeted curricula. • Learning objects selection and assembling in targeted curricula. • Design of web distributed distance courses. • Best practices in the use of interactive communication technologies. • Best practices in management of small, medium and large ODL courses. Software design and development expertise, accumulated by Europe's best IT/ODL academic departments and ARIADNE engineers in building educational software tools, might also be exchanged and transferred to those members that volunteer to participate in the Foundation tools' further development: 'Open source' or 'Free/Libre software' development models may, later on, be used by the Foundation to maintain/improve its tools. **There are a number of tools available:** **SILO:** With silo, you can Search & Index Learning Objects. **Federated Search (GLOBE):** Two experimental tools that federate queries to both Merlot and Ariadne repositories are available. **Integrated Learning Management Systems:** An experimental tool that queries the ARIADNE KPS is integrated in two LMS. In both cases, you'll need an account to login those LMS; try "invited" for login and "invited" for password.
Metadata Standards	IEEE LOM and Dublin Core
Content Packaging	unable to find information at time of writing
Features	• Mixture of content primarily text documents, some rich media • Multilingual German, English, Spanish, French, Italian, Dutch, Romanian • An authoring tool ‘KPS’ is available • No login required to view metadata • Login required to preview and access resources

2.3.19 BCcampus



Lead	Open School BC
Origin	British Columbia
Background	The overall project objective is to acquire and implement a "Learning Object Repository" for BCcampus, OpenSchool BC and the Alberta Online Consortium (the 'Sponsors'). In common for all three Sponsors, the primary goal for the repository is a mechanism to store and share reusable digital curriculum materials with educators. The requirement for housing and distributing actual media distinguishes this initiative from other systems that function primarily as metadata stores. BCcampus, Open School BC, and the Alberta Online Consortium function within a larger network of educational institutions, each with their own repository needs. For "Learning Objects" to be widely successful, a large ecosystem of learning objects and repositories will eventually need to be established. As such, project Sponsors are interested in proposals that enable the widespread, low cost creation of repositories at education system partners provincially and beyond. In 2003, 2004, & 2005 BCcampus had approximately $4.5 million dollars of development done to create online learning programs, courses and learning objects through its Online Program Development Fund. All of these online learning resources are to be housed in the BCcampus Learning Object Repository. Through the repository these resources will be made freely available to all of the faculty and staff in BC's public post secondary system for reuse. All OPDF resources are licensed for reuse using Creative Commons http://www.creativecommons.org or BC Commons a derivative Creative Commons license BCcampus created that constrains sharing and reuse to BC's public post secondary system. BCcampus also expects educators and institutions will use the repository as a mechanism to share materials not directly funded through the OPDF.
URL	http://www.bccampus.ca/Site3.aspx
Aims and Objectives	▪ The primary goal for the repository is a mechanism to store and share reusable digital curriculum materials with educators. ▪ To facilitate the sharing and reuse of Online Program Development Fund (OPDF) funded content and other curriculum materials across the province ▪ Provide access for an estimated 3,000 educators and 10,000 students
Metadata Standards	IEEE LOM

Content Packaging	IMS Content Packaging
Features	▪ Basic and Advanced Search ▪ Browse by multiple taxonomy schemes ▪ Web based metadata entry ▪ Web based object upload ▪ Creative Commons and BC Commons Licensing ▪ Batch Import ▪ Supports multiple application profiles ▪ Federated Search ▪ Workflow

2.4 Trends within Repositories

2.4.1 Metadata Catalogues not Objects

Out of the repositories covered in this report only a minority of services are providing access to actual resources or content packages. The majority of the repositories are simply online metadata catalogues of web based materials.

This trend has seemingly emerged in response to a drive from the academic community to move away from generic internet search engines to producing online catalogues of high quality resources based on a structured peer review process. This approach avoids all the complexities associated with learning resource management. In particular the issues and complexity surrounding digital rights means that few projects have the funding or resources to tackle learning resource management. Of the repositories that actually store content, such as Connexions, very few appear to have implemented content packaging standards.

2.4.2 Federated Searches

Learning object repositories, as a whole, are still extremely immature, with projects such as MERLOT and EdNA Online being the leading examples in their respective countries. Federated searches between large scale repositories have already been, and continue to be implemented. The advantages to the user are obvious, and bring the ideal of global reuse of learning resources closer to reality. However, the projects offering federated searches such as MERLOT and EdNA are relatively mature and require no authentication. The main advantage federated searching for repositories is that the number of objects available to their community increases dramatically in a very short amount of time.

2.4.3 Creative Commons Licence

Services that provide access to content are in some cases implementing the Creative Commons Licence[1]. A good example of a site using Creative Commons Licensing is the Connexions initiative (2.4.10) which provides the following description of how it would work for a user:

> You can give an existing module an alternate title or delete/edit the author's links. But you cannot edit the content of a module unless you are the author or the author granted you the maintainer role. Connexions gives you two options in this situation. You can request that the author change the contents of an existing module with the Suggest Edits function, or you can make a copy of an existing module, edit it as needed, and publish it as your own with the Derive Copy function. Derived copies contain an acknowledgement that they are based on an existing module.[2]

Further information about the contributors licensing model adopted by the JORUM Service in Development can be found at the JORUM Contributors FAQs[3] webpage.

2.4.4 Quality Assurance of Content

A number of the repositories reviewed in this report are enforcing some format of quality assurance of content. The QA process adopted by different learning repositories ranges substantially. Resources submitted to MERLOT are catalogued by voluntary subject experts as part of their quality assurance policy, whereas the Co-operative Learning Object Exchange

[1] Creative Commons at http://creativecommons.org/
[2] Connexions FAQ at http://cnx.rice.edu/help/faq/document_view
[3] See http://www.jorum.ac.uk/contributors/chelp/faq.html

(CLOE) project promotes the reuse and repurposing of actual learning objects and uses a highly defined quality assurance strategy. A flow chart of this strategy and an example resource evaluation form used by CLOE can be found in Appendix A and B of this report.

Other repositories rely on a user based peer review process and star rating system, to determine what should be classified as quality content.

2.4.5 Open Source

A number of learning repositories are currently providing a service based on open source software. If the initiative is providing an online catalogue of web based resources or access to digital resources then there are many suitable open source options. Examples of these include the DLearn repository that uses the DSpace repository software and Connexions that uses the Plone content management software as a foundation for its repository service.

However, the open source community is still mainly focussed around institutional repositories and the preservation of academic outputs. This is evident with open source developments such as EPrints[1]. This focus means that metadata schemes based on standards such as Dublin Core are heavily supported within these repositories. Intensive customisation is required to integrate learning object standards such as IEEE LOM Metadata and IMS Content Packaging into these open source systems. Therefore projects that provide learning object management and content packaging are often limited when considering an open source implementation. The open source watch report submitted to the JISC[2], provides further details.

2.4.6 Peer-to-Peer

There appears to be growing support for the de-centralised architecture of peer-to-peer repositories than for the more traditional centralised approach. Peer-to-peer repositories have been popular for many years through the rise of file sharing. Learning repository initiatives such as Splash and Lionshare are using peer-to-peer technology to allow institutions to administer their own implementation while at the same time providing search facilities to all other instances of the repository. The peer-to-peer solution is an approach to overcome the difficulties that some communities regard centralised repositories as being inaccessible silos of content. However, with many centralised learning repositories now offering federated search options, the difficulties inherent in the centralised approach are being overcome.

