Digital Library Federation
Digital Library Content and Course Management Systems:
Issues of Interoperation
July, 2004

Appendix 4.0: Use Case Working Group: Report and Recommendations

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February 23, 2004

Problem Space Defined:

Faculty, students, and academic support staff increasingly use a broad range of educational technologies to create and share teaching and learning materials. From all reports, however, there is need for new tools and services that will make it much easier for scholars to access and incorporate the rich digital content in digital libraries, museums, and other repositories into their teaching and learning products and practice. While some tools exist to facilitate federated searching, and a number of course management tools help a scholar build and maintain course web sites, scalable tools have yet to be developed which can make transparent the process of gathering and adapting content from digital repositories that is critical for the creation of learning objects.

As scholars become more comfortable incorporating digital content into their teaching and learning products, they are becoming more interested in gathering content from all sorts of providers including those subscribed to by libraries, learning object repositories, academic departmental repositories, their own desktop collections and those sent to them by colleagues in their fields. Once identified, however, there are few common working spaces where scholars can collect the content, transform it as they wish, and create learning objects. At this point, most scholars adapt the content they find in their own working environment using common desktop and presentation tools. Yet, academic support technologists are hearing that scholars want more.

Scholars want to be able to organize, describe, and aggregate content objects into learning objects such as resource lists, case studies, tutorials and lectures. They want to develop subject based themes for the content that they gather as they find it so that it can be used in a number of different venues, from a course to their own research planning. They want to make the discrete and aggregated content in its transformed form available to others in some collaborative, but controlled fashion. Providing tools to facilitate this aspect of scholars' workflow would free their creative processes and, presumably, be of great value to them.

Tools that ease the creation and management of learning content throughout its lifecycle would not only improve the teaching life of scholars, but would also help to define some important services that could be provided by content repositories, and/or by the educational support industry, broadly speaking. Such tools could also help to streamline

the conduits by which content and content aggregates are imported and exported into learning environments. By standardizing the packaging of the work products for ease of use in the various environments for which they are intended, the likelihood that content within digital repositories will actually be used by scholars greatly increases, thus bringing better return to the investments already made. In so doing, the chances are much greater that learning objects thus created will be shared by the larger educational community, including K - 12 teachers, community colleges, and international communities.

The problem space being described resides between content repositories on the one side, and educational technologies, of which course management systems are a central component, on the other. The types of content repositories accessed by faculty and students include institutional digital repositories such as that of the California Digital Library and Stanford Digital Repository; learning object repositories such as MERLOT and GEM; library ILS catalogs; text and image content providers such as ARTStor, JSTOR, Highwire Press; scholarly publishers; abstract & indexing databases; departmental repositories of course related materials; personal sources; web pages, etc. On the other side of the space are learning environments and tools in which content has been transformed into learning objects and needs to be associated with learning groups and managed within the learning environment. The learning environment could run the range from a broad Sakai-like Learning Management System to a Course Management system such as WebCT or Blackboard. Other tools for adapting and presenting digital content that faculty and students now use---and would like to use more easily---include such applications as Powerpoint, Endnote, Adobe Acrobat, and weblogs.

Between content repositories and educational technologies lies the scholar's workspace wherein he or she needs to be able to gather content with as much relevant metadata as possible, use and adapt it as necessary (and supportable), interoperate with other tools and environments, and publish it to the desired audiences. It is in this space that the Mellon LMS – DR Interoperability Study Group recommends some demonstration projects be funded. To support those findings, the Study Group has created a checklist of services that a content repository could and should provide to work best with a learning management system and other educational technologies. To complement and ground the analysis of services into real life situations, three initial Use Case Scenarios have been developed from the point of view of scholars who are trying to develop a learning resource. Besides describing the players and transactions depicted by the Use Case descriptions, the Use Cases delineate the functional requirements for a *gathering / authoring tool* that could be developed for learning content creators. (See Use Case Example – 01 through 03)

Functional Requirements and Key Common Assumptions: The following functional requirements emerged from the Use Case Scenarios developed by the group:

Gather:

DISCOVER = identify content sources
SEARCH = find content within sources
COLLECT = bookmark/link within each content source or within tool, probably using set formats or templates for types of learning objects or aggregations of content
IMPORT = into tool or managed environment, bring or point to content itself, or metadata about content .
SAVE = prior to publishing, make a copy for the desktop, external or non-personal workspace that is managed for collaboration or sharing
FIND SIMILAR = identify like items, per the Amazon.com model

Create:

DESCRIBE RESOURCE = annotate, interpret, and write about content before publishing
ORGANIZE = order, sequence, transform content to create learning object
ASSOCIATE = declare link between content or learning object and course, project group or learning objective
MODIFY = change, edit, annotate content or learning object for re-use after initial publishing. Differentiated from **Organize** in that this function may trigger other services to selected community members such as Alerts or Notification related to allowable permissions or conditions to re-use

Share:

EXPORT = transfer content to other formats and/or tools, e.g., PowerPoint, METS. Differs from **Save** by its facilitation of supported format, output, packaging of content or learning object for specific display, rendering, use, storage environments
PUBLISH = make formally available to learning environment with implications for declaration / agreements related to rights for re-use, short and long term storage and archiving services, and expectations for content transformation services
ARCHIVE = establish agreements regarding short or long term storage, preservation, and delivery services.

