Final Report of the CARLI Learning Objects Task Force
January 8, 2007

Executive summary

The CARLI Learning Objects Task Force was formed in March 2006 to answer the question of what it would take to create a statewide learning objects repository. As is often the case, sometimes a question can generate far more questions than answers.

While there is clearly support and interest in this project throughout the state, there are also issues that need to be considered before a project to develop a learning object repository could begin. Some of these questions include:

- What are the competing factors currently at work that could inhibit success of this project, such as other consortia and consortial commitments or other projects both nationally and internationally?
- How will CARLI move from its traditional role of serving the needs of libraries to a much more broadly-based constituency at each institution?
- How will CARLI support a much broader function within the academic community of Illinois?

Once these questions have been answered and CARLI staff has had the opportunity to learn from other large-scale localized learning object repositories, it will be possible to set up a pilot system to explore the issues in setting up the repository state-wide. The task force recommends that CARLI use the Connexions software as the basis for this test.

Given that most of the implementation work for this test will be performed by CARLI staff, it is not possible for the task force to develop a plan to build this resource and keep it current and dynamic, nor is it possible to include estimates of the resources that will be required for startup and ongoing services.

The task force recommends if CARLI chooses to move forward with this plan that CARLI charge another task force to develop a plan for building the repository content and developing procedures and policies for keeping the repository current and dynamic.

To provide continuity, at least one member of the current task force should be appointed to the successor task force. In addition, to provide the broad range of input that will be required to make a repository of this type work in the many contexts found at CARLI institutions, membership on the successor task force must extend beyond library staff in CARLI institutions. For the project to be a success, various constituencies must be involved in the process. Some of these constituencies include campus information technology departments, teaching and learning centers, instructional design departments, as well as teaching faculty at CARLI institutions.

Estimates on resources that will be required for startup and ongoing services will have to come from CARLI staff.

Background

In early 2005, ILCSO started the process of implementing three digital library products (CONTENTdm, SFX, WebFeat) the consortium had selected in 2004. In February of that year, the ILCSO Board charged the Task Force on Future Visions for Digital Library Products to "think big" about the future. A report was due by June 1, 2005, but was put on hold due to the creation of CARLI. Subsequently, the focus of activity shifted beyond ILCSO to the entire CARLI community.

The CARLI Task Force on Future Visions for Digital Library Products issued a report in August of 2005. The recommendations in that report were endorsed by the CARLI Board at its August 19 meeting. The recommendations in this report[1] were prefaced by the following wording:

> "The task force examined a number of ideas for programs and projects that will help CARLI achieve this vision. Each one recommended below is conceived to be an important component of CARLI's success in creating seamless access to an information environment that is rich in authoritative and trustable content and services, easy to use, ubiquitous, and integrated into the learning and research enterprises of their institutions.

[1] The *Future Visions Task Force Report* can be found at http://www.carli.illinois.edu/reports/futvis/050817ThinkBigRept.pdf

> All of these ideas, which we are presenting in priority order, are at the conceptual stage. Small and nimble planning groups will be necessary to carry out the next stages of feasibility study and implementation strategy planning."

The report then listed six ideas warranting further exploration. The fourth item being *Build a collection of learning objects developed in CARLI institutions:*

> Using the concepts tested by MERLOT (http://www.Merlot.org/Home.po), and Rice University's Connexions (http://cnx.rice.edu/), build a free and open resource designed primarily for faculty and students of higher education, containing learning materials along with annotations such as peer reviews and assignments. In this facility, authors (which includes librarians) will be able to publish and collaborate, instructors could rapidly build and share custom applets and courses which can be used and reused by members of the greater CARLI community, and learners will be empowered to explore the links among concepts, courses, and disciplines.

This led to the formation of the task force, with a charge similar to the text in the report:

> "Faculty and others in CARLI institutions are actively developing courses and customized applets. The CARLI Board holds as a high priority the creation and maintenance of a dynamic, free, and open resource of these digital learning materials designed primarily for faculty and students of higher education. Using the concepts tested by MERLOT and Rice University's Connexions, this resource will contain learning materials, along with annotations such as peer reviews and assignments, and will enable authors to publish and collaborate and instructors to build and share applets and courses that can be used and reused. The Task Force is charged to develop a plan to build this resource and keep it current and dynamic, including estimates of the resources that will be required for startup and ongoing services. The Task Force's report is due in December, 2006."