2.4.7 Community Support

Some of the more established sites support additional features that help encourage communities of interest to develop alongside the repository. These help with encouragement of users to revisit on a more regular basis and develop a culture and understanding about the importance of learning resources. Australia's EdNA online supports and encourages the development of communities in a number of ways:

- Groups
- Mail lists
- Forums & Chat
- Developers tool kits
- RSS Feeds
- Relevant News, Events and Links
- Newsletters
- Training
- Publications
- Best practice guides

[1] http://www.eprints.org/
[2] 'Report on Open Source Learning Object Management Systems' August 2005, JORUM Team.

By providing the community with additional functionality not directly linked to the actual repository, EdNA provides users with more reasons to be a member of, and contribute to the community. It is important to note however that services such as EdNA have been operational for over 10 years and thus we should not underestimate the time it takes for a community to use a repository initiatives as a 'one stop shop' for all their requirements.

2.4.8 Contribution Schemes

A number of the larger sites that are keen to grow their resource collections are adopting a variety of schemes that will hopefully encourage resource contribution. They vary by offering award systems, for example MERLOT's 'Editor's Choice' Award that is based on peer review, to Wisconsin Online Resource Center's credit system which is done on an institutional level.

2.5 Reflections on JORUM

The initiatives included in this report are a disparate group, with very few of them actually sharing similar functionality to JORUM. However the sites surveyed are relevant as they have all attempted to build an online community around learning resources. JORUM will stand apart from the majority in terms of its specific objectives, as its functionality, as well as its focus, will be very much about the contributions users make to the content of the site, and reuse and repurpose of actual resources deposited in the repository.

The initiatives that seem to be more successful in terms of their sense of community are those that are related to a specific geographic area i.e. the Wisconsin Online Resource Center or Maricopa Learning Exchange (MERLOT and EdNA are exceptions to this trend, although they are both relatively mature). As JORUM is a national service, quite unlike many of the initiatives surveyed, the way in which JORUM is rolled out is critical to the way in which it will be perceived by individual HE and FE institutions. The initial strategy must ensure a sense of community support, belonging and ownership at an early stage.

For JORUM to succeed the focus must be as much on community building and support, as it is on the content storage and delivery. The content of this report illustrates that a number of services have become extremely successful, while providing very little functionality technically. The promotion of the JORUM service will focus not only on the repository and its functionality, but also on the support and community building aspects that will help ensure its success.

The purpose of this report is to summarise developments of mature projects such as MERLOT and discuss their applicability to JORUM. It should be noted that JORUM has already taken account of research done by mature learning repositories like CAREO. It is important that we acknowledge that there are very few, if any, repository initiatives who have implemented the IMS 'Digital Repository Interoperability Specification' at the core of their strategy and are investigating the best possible solutions for issues such as metadata creation, learning object management, workflow, licensing, digital rights and content packaging.

> We should note, however, that most of the resources and tools do not fit our definition of repositories; many do not store the electronic objects but only manage the creation, maintenance and searching of meta-data. It is the hope of the Academic ADL Co-Lab that "true" repository systems will develop that combine content and metadata management.
>
> [ADL 2004, p.2].

2.6 Recommendations

In terms of JORUM, there are a number of features and/or projects that are relevant to the service in development. These recommendations are categorised as follows: worth looking at in greater detail, keep an eye on their development or consider practical use of now.

2.6.1 Investigate Further

- Look at ways to develop the JORUM website from the perspective of community support rather than simply as a collection of introduction pages for the repository
- Look at ways of developing international links/affiliation with like-minded projects that may share actual learning objects i.e. Connexions, EducaNext, CAREO
- Look at a service which obtains permissions and fees for respective objects like AESharenet
- Consider contribution schemes to get content created by users in first instance
- Consider how JORUM could be 'White Labelled' so that it could be integrated with institutions' own VLE i.e. like EdNA Online

2.6.2 Repositories to Watch

- The Belle R&D Project: This has many shared aims with JORUM and there could be significant benefits to seeking some contributions from or alliance with them
- Peer-to Peer Initiatives: In terms of growth in number of users, the culture of P2P within the academic community is an interesting one
- Open Source: Especially the Connexions Initiative, and the vast amounts of relevant functionality the underlying Plone open source software has to offer

2.6.3 Practical Implementations

- Federated search services through the likes of MERLOT, CAREO etc.
- Tool Kits to allow institutions to create their own mini JORUM (like DSPACE)
- Production of a JORUM metadata tool similar to RELOAD, which could automatically upload resources to the repository and allow the user to browse and search the JORUM repository
- Focus on limited communities at launch to test functionality and collate content
- Provide tools for community support, using EdNA Online as a model for success

3. Commercial e-Learning Repository Systems

3.1 Overview

Whilst the previous section has considered learning repository initiatives, the aims of this section are to:

- Define the types of commercial systems relevant to the application of learning repositories
- Review six commercial repository systems
- Highlight potential areas of interest to JORUM

Many commercial learning repository systems are emerging in the marketplace and close observation of them is required. Some have been developed in a non-commercial environment, such as a university. Others may be based on systems that were originally developed for other purposes which have then been 'converted' or re-branded to target the growing demand of products in the education marketplace. This section provides some information on existing learning repository solutions and highlights solutions that may be of interest in the future for JORUM due to its ever changing requirements.

The JORUM team have produced a separate report on Open Source systems that could be used for a future JORUM, and open source solutions are therefore excluded from this report.

3.2 Definitions of Commercial e-Learning Repositories

We have already (p. 6) defined a repository as;

Enabling the storage, discovery and retrieval of metadata and/or electronic objects stored at a local or distributed level.

Repository software applications have evolved dramatically over the past 20 years, from the development of basic document management systems and automated version control, to the innovation and inclusion of knowledge management and artificial intelligence. The application of repository systems to the world of e-learning is often confused by a myriad of technical jargon and marketing hype. Learning repository projects have often responded with the implementation of their own bespoke system, or the adoption of an open source solution. It is important not to underestimate the degree to which commercial repository solutions are often based on proven technology and recognise the benefits they can bring to the e-learning community.

The following four definitions illustrate the types of repository systems that are applicable to learning repositories:

3.2.1 Document Management Systems

A system for the storage, tracking and retrieval of single electronic files. Document management system typical provide functionality such as version control, check in and check out of documents, automated workflow, groups, roles, permissions and a powerful search engine. The metadata schemas are often customised to meet the requirements of the client, and the types of documents they need to store. The focus of a document management system is almost always around security and not interoperability.

3.2.2 Content Management Systems

A Content Management System is a repository application used to organise and facilitate the collaborative creation of content. The main application of a CMS is often the management of web sites and web based content. Like Document Management Systems, CMS systems have the ability to store and retrieve electronic files. Functionality is also similar to DMS and includes automated workflows for publication processes, version control, powerful search engines and content editor.

3.2.3 Learning Object Repositories

A Learning Object Repository will often possess the functional qualities of a DMS or a CMS such as basic search, advanced search, preview and workflow. However the focus of a learning object repository is about the interoperability of the system itself and the content within it. This can be achieved through adopting interoperable metadata standards, such as the IEEE LOM, and IMS content packaging specifications. In addition the system must be able to harvest information from other repositories again using standard technologies such as OAI-PMH, and ensure that its own content or information about it is exposed through similar methods.

3.2.4 Learning Content Management Systems

A Learning Content Management System is effectively a combination of a learning object repository and a content management system. Its objective is not just the storage and retrieval of content, but also the delivery, tracking and relationship management of the content and its users. Most LCMSs are vendors of Virtual Learning Environment platforms that have implemented learning repository functionality in the background.