The task force was formed in March 2006 and had its first meeting by conference call on April 18, 2006. The task force members were:

Frank Cervone, Northwestern University, Chair
TJ Lusher, Northern Illinois University
Amanda Makula, Augustana College
Lori Mestre, University of Illinois at Urbana/Champaign
Bernie Sloan, CARLI staff liaison
Linda Wade, Western Illinois University
Frances Whaley, Illinois Valley Community College

Survey

In order to get a clearer understanding of the perceived needs, desired functions, and potential advantages of a learning objects repository, the task force conducted a survey. The survey was launched on July 1, 2006 and was made available to all members of the CARLI community. A second reminder notice was sent to the CARLI "ANNOUNCE" listserv on July 7. By the time the survey was closed (July 17, 2006), a total of 73 people had responded.

In the survey, members were asked "What are the most important features of an online repository of digital learning materials? In other words, what would you want it to be able to do?"

From that question, several major themes emerged. Some of these were that:

- A learning objects repository should facilitate building on others work with the goal of less reinvention of the same types of items and materials. Additional functionality in this area would provide for multiple branches of a particular item, so it could be customized for individual use yet still be tracked back to its origination.
- "Trusted network" information should be available for individual items. This would include enabling user comments to facilitate communication about how items are used and managing comments on items applicability in various contexts.
- The organization of materials must be robust and intuitive. Search options should include various approaches: keyword, topic/subject, educational level, type of resource (online tutorial, assignment, etc.), format (PDF file, Powerpoint, etc.), as well as a rich thesaurus.
- Rich metadata must be provided that would address several issues, including
    - *Learning objectives* - What is being taught?
    - *Intended audience* - Is this aimed at undergraduates? Is it advanced material for people who already know some basic material?
    - *Special software needs* - Do I need to have Shockwave or Flash or something else installed on my computer to be able to use it?

- *Date deposited* - Do I need to be on the lookout for content in the learning object that may have become outdated? Do I need to be on the lookout for broken links?
- *Percentage of content that is specific to a particular institution* - Does the material have lengthy instructions on how to get to a database from a library's home page, or could another library use the material without needing to adapt it?

- The repository might need to interface with local authentication systems, such as Active Directory and LDAP, to be useful in a locally-based Learning Management System.

The necessity of material in the repository to be free of copyright restrictions was an important concern of several respondents. Finally, a number of people mentioned that objects need to use “standard” software in order to be broadly applicable. However, defining “standard” software may be more easily said than done.

In addition, members were asked “What kinds of content should be available in the repository? For example: Librarian presentations, instruction guides, ideas for classroom assignments, planning documents, policies, tutorials, assessment tools, other.”

The range of responses to this question was quite extensive. In addition to particular types of materials, such as instruction guides, planning documents, policies, assessment tools, "ask an expert" listings, mission statements, strategic plans, assignments, tutorials, images, curricula and pathfinders, specific comments were made related to how the content should be selected.

A repeated request was that the repository should strive, at first, to cover areas where there is the greatest duplication across institutions, the assumption being that “master copies” of materials of interest consortia-wide would be created. This would include such things as Voyager tutorials, information on searching in CONTENTdm, etc.

It should be noted that the majority of material survey respondents assumed would be contributed, when identified by a format type, was in a “traditional” format, such as Word documents, Powerpoint presentations, and PDF files.

Issues

Repository management models

Repository management models can take one of two forms: centralized or decentralized. In a centralized model, such as that used by Connexions[2], all of the learning objects are located on a shared server. In a decentralized model, such as MERLOT[3], there is still a need for a shared server, but its function is to simply provide indexing, discovery and other value-added services (such as ratings) for objects that are located on other machines, housed at various institutions across the state.

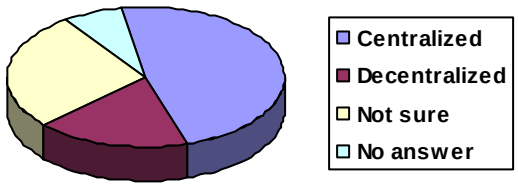

Figure 1 - Repository model preferences

Early in the implementation process, the consortium will need to make a decision on which model will be used. In the institutional survey (figure 1), 47.9% of the respondents preferred a centralized location, 17.8% preferred that it be maintained at each institution, 27.4% of the survey respondents were not sure which model would be preferred, while 6.8% of the respondents did not answer this question. However, the survey did not define the exact details of either a centralized or decentralized solution nor were the roles, responsibilities, technical demands or costs associated with either model.