3.3 Why are the lines so blurred?

Selecting the right commercial system for a learning repository project or initiative is not a simple process. Commercial vendors are naturally constantly striving to achieve a degree of competitive advantage over other vendors within their market. The area of repository software is a minefield of technical jargon. In addition standards and specifications, so essential to the objectives of a learning repository, particularly in JORUM's case, are often complex. As these standards and specifications are open to interpretation, vendors provide functionality based on their own interpretation, which in practice may not deliver systems which are fully interoperable. Events such as the CETIS codebashes in the UK help to give vendors the opportunity to test the interoperability of their systems behind closed doors, but there are still shortfalls with commercial solutions in terms of their .

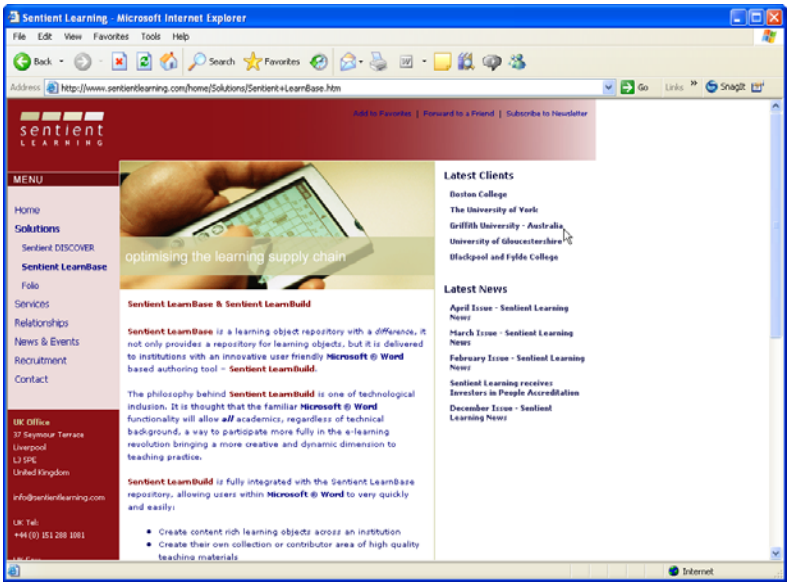
Learning Repository initiatives, like those discussed in section 2.3, have demonstrated that it is possible to provide a service based on any one of the repository types discussed in 3.2. Without a valid evaluation it is impossible to determine to what degree commercial vendors actually support standards and specification relevant to learning and teaching. Therefore the systems selected for the following section were chosen on their involvement with the academic sector and because of existing educational clients. However it is important to reiterate that all information was collected through internet research and vendor communication which does not form the basis for a true evaluation.

3.4 Commercial Repository Systems

As in the previous section, the review of repository systems included here was largely carried out through desk research. Consequently it was not always possible to ascertain certain information, e.g. lack of, or inclusion of, functionality or features in the repository system.

For each repository system a web site is given. Much of the information contained in this section of the report was taken directly from these web sites, although additional information has also been included (including from reports and personal communications).

3.4.1 Sentient Learning

	
Origin	U.K
Company Background	No specific information available on website
URL	http://www.sentientlearning.com/home/Solutions/Sentient+LearnBase.htm
Outline of Products	Sentient LearnBase is a learning object repository facility which is complemented by a user friendly Microsoft ® Word based authoring tool – Sentient LearnBuild. *'It is thought that the familiar Microsoft ® Word functionality will allow all academics, regardless of technical background to participate more fully in the e-learning revolution bringing a more creative and dynamic dimension to teaching practice.'* Sentient LearnBuild is fully integrated with the Sentient LearnBase repository, allowing users within Microsoft ® Word to very quickly and easily: • Create content rich learning objects across an institution • Create their own collection or contributor area of high quality teaching materials • Create IMS content packages using content from the repository or external sources • Share, re-use and re-purpose learning objects • Publish learning objects which can be linked and accessed from the LMS/VLE/MLE system through the resource URL

	• Easily create metadata templates to facilitate searching and sharing of learning objects • Search along multiple dimensions to easily target relevant material Sentient LearnBase can be configured to suit any institutional hierarchy or diverse structures, providing an ideal solution to all customer needs. This learning object repository can be installed or delivered over the ASP Service Model depending upon institutional preference. Sentient DISCOVER v2.0 integrates with all major course management systems, including WebCT, Blackboard & Learnwise, and accesses 90% of the worlds OPAC enabled library systems: ALEPH, Geoweb, DS, Heritage, Horizon, Innopac, Unicorn, Voyager, Talis & more.
Features	• Authoring tool utilising MS Word • Creates IMS content packages • Creates 'on the fly' metadata templates • There are no UK clients using the Learnbase and/or Learnbuild product listed on website.
Clients	For this particular product there is none available online or by email request

3.4.2 Harvest Road Hive

	
Origin	Australia
Company Background	HarvestRoad is a software developer with its headquarters in Perth, Western Australia, Australian branch offices in Sydney, Melbourne and Canberra and overseas offices in Mexico City, London, Paris and Atlanta, USA as well as global partners/resellers in the USA, UK/Europe, Latin America and Asia Pacific. Established in 1996 and publicly listed on the Australian Stock Exchange in September 1999 (ASX:HRD), HarvestRoad has developed a commercial off-the-shelf independent learning object repository system that enables the collection, management, re-use and sharing of any type of digital content within the education and online training environments for the higher education, K-12, distance and vocational education, Defence, government and corporate eLearning /eTraining markets. Having commercialised its product in 2003, the company's client base extends to include Higher Education institutions, Distance Learning consortia, Government entities particularly Defence, Associations and educational service providers in the USA, Europe, UK, Asia, Australia and Latin America. *HarvestRoad's global marketing strategy is focused on:* • Leveraging eLearning opportunities in collaboration with its partner network • Being an active participant and adopting a leadership role at key industry events and forums, in particular those associated with industry Standards that effect eLearning enablement such as ADL/SCORM, CORDRA, S1000D and IMS • Removing technology as an issue for eLearning globalisation *Demonstrable Action supporting this strategy includes:* • HarvestRoad supports 'open standards'. We have developed support for the Open Archives Initiative (OAI-PMH) as a data provider. We also support the Open Service Interface Definitions (OSID) developed by the Open Knowledge Initiative Team at Massachusetts Institute of Technology with whom we have been working on a joint research initiative to achieve multiple repository interoperability. This capability was demonstrated at alt-i-lab 2005 in Sheffield in June 2005 where it was awarded Top Honours. • HarvestRoad has provided its Learning Object Repository software for test-bed research to the Academic ADL Co-Lab in Madison, Wisconsin and the University of Hull e-Services Integration Group where applied research is evaluating interoperability with Standards initiatives such as CORDRA and Open Source learning tools. • HarvestRoad has established a joint research and development project with Boeing and the Australian Department of Education, Science and Technology to establish an Australian ADL Partner Co Lab and in particular to demonstrate interoperability with SCORM and S1000D specifications. This will be launched in Melbourne in October 2005 and will be a world first

	• HarvestRoad helped establish the Latin American ADL Partner Co Lab with ADL, the Mexican Department of Education and our client the Latin American Institute of Educational Communication (ILCE). • A 12 month pilot with the ADL partner Co Lab in Canada for the LOR requirements of the Canadian Defence Force • In May 2005 HarvestRoad established a twelve month Global Learning Object Repository collaboration initiative with Apple Computer , the Etech Group and several US and UK schools • HarvestRoad is a Partner with Moodle, the open source Learning Management System gaining extensive worldwide traction. HarvestRoad Hive® is the Moodle preferred and recommended Learning Object Repository solution. • HarvestRoad is a corporate affiliate member of the Sakai community and recently established a Latin American open source affiliation and partnership for the National University of Mexico(UNAM) – over 250,000 students – with Sakai and Sun Microsystems • HarvestRoad is a corporate member of IMS Global and contributes regularly to specification development • HarvestRoad is a Core Member of the European eLearning Industry Group (eLIG), an open consortium of 43 leading ICT (information and communications technology) companies and eLearning content providers who seek to promote eLearning throughout Europe, in schools, universities, the workplace and homes.
URL	http://www.harvestroad.com
Outline of Products	HarvestRoad Hive® is an independent, federated Learning Object Repository. It has all the attributes of commercial repositories plus many more powerful features. It is the product of 9 years of experience developing web-based content and learning object management systems. It is used to store, manage and deliver content in any form, particularly when that content needs to be delivered to a geographically or functionally dispersed user base, or where content is used within integrated web based applications. Much of the ongoing development of the product is driven by the client-centric focus HarvestRoad invests in its software development. HarvestRoad Hive® will manage any form of digital content as granular or compound objects; it is independent of Authoring / Design tools and delivery tools such as Learning Management Systems and Enterprise Resource Systems. It is designed to be interoperable with other Learning Object Repositories and in this way it establishes a content bridge between islands of content stored within and across multiple institutions or organisations, regardless of the type of content or its purpose. This powerful feature gives organisations choice and a content management migration path which protects their investment if they choose to move from one Learning Management System or Learning Object Repository to another. HarvestRoad Hive® is used to store and manage learning objects and their metadata, assemble these into standards-compliant packages, and deliver them on demand to learning and course management systems, corporate training systems or web portals. Key features include: • **Version control** – controlled editing in collaborative situations - know that you are using the correct or latest version of a file at all times • **Workflow** – structured and flexible workflow attributes to implement quality processes for content maintenance • **Metadata management -** the ability to customise to your specific needs • **Access and Permissions** – ensuring the right person can access the right file • **Copyright** – protecting Intellectual Property • **Flexible content rendering** – delivering content in alternative formats to different user interfaces, i.e. web browsers and other devices including PDAs • **Rapid content publishing, assembly and disassembly** of learning objects for true reuse incorporating the JISC RELOAD Editor • **Distributed caching** – supporting scalable, responsive and rapid delivery of content to portals, learning management systems and other applications across the networks • **Content sharing, reuse and repurposing** – to make the most of your investment In summary, HarvestRoad Hive® may be used to manage the process by which content is created, quality-controlled, published and delivered to Learning Management Systems. It may be used to describe any type of business document, and manage content over its lifecycle. HarvestRoad Hive® is independent and can be integrated with authoring tools and content delivery systems of your choice.

Features	**Content Management** • Unique combination of eLearning, document and content management, with built-in core features of application server platform • Secure federated repository for any digital object or metadata to describe any web or physical resource • Flexible content architecture that supports multiple repositories (bureaus) per server (e.g. ASP Hosting for separate organisations on the one server) and unlimited category levels • Robust repository management services, including check in/out, controlled editing, major and minor revisions, integrated unlimited-step workflow routing • Choice of browser (IE, Netscape, Safari) or Java swing client interface (Hive Explorer for Windows or Mac) • Content Assembly into IMS and SCORM content packages, using Hive Explorer for RELOAD Editor (both Learning Design and ADL SCORM versions!). See Appendix K for more detail. • Content Package disassembly into components, converting the "manifest file" into links to content in the Hive repository • Publishing HTML into components, converting relative HREF links to content in the Hive repository • HarvestRoad Hive® Rapid Publish plug-in for Microsoft Word (separate module) • Automatic conversion to HTML or XML, using the Verity HTML Export and XML Export engines • Running of courses from within Zip files, and automatic import of IMS/SCORM content packages • Category browsing, simple and advanced searching across metadata and/or content • Full content and metadata indexing • Saved searches and publications • "Timed Visibility" on categories, courses, content items and the relationships between content and courses • Batch publishing using drag and drop interfaces with your local file system • Thumbnail viewing • Comprehensive, separate reporting database containing all transactions affecting all entities in the system **Workflow** • Flexible workflow engine that drives content through easily configurable workflows • Any number of workflow; any number of steps in a workflow • Any number of workflow teams, comprised of groups, roles or users • Flexible team processing rules, including "Any", "All" and "At Least" • Supports collaborative content construction and review • Automatic email notification and escalation if target deadlines not achieved • Reject to any step; reject to publisher from any step; restart from any or specified steps. **Metadata** • Plug and play metadata schemas, plus specific support for a range of metadata standards for describing resources • Full metadata mapping across schemas – end users can search using simple, configurable interfaces, yet perform powerful metadata searches without needing to know metadata schemes **Copyright** • Advanced Copyright Engine (ACE), including the ability to report on content usage for the purposes of meeting obligations of independent auditing and license compliance • File blocking to prevent copying of copyright materials by more than one item at a time. **System and User** • Groups, roles and user management, including mapping user and group details to LDAP directories • External authentication of designated users • Flexible and customisable permissions layer – define your own permission sets (e.g., Author, Viewer,

	Searcher etc.) if required • Delegated administration responsibility and extensive permission sets • User definable item types to set business rules and any level of control to enforce business processes • User definable mime types to support custom file formats • Distributable system architecture • Hot Backup mode for 24x7 operation • Self-managing content and user session cache control • Detailed transaction and event logging for audit trail and reporting • Internationalised for easy translation and product interface is currently available in English and Spanish; locale-specific support for content indexing, stemming and stop word processing **Integration** • Java APIs for programmatic integration and template tag language for web developers • Executable server-side agents to obtain data from virtually any external source • Choice of rich functionality interface or "Lite" search and browse interfaces for slow network links • Configurable user interface pack for integration into other applications or to develop custom interfaces to the repository. • Export of learning objects to 3rd party Learning Management Systems including Open Source LMSs such as Moodle and Sakai. (See Appendix M for more detail on Content Mediation) • Choice of generic cgi or Windows IIS ISAPI module to process http requests for Hive • Support for Open Archives Initiative (OAI-PMH) as a data provider • Support for Open Knowledge Initiative (OKI) Open Service Interface Definitions (See Appendix B for more detail)
Clients	HarvestRoad Hive® is being used by Mexico's **Latin American Institute of Educational Communication (ILCE)**, which was originally established as a United Nations initiative responsible for developing international programs for education throughout Latin America. The ILCE first purchased HarvestRoad Hive® to manage the learning objects that are to be delivered up to 1.2 million teachers across Mexico and also act as an Education Service Provider, providing hosted digital repository facilities and management for 12 member states including Bolivia, Ecuador, Nicaragua and Costa Rica. **Ministry of Education, New Zealand –** The Correspondence School of New Zealand under the umbrella of the MOE selected HarvestRoad Hive® as their digital repository for learning objects associated with its 20,000 students' long distance learning requirements. **Florida Distance Learning Consortium, USA** – consists of twenty eight community colleges, eleven universities and SACS (Southern Association of Colleges and Schools) accredited private institutions. The Consortium is responsible for providing distance learning to students taking more than 444,000 courses through a blend of online and other technologies. The post secondary educational system serves more than a million online and on-campus students. **Cranfield University** in the United Kingdom is also using HarvestRoad Hive® to manage the content they develop for the UK Defence Academy. In addition, HarvestRoad Hive® is to be used to manage not just learning objects, but a range of business and education specific documents in many projects across the campus and across the Ministry of Defence, such as a Doctrine Repository and an Image Library Repository. HarvestRoad Hive® is also being used in the **Northern Territory Education & Training Department (NT DEET)** to manage learning objects obtained from The Learning Federation, further illustrating the fact that HarvestRoad Hive® is designed to meet the functional and implementation demands of national and state-based curriculum content management requirements. NT DEET is responsible for delivering education and training to a geographically dispersed and multi-lingual community. **Emerge eLearning Environment**, The Netherlands, is a consortium of seven Universities across Holland which have established HarvestRoad Hive® as their institutional repository. HarvestRoad Hive® is also being used in this environment to support the SURF LOREnet (Learning Object Repository) Project to establish a national repository solution for all educational institutions across Holland. The project incorporates the Open Archives Initiative (OAI) protocol. **CPA Australia** - HarvestRoad Hive® was chosen by the Association for Certified Practicing Accountants (CPA) Australia for its eLearning System which delivers a blend of flexible online courses to CPA Australia's membership enabling study to be undertaken anywhere, anytime to suit the member's individual circumstances. It is Australia's largest professional organisation with a membership totaling more than 102,000, with approximately 20,000 members based outside Australia and is the world's sixth largest