There are positive and negative aspects to both models. In a centralized model, the major advantage is that individual institutions do not have to worry about hosting learning objects on a local server. In theory, a centralized solution would provide for greater control over the learning objects in the long term. However, there are also disadvantages and complex issues with a centralized model. One possible disadvantage is the potential for delayed turn around time in getting objects into the repository as well as a more complex security environment to cope with a large matrix of user types and institutions. Furthermore, agreements will have to be created that address who owns the material put into a repository. Operationally, the consortium will have to work out how

[2] http://cnx.org/

[3] http://www.Merlot.org/

access rights for initially inputting and subsequently updating objects in the repository will be defined and maintained.

In a decentralized repository model, one of the advantages is that the individual institutions have greater control over their locally created content, which would potentially provide for faster turn around time when adding and updating content. However, there are significant disadvantages as well. Decentralized repositories inherently mean more work at the individual institution level, primarily in maintaining the local infrastructure to provide for object dissemination.

Software Platforms

Today, there are several general repository products that could potentially be used for hosting a very simple learning objects repository. While some of these are more suitable than others, all tend to offer some unique features not found in competing products. Unfortunately, none of these currently provide support for standard learning object packages in either IMS or SCORM format or the metadata for describing such materials, such as IEEE LOM and rights expression languages, such as ODRL. Therefore, none of these solutions, at the present time, will be able to effectively communicate the content of the learning objects to a learning management system, such as Blackboard, WebCT, or Sakai.

Nonetheless, in the general repository arena, products can be divided into two camps: those based on commercial software and those based on open source.

Commercial solutions are purchased. The two major advantages of commercial products are that they are supported by a software vendor and are typically capable of creating a workable repository in a short amount of time. While these systems are not usually open to local modification, they often provide functionality which rivals that found in library management systems, such as fully developed metadata creation tools and facilities that provide for sophisticated access, authorization, and rights management. However, most of these are designed for a generalized repository model and do not have functionality that would be expected in a learning objects repository, such as facilities for rating or ranking material, nor do they support any of the emerging standards in the instructional technology world such as OKI.

Some of the commercial products in this area include CONTENTdm (distributed by OCLC), Digitool (Ex Libris), and Hyperion (Sirsi), all of which are generalized repository systems that support a wide variety of media as well as both the OAI-PMH metadata harvesting protocol and the Z39.50 bibliographic information transfer protocol. Current descriptive metadata formats include Dublin Core and VRA (Visual Resources Association) core. The advantage of CONTENTdm over the others is that the CARLI consortium already has a license for the software and several CARLI libraries are using it for various collections.

There are other commercial systems on the market; however, they have significantly less market share than any of the three products already discussed. One such product is MetaSource from Innovative Interfaces, Inc. (III). Highly integrated with other components from III, this is an advantage to III library management system customers, but it would be a drawback in the CARLI environment as it cannot provide repository services without the purchase of the additional components that are part of the III library management system.

Open source products are developed in a significantly different manner than commercial software. In open source, products are developed cooperatively, typically through some formal organization of volunteers. Most often, these organizations are not commercial entities. One of the advantages of open source software is that it is extensible and usually has a lower cost for initial acquisition. A downside, however, is that many open source products have no formal support mechanism.

Nonetheless, most of the successful general repository initiatives in the academic world have been developed on open source software. Some of the software that has been used includes:

- EPrints, the oldest and most widely used repository product. Most text-based repositories that focus on “journal-like” material are based on EPrints. Developed with joint support from JISC (Joint Information Systems Committee) in the UK and the NSF (National Science Foundation) in the US.
- DSpace, initially developed as a proof-of-concept joint program between MIT library and Hewlett-Packard. Most general purpose repositories today are based on DSpace.

- FEDORA (Flexible Extensible Digital Object and Repository Architecture), originally developed as a joint project between Cornell and Virginia. FEDORA is more of a repository toolkit rather than a ready-to-deploy repository system.
- Greenstone, a suite of software developed as part of the New Zealand Digital Library Project. Currently is distributed by UNESCO and the Human Info NGO. This product has not seen wide adoption in the US, but it does have a wide rate of adoption outside the US, particularly in developing countries given its lightweight design and system requirements.