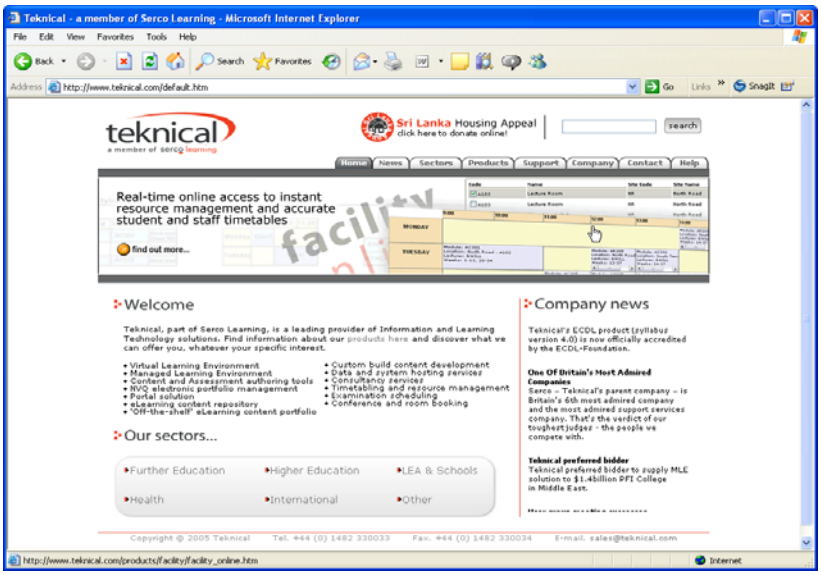
	accounting body. The group provides in excess of 50 services to its members, the key one being the professional schedule that delivers a range of courses in the field of professional development and education. HarvestRoad **Defence** clients include: The USAF Training Command, UK Defence Academy, Canadian Department of National Defence, The US Navy Post Graduate School and the Australian Department of Defence. HarvestRoad Hive's® integration with WebCT, WebMentor and Blackboard LMS is deployed at Open Learning Australia (a consortium of seven universities), Griffith University and Murdoch University in Australia; TU Delft, Erasmus and Wageningen Universities in Holland; Cranfield University in the UK; Portland State University and Florida Distance Learning in the USA.

3.4.3 Learn eXact

	
Origin	Italy
Company Background	**Giunti Interactive Labs**, a **Giunti Editore** company, has developed its competency to support strategic decisions on **Content, Learning & Knowledge Management**, and to help develop innovative projects for improving a Company's 'know-how'. Everything within the *knowledge society* of the third millennium.
URL	www.learnexact.com
Outline of Products	**Learn eXact** is an integrated software suite that enables the creation, management, delivery and tracking of third generation e-learning content based on XML, Learning Objects and new generation standards, covering the full lifecycle of Learning & Knowledge content production from the indexing of raw resources and creation of structured templates to the integration of constructive and collaborative sessions enabling delivery & tracking of multi versioned contents on different platforms, supports and devices. **eXact LCMS** The authoring tool eXact Packager together with the advanced search, workflow and versioning engines of the eXact Lobster digital repository composes a powerful Learning Content Management System (LCMS) that allows organizations to speed up and improve the process of creating, indexing, storing, aggregating, revising, managing structured content to be used within standard e-Learning and e-Knowledge management platforms. The eXact LCMS provides a high added value in the management of different versions of digital content, supporting the deployment for different formats, standards, platforms and delivery devices. **eXact LMS** The delivery module eXact Siter together with the advanced e-Learning process management & tracking features of the eXact Lobster digital repository composes a flexible and modular Learning Management System (LMS). The eXact Siter enables the set up & management of synchronous and asynchronous learning experiences based on e-Learning content compliant to international standards and specifications (SCORM certified) also to be possibly delivered on wireless, palmtop and wearable mobile devices (eXact Stations) also supporting location based content personalization.

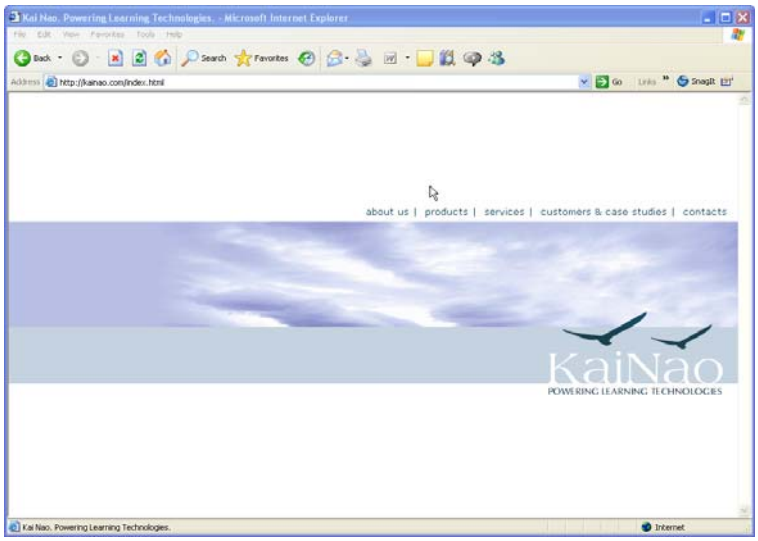
Features	**eXact Packager** This module is used to create, index/, version and publish e-Learning content. With the eXact Lobster Digital Repository it constitutes the LCMS sub architecture of the learn eXact suite. The eXact Packager allows you to: ▪ Import, edit, index and publish courseware, Learning Objects and raw resources (text, HTML, GIF and JPG, animations, video, audio, MS Power Point, Word and Excel files) ▪ Create new instances of Learning Objects using an advanced XML based modeling & templating technology ▪ Easily modify Learning Objects' structure, content and rendering style ▪ Disaggregate existing Learning Objects & coursewares for reuse ▪ Organize contents as a tree structure adding sequencing & adaptive navigation rules and constructive learning services ▪ Package Content in ALL major market available packaging formats (SCORM, IMS, AICC, WebCT, proprietary formats) **eXact Lobster** This module is used to manage, search and store e-Learning content. It is the Digital Repository component of learn eXact, and includes a native XML Server (Tamino Server® from Software AG, (www.softwareag.it). The eXact Lobster allows you to: ▪ create and manage multiple domains ▪ search for content using multiple schema metadata-based engine ▪ manage resources status and versions ▪ manage activities/users associations ▪ manage content and workflow ▪ broker contents amongst different servers and federated settings **eXact Siter** This module is used to deliver and track e-Learning content. The eXact Siter is the default LMS of the learn eXact suite and provides all functionalities for the setup and management of on-line synchronous and asynchronous learning experiences. The eXact Siter allows you to: ▪ register users and create user profile ▪ manage courses and classes with student and tutors ▪ customize portal and platform language ▪ schedule events into calendars and timed learning paths ▪ track performances and manage report production ▪ manage virtual community services (chat, forum etc.) ▪ blend collaborative & constructive learning
Clients	O.K.I (Open Knowledge Initiative) at Massachusetts Institute of Technology (MIT) Learn eXact LCMS is the first commercial product that has integrated with MIT's Open Knowledge Initiative enabled third party software. The most relevant product used in this case is the eXact packager authoring module which upgraded to the new OKI ODIDs layer allows integration to third party content repositories. This allows users to perform local queries together with distributed searches to federated repositories to harvest assets, learning objects and content packages to be then assembled into learning courses.

3.4.4 teknical

	
Origin	U.K
Company Background	Teknical, part of the Serco group of companies, is a leading provider of Information and Learning Technology solutions to the education, NHS, public and commercial sectors. The company was founded Spring 1997 and has built a wide portfolio of solutions for the education and training market. It became part of the Serco group in early 2004.
URL	http://www.teknical.com/default.htm
Outline of Products	**Teknical's e-Learning repository** Features include tools for meta-data tagging, taxonomy browsing, locating and recreating facilities. This enables course creation in a granular form, stored with IMS / IEEE LOM meta-data for controlled or open re-use and sharing. The repository is designed to use learning content from vendors that adhere to the international specifications from IMS and SCORM, in particular the meta-data and content packaging specifications. e-Learning objects stored within the repository can be manipulated to combine 'organisations' and create new composite objects and learning packages. e-Learning repository supports cataloguing systems including Dewey Decimal and Library of Congress. In addition any user-defined system can be used. Multiple classification of the same object is possible. Fully integrated within Teknical's virtual learning environment, the repository is accessed via a standard Web browser. **Stored content** e-Learning objects stored within the repository can reside on both an Intranet or the Internet, allowing multiple site or departmental resource sharing resulting in considerable return on investment for those actively involved in content creation. **e-Learning objects** This product provides the following features: • An intuitive environment embedded within Microsoft Word for the easy creation of interactive learning materials. • Conforms to international specifications • Can contain resources including audio and video clips, images, Microsoft PowerPoint presentations, Macromedia Flash and Director movies, Adobe Acrobat documents and Qarbon Viewlets. • Easily add glossaries, further information sections and indexes. • Provides a browser based off-line viewer for testing.

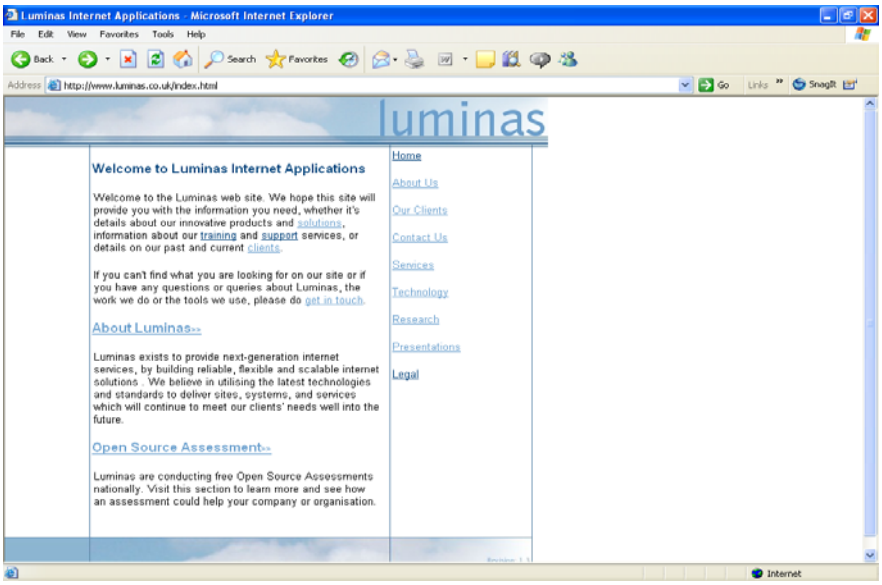
Features	• Granular form IMS / IEEE LOM meta-data • IMS and SCORM compliant for packaging • MS word editing package • Wide variety of media type
Clients	For this particular product there is none available online or by email request

3.4.5 KaiNao Ltd

	
Origin	UK
Background	KaiNao Ltd was formed in April 2004 from the core management and development team who delivered a five year project (HLSI) to develop learning technologies to support the creation, use and re-use of educational content. Work commenced in 2000 well before repositories had established themselves as a means of content sharing across institutions and partnerships. The project became the first implementation of a standards based repository in the UK and has helped shape the standards as we know them today. The experience gained through this early implementation has resulted in a stable and well-tested software platform now in daily use across the whole of the Yorkshire and Humber region
URL	http://www.kainao.com/
Outline of Products	**K>Collector** - the repository is an enterprise solution with an intuitive web-interface to support the management of all learning assets. K>Collector provides for storage, search, discovery and retrieval to support use and re-use. Incorporating search and browse interfaces, the repository can provide a one-stop solution for organisational wide access to digital resources and integrate with delivery mechanisms such as Virtual Learning Environments and intranets. **Features:** • Provides storage of educational content in course, module, lesson or asset form. • Imports and exports educational content in interoperable formats. • Accessible via web browser, web services or directly from K>Creator or K>Pack **K>Creator** - a Microsoft Word plug-in that allows educational practitioners to create educational content for online and offline delivery. Fully integrated with the repository, it produces web ready content plus an IMS standards based packaged output for saving. This product has internal metadata tools to assist in describing content to facilitate future searching and retrieval. K>Creator can be supplied with an additional plug in which enables creation of assessments in the form of tests and questions which again are in a IMS standards form and can be included in the repository

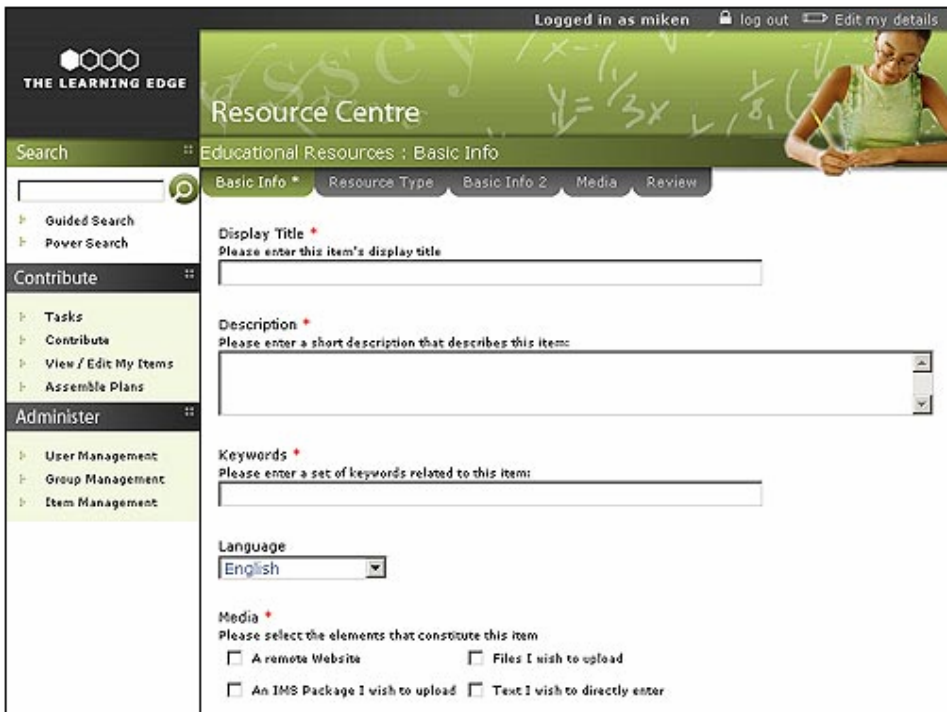
	Features: • Intuitive, easy to use authoring using Microsoft Word standard features. • Allows the use of any multi-media content that can be delivered over the web. • An integrated metadata collection and editing suite. • Seamlessly integrated with K>Collector to allow use and re-use of content directly from the repository. • Outputs for CD-ROM, web, Virtual Learning Environments, utilising educational standards and specifications.
Features	• Tried and tested system in educational context • Import existing and assemble new IMS and SCORM content packages • Implement multiple metadata standards, simultaneously, including IMS (SCORM), Dublin Core, • Authoring tool integrates with MS word • Intuitive interface design
Clients	HLSI - The HLSI project is a Regional Development Agency funded provider collaboration and partnership in the Yorkshire and Humber Region. The repository and authoring tools are deployed across 40+ HE/FE/ACL institutions and organisations providing a range of content from key and core skills through to level 4 materials. With a growing set of users, HLSI forms a key component in the regions Learning Teaching and Skills community and is instrumental in creating collaborative relationships between providers. OWL- A partnership of 6 Further Education and 3 Higher education institutions, its mission statement is to be the first choice for quality resources and collaborative partnership in the North East. As a growing partnership OWL deployed their repository and authoring tools with the aims of providing members with materials which combine and exploit the expertise within the partnership through sharing, which in turn supports subject specialists' networks and themed areas. Replika - Replika is a consortium of European partners and required a multi lingual environment for its Czech, Danish and Spanish partners. Replika deployed their repository which has been developed to recognise language variation of in-coming browsers and present in that language, the authoring tool was similarly adapted to meet the needs of language implementations. Work continues to investigate the cross-nation use of jointly developed content. Coventry and Warwickshire NTI - As part of this strategy the NTI has recently made the decision to provide a repository and authoring tools to its partnership to develop digital and online content to meet the needs of regional employers. Its main purpose is to satisfy the growing demand from employers for their businesses to have skills from technician level right through to postgraduate level. It is their aim to provide education and training opportunities to fill this rise in demand by offering courses, which are far more relevant and flexible to employers than has been possible before.