The VITAL product from VTLS is unique in the marketplace as it is a commercially developed and maintained front-end to the FEDORA open-source repository project. VITAL was developed to provide a usable front-end to FEDORA as there currently is no production-level component available as part of the FEDORA distribution package. VITAL provides a way to start using FEDORA relatively quickly with little application development effort.

Metadata and object classification

The OCLC E-Learning Task Force of 2003 says for learning objects to be useful they need to have "systematically consistent" and "easily created" metadata[4]. This metadata allows users to easily find the material of interest to them. Therefore, an effective repository of learning objects must have a structure in place for the creation of metadata that both makes it easy for learning object contributors to classify their material while at the same time providing functionality to enable users to locate needed items quickly and efficiently.

MERLOT offers one model for a categorization scheme and associated search functionality. Along with Wisc-Online[5], these two projects provide good examples of learning object repositories that have effectively implemented keyword searching,

[4] Libraries and the Enhancement of E-learning, available at http://www5.oclc.org/downloads/community/elearning.pdf

[5] http://www.wisc-online.com/

browsing, and advanced search functions such as search by author, title, description, subject, material type, primary audience, technical format or language of material.

A particular concern is how items may be consistently classified by subject or discipline. Given current practice, it seems that a faceted system based on broad categories is more effective in a learning object repository as opposed to an extensive categorization scheme. For example, MERLOT uses only 16 broad subject categories: Biology, Business, Chemistry, Engineering, Health Sciences, History, Information Technology, Mathematics, Music, Physics, Psychology, Statistics, Teacher Education, Teaching and Technology, World Languages, and Criminal Justice. Within these subjects, one further level of qualification is provided. In Information Technology, for example, these areas are: Applications, Security, Software Engineering, Systems Analysis, Web, Computer Information Systems, Database, E-commerce, Hardware, Information Literacy, Networking, Operating Systems, and Programming.

Peer review and evaluation of material

A digital repository is only as good as the quality of the materials it houses. A critical component of CARLI's repository would need to be the systemic, standardized peer review of learning materials prior to inclusion. The MERLOT database offers an existing model for this process. "Discipline-based communities," comprised of faculty with expertise in the subject areas of biology, business, chemistry, engineering, health sciences, history, information technology, mathematics, music, physics, psychology, teacher education, and world languages, are charged with developing evaluation standards and implementing peer reviews of learning materials. For any given learning object, peer reviewers assess the object's "quality of content, potential effectiveness as a teaching tool, and ease of use"[6], assigning each category a rating of 1 - 5, with 5 as the highest[7]. The reviewers send their comments to the learning object's author before making the report available on the MERLOT site. In addition to the evaluation, the report also describes several other aspects of the learning object, such as learning goals, target

[6] MERLOT Evaluation Criteria for Peer Reviews, http://taste.Merlot.org/evaluationcriteria.html

[7] MERLOT Peer Review Rating System, http://taste.Merlot.org/ratingsystem.html

population, any prerequisite knowledge or skills required, and a summary of procedures and technical requirements for using the learning object and its software.

In addition to the formal peer review process utilized by MERLOT, an informal review process occurs when individual members of MERLOT submit comments regarding their personal experiences using a particular learning object and/or examples of a learning/assignment context suitable for a particular learning object.

Whether or not CARLI adopts a repository model similar to MERLOT, it is important that peer review and evaluation standards be put in place to ensure the quality of the proposed repository's materials. Considerations for developing a peer review process and defining evaluation standards include: identifying and recruiting qualified peer reviewers, articulating core standards upon which to evaluate the learning objects and developing a quantifiable way to measure them, designing a protocol for communicating the results of the peer review to the original authors, constructing a user-friendly platform for displaying the peer review data to repository users, and allowing CARLI members to submit user comments and informally share information about any learning object.

Other items to be considered

In the free form comments that were provided in the survey responses, two interesting patterns emerged. One was the strong focus on the ability to find learning objects through rigorous bibliographic control without much focus on the issues related to the content of the repository itself. The second interesting pattern was an assumption that the repository was primarily for library instruction, rather than a resource for learning objects throughout the disciplines.

While both of these may represent potential stumbling blocks in the implementation of a learning objects repository, there are other considerations to take into account, particularly the role of the proposed repository in the larger scheme of things. One survey respondent stated point blank, “MERLOT is a cooperative learning object repository and I'm not sure why CARLI wants to duplicate this effort.” This is a good question. In particular, we need to ask “What would be the benefit to faculty at our institutions to contribute to a statewide effort rather than a national or international one?”