3.4.5 Luminas

	
Origin	U.K
Background	Luminas was incorporated in April 2000, and since then has experienced strong growth on the back of healthy sales. Their continually expanding client base demonstrates that there is a clear need for the services which they provide. Luminas exists to provide next-generation internet services, by building reliable, flexible and scalable internet solutions, utilising the latest technologies and standards to deliver sites, systems, and services which will continue to meet clients' needs well into the future.
URL	http://www.luminas.co.uk/about/
Outline of Products	Within the FE and HE arenas, they deliver major internet-facing applications developed in a close working partnership with the institution or companies involved. These are usually leading-edge projects which receive funding from bodies such as the JISC or the US's NSF to explore issues which bridge cultural or scientific heritage with new information management practices. Here, their applications play a crucial role in providing the infrastructure to create cultural or scientific repositories which aim to provide services in the long term within academic institutions.
Features	• Open source flexibility • Platform independent • Developing the DSpace platform

Clients	**Fine Art** is a web-based collection of work by staff and students of UK Higher Education institutions who have made a significant contribution to UK fine art education through practice. It contains work from the mid 19th century through to the present day, drawing from the collections of 10 institutions and the Council for National Academic Awards. **Arches** supports and links institutions, departments, courses and modules as they introduce, evaluate and disseminate exemplary, transformative and innovative pedagogy through re-purposing new and existing collections of digital resources pertaining to ancient Greece and Rome. **The BioMed Image Archive** is an online collection of around 8000 medical, dental, and veterinary images for use in learning, teaching and research. All the images have been donated by academics working in the biomedical fields in different countries. Within a current large repository project, in collaboration with Otego, the Swiss Orixo company, Luminas is helping one of the largest HE laboratories in the world to design and implement a genomics/transcriptomics data archive, building on the work of the DSpace project.

3.4.6 The Learning Edge

	
Origin	Australia
Background	The Learning Edge is a leading software solutions provider for the educational market. Part of the Dytech Group, The Learning Edge has developed a product of the same name that is an advanced content authoring and learning content management system (LCMS). Started in 2002 by Dytech Solutions, TLE capitalises on Dytech's experience in developing eLearning software for the K-12, tertiary and corporate markets. Conceptualised and developed during 2002, TLE was launched in 2003. Based in Hobart, Tasmania, TLE has worked closely with the Tasmanian Department of Education, allowing the technology to be rigorously tested and trialled in a multi-faceted educational environment.
URL	www.thelearningedge.com.au
Outline of Products	The Learning Edge Learning Content Management System is a world-leading, webbased platform for the creation, management and delivery of online learning materials. Content can be tailored to the individual needs of an institution and may include Learning Objects (IMS packages), course content, information on specific areas of interest, teaching and learning strategies, items of curriculum, images, sounds, videos, PDFs, MS Word documents and much more. Documents can be stored within a flexible metadata-enriched environment, with categories based on broad types, definable by your administrators. Educators can search the digital repository, external web pages, external repositories (such as EdNA), or library systems, using The Learning Edge's powerful federated search engine. The Learning Edge Activity Assembler is a simple to-use online-editing tool to assist your educators in the design, sequencing, assembly and authoring of learning activities. What you see is what you get (WYSIWYG), just click and drag – no HTML editing tools or web design knowledge is required. The Activity Assembler allows for the sequencing of Learning Objects as well as the authoring and customisation of new learning activities. Completed activities can be collaboratively worked upon and shared with other educators, or delivered directly to students through one of the many flexible delivery methods.

Features	▪ IMS Compliant ▪ DRI Compliant ▪ Open web services for external integration ▪ Export to VLE systems ▪ Federated Searching ▪ HTML Conversion of non-web content ▪ Workflow ▪ Groups, Roles and Permissions ▪ Basic and Advanced Search ▪ Authoring tool that integrates with Microsoft Word ▪ External VLE for all users who don't already have a Learning Management System ▪ Active Caching Tool automatically downloads bandwidth intensive content in hours of low usage ▪ Multiple classifications
Clients	▪ BC Campus (www.bccampus.ca)

3.5 Product Highlights and JORUM

It would be inappropriate to suggest intrinsic differences and enhanced capability in any of these products without undertaking a full evaluation, which, as stated at the beginning, was outside the scope of this report. However in terms of services or functionality offered amongst the commercial repositories there are a number of products worth keeping a watch on:

- **HarvestRoad Hive Explorer** integrates with the open source **RELOAD** tool and with the open source VLE, **Moodle**.
- **HarvestRoad Hive Explorer** approach to federated repository solutions.
- **The BCcampus** initiative is closest in their requirements to JORUM and they have implemented **The Learning Edge.** The Learning Edge also has an authoring tool, BCAT[1], which allows users to author content to integrate directly with the Blackboard VLE.
- Learning content produced with the **Learn eXact** suite may be delivered by using traditional formats (DVD, CD-Rom and the Web) or or also possibly on wireless, palmtop and wearable mobile devices.
- The utilization of **DSpace** by **luminas** in their Open Source repository solution.
- The intuitive interface design of KaiNao's **K>Collector**.
- **Sentient LearnBase and LearnBuild** integration using user familiar authoring tools
- **KaiNao Ltd** authoring tool integration with MS Word.

[1] http://www.thelearningedge.com.au/bcat.asp

4. Summary and Recommendations

4.1 Summary

This report has clearly shown that development and take-up in the use of repositories for the education sector is steadily increasing, including in the area of e-learning. The implementation of commercial and non-commercial systems to fulfill the broad range of roles for repositories is very evident. What is also evident is the vast range of system functionality and service models that are available with many of these solutions, reflecting in many cases the wide range of requirements that the customers have.

It is clear that these wide scale developments will offer an insight into alternative service models, additional service components/activities that could be offered by JORUM in additional to specific system functionality that the JORUM community could benefit from and to that end the following are a list of recommendations that concludes this report.

4.2 Recommendations

5. Continue to provide minimal watch activities on emerging and developing repository services in the educational sector, both commercial and non-commercial throughout the world.

6. On the basis of the watch activity, identify for JORUM team discussion aspects of service models observed that the JORUM team may wish to recommend for implementation.

7. On the basis of the watch activity, identify for JORUM team discussion system requirements and specific functionality that JORUM team may wish to recommend for implementation.

8. Identify from the watch, open source solutions and developments that the JORUM team may also wish to recommend for investigation/implementation.

5. References

[ADL 2003] **Academic ADL Co-Lab** 'From Local Challenges to a Global Community: Learning Repositories and the Global Learning Repositories Summit', November 2003. (Online at http://www.academiccolab.org/resources/FinalSummitReport.pdf)

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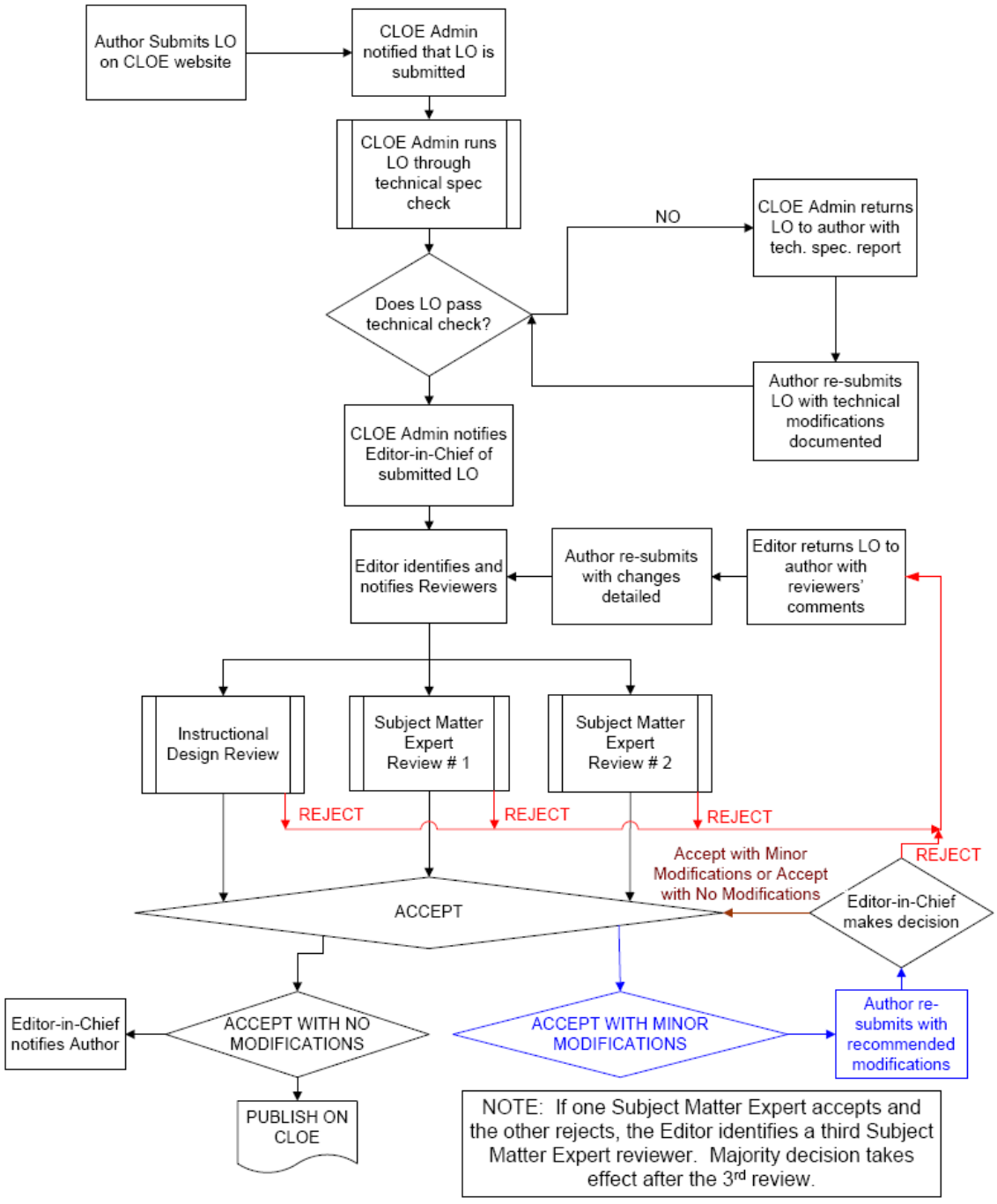
(Online at http://www.hewlett.org/NR/rdonlyres/158FC043-A56F-43C6-ABA7-EB9A62656FCB/0/RepoSurvey200411.pdf)

[Currier *et al*. 2004] **Currier, S., Barton, J., O'Beirne, R. and Ryan, B.** 'Quality Assurance for Digital Learning Object Repositories: Issues for the Metadata Creation Process. ALT-J Research in Learning Technology, Vol. 12, no. 1 (March 2004). Pp 5-20

[Giersch, S *et al.* 2004] **Giersch, S, Klotz, E. A., McMartin, M., Muramatsu, B., Renninger, K. A., Shumar, W. and Weimar, S. A '**If You Build It, Will They Come? Participant Involvement in Digital Libraries', August 2004
(Online at http://www.dlib.org/dlib/july04/giersch/07giersch.html)

6. Appendices

Appendix A - Proposed CLOE Peer Review Process



Appendix B – CLOE Peer Review Form

CLOE Peer Review Committee
Learning Object Submission Guidelines for Authors (evaluation standards)

When a learning object is submitted it will undergo an initial functionality review. After passing this first level of functionality testing,[1] the learning object is reviewed on the following criteria:

N.B. Normally a rating of "not at all" on any question by the reviewers will require that the author provide additional information or revision of the learning object before the learning object is accepted.

Learning Object: **Reviewer:**

	Quality of Content	not at all	somewhat	definitely
1.	The content of the learning object is accurate.			
2.	The use of technology is appropriate for this content.			
3.	The content is presented clearly and professionally (spelling/grammar, etc).			
4.	Appropriate academic references are provided.			
5.	Credits to creators are provided.			
Effectiveness as a Teaching/Learning Tool				
6.	There are clear learning objectives.			
7.	The learning object meets the stated learning objectives.			
8.	The target learners are clearly identified (academic level addressed/technical ability/demographics).			
9.	There are clear instructions for using the learning object.			
10.	The technology helps learners to engage effectively with the concept/skill/idea.			
11.	The learning object provides an opportunity for learners to obtain feedback within or outside the learning object.			
12.	The author provides evidence that the learning object enhances student learning.[2]			
13.	Pre-requisite knowledge/skills, if needed, are identified.			
14.	The learning object stands alone and could be used in other learning environments.			
Ease of Use				
15.	The learning object is easy to use (i.e. navigation, user control).			
16.	The author indicates whether the learning object is accessible for learners with diverse needs.			
17.	Technical requirements for the learning object are provided.			

Additional Comments:_____

[1] Initial functionality testing will be conducted by the CLOE gatekeeper and will include checking to ensure that links work, plug-ins are available, platform and browser compatibility are identified, *et cetera.*
[2] Acceptable evidence could be anecdotal comments, student perception questionnaires, or more formal learning impact studies.