Another interesting point was raised by another respondent who said:

> "I'd like to see it serve the same purpose for library instruction that WorldCat does for bibliographic records, i.e. cover the universe of content that librarians provide instruction on, other than material solely relevant to one university."

If this were to be the case, it would tend to argue against a localized (i.e., statewide) solution and argue in favor of the centralized model one sees in something like WorldCat.

However, these observations should not be construed as unduly negative. There is clearly support and interest in this project; however CARLI needs to seriously consider what the role of this learning objects repository will be within the academic environment. As one survey respondent put it: "Generating incentives to contribute and making the repository a safe space for contributing appear to be important aspects for the project's success. It would be sad to see CARLI invest a lot of time and energy in the infrastructure without seeing it come to fruition due to problems with getting contributions."

Summary and Recommendations

Given the nascent nature of this project and the somewhat contradictory information gathered by the survey, it is difficult to make a definitive statement on the direction CARLI should take in creating a learning objects repository. While many of the survey participants thought the idea had merit, there are several issues CARLI needs to consider before embarking on the project. Some of the questions include:

- What are the competing factors currently at work that could inhibit success of this project such as other consortia and consortial commitments and other projects both nationally and internationally?
- How will CARLI move from its traditional role of being solely focused on the needs of libraries to a much more broadly based constituency at each institution?
- How will CARLI support a much broader function within the academic community of Illinois?

In order to help answer some of these questions, CARLI staff should engage with the staff at other large-scale localized learning object repositories, such as Wisc-Online and MLX (the Maricopa Learning Exchange[8]) to discover what they have learned from their implementations. CARLI staff should also engage with the academic technology communities at various CARLI institutions to discover what activities related to learning repositories may already be on-going within the state.

Once these questions are answered, it would be advisable to set up a pilot system to explore some of the issues raised in the survey.

Although it does not support several important metadata schemes for learning objects or a peer review function, the CONTENTdm platform could be used as a first step in creating a central "clearinghouse" of material. By doing so, CARLI could explore several of the management issues related to a learning repository particular for text-based materials.

However, this solution would not address many of the other issues identified as being critical to a successful implementation of a learning object repository, particularly the ability to perform peer review of learning objects and integrate complex learning object types into the repository. In order to truly test out the concept of a statewide learning object repository, CARLI will have to set up a server with repository software specifically designed to work with learning objects, such as that used by Connexions[9] or perhaps one of the few commercial products, such as intraLibrary[10].

Implementing one of these systems will move CARLI forward in its exploration of the concept of a state-wide learning objects repository and its long-term feasibility.

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[8] http://www.mcli.dist.maricopa.edu/mlx/

[9] Of the various open-access projects, only Connexions provides an open-source version of their software.

[10] intraLibrary is a commercial learning objects repository system. It is primarily used in Europe. More information can be found at http://www.intrallect.com/products/

Appendix A – Survey respondents

Institution	Number of Respondents
Augustana College	2
Aurora University	1
Blackburn College	1
Bradley University	1
Chicago State University	3
College of DuPage	1
College of Lake County	1
DePaul University	1
East-West University	1
Eastern Illinois University	1
Elmhurst College	1
Erikson Institute	1
Harrington College of Design	1
Heartland Community College	1
Highland Community College	1
Illinois Central College	2
Illinois Institute of Technology	1
Illinois State Library	3
Illinois State University	2
Illinois Valley Community College	1
Illinois Wesleyan University	1
John Wood Community College	1
Judson College	1
Kankakee Community College	1
Kendall College	1
Knox College	1
Lake Forest College	1
McKendree College	1
North Central College	1
North Park University	1
Northeastern Illinois University	2
Northern Illinois University	2
Northwestern Business College	1
Olivet Nazarene University	1
Parkland College	2
Rend Lake College	2
Rush University	1
Sauk Valley Community College	1
Southern Illinois University Carbondale	4
Southern Illinois University Edwardsville	4
Spoon River College	1
University of Chicago	1
University of Illinois at Chicago	2
University of Illinois at Springfield	2
University of Illinois at Urbana-Champaign	5
University of St. Francis	1
Waubonsee Community College	1
Western Illinois University	3