These functions point to a type of tool (and/or service) that at its core level would enable faculty, students, and the public to *Gather-Create-Share:* to gather a wide range of cultural and scientific digital objects from many different repositories to create teaching and learning products that can be shared with, and reused by, others inside and, in important cases, outside of the higher education community.

The Use Case Scenarios also include underlying strategic assumptions related to the creation of a gathering tool, from the points of view of tool developers, end users, and

content repositories. These assumptions were included to better explicate which player could /would be responsible for which function.

Demonstration projects: Recognizing that there are many ways a gathering / authoring tool could be built, it makes great sense to get together a number of collaborative partners not only to ensure that efforts are not duplicated, but also to make sure that the tool can work together with other major efforts in the digital repository / LMS arenas. Some early and promising prototypes exist, such as the UC Berkeley Interactive University's *Scholar's Box* tool or Groxis' *Grokker* product, but these tools either need further development to provide scalable options for scholars (Scholar's Box), or do not yet have the hooks into the Learning Management side of the equation to meet scholars' needs (Grokker). It would make sense to evaluate what has been created already to assess what functionalities are included and what are not, how well the features provide the services and then determine what the focus should be for various partners contributing to the demonstration projects. Included with this summary are a number of brief use case scenarios that have been sketched to illustrate the functionalities noted above.

Collaborative partners: Many useful combinations of collaborators could be envisioned to achieve the functionalities described by the Use Case Scenarios, and indeed, discussions among some of the institutions seated at the Study Group table have already begun. Some of the more obvious partners include content provider repositories of various formats and degrees of preservation responsibility, integrated library systems with course reserve and catalog modules, federated searching tools, portal tools, course and / or learning management system tools, and of course, scholars from various disciplines who are interested in a variety of content formats.

Lifecycle Work Flow: An approach that could guide demonstration projects is to explore the lifecycle or end-to-end process of higher education faculty, students, and/or staff gathering materials from multiple repositories, creating new teaching and learning products from these materials (in some cases through use of other authoring tools as well), and then sharing/publishing materials for reuse in some sort of repository, whether it is part of a digital library, learning object repository, and/or a repository within a course management system. In each case, these end-to-end demonstrations (from repository-to learning environment-to repository) would be driven by the needs of key users (use cases).

Demonstration projects would then include the following major components in the end-to-end process, with choices to be made in each area about what to focus on:

Use Cases (user experience) as driver →
→ Material/Object Type →
→ Sources/Repository technologies →
→ Instantiations of "Collect-Author-Share" tool →
→ Interoperation with other educational and information technologies →
→ Publishing to Learning Material/Learning Object Repositories
→ {This cycle can then repeat in various re-use scenarios}

Demonstration projects do not have to follow this complete functional flow; one might, instead, focus on some of the steps in this process. We believe there is substantial value, however, in exploring, from both the user's point of view and the technologist's point of view, the complete gathering-creating-sharing cycle(s) within which flexible teaching and learning materials are built from the rich digital content collected in digital repositories and museums.

Below is a list of possible options for each major component in the lifecycle process. By choosing from these options (a menu of sorts), different demonstration projects could be crafted, comprising a range of partnerships that explore important use cases and instantiations of technology. This is not meant to be a comprehensive list (nor is it in priority order), but rather includes some interesting choices from the working group's point of view.

Menu to Choose from for Demonstration Projects

1. **Use cases/User Experiences** (that would drive/be investigated in pilot(s))

    a. Faculty and graduate students create lecture materials from collections of digital images and associate with syllabus inside campus CMS managed course web site
    b. Faculty and/or graduate students create reading and/or resource lists from within a Library portal and publish to an independent course web site
    c. Faculty browse interdisciplinary Reading List collections within learning object repository (e.g., OCW at MIT) and select one for reuse in a collaborative research project among scholars on different campuses
    d. Faculty creates a pre-defined search from various content repositories using metasearch tool and adds to an assignment in the CMS managed course web site
    e. Students gather images, text, citations from multiple sources to develop a joint presentation for class
    f. Library curator creates a themed collection of learning materials based on her subject specialty and publishes it to Library's Subject Resources web page for use by wide range of scholars
    g. Instructors from a community college build small learning objects from materials in the themed collections found on a Library's publicly accessible web page and publish them to a learning object repository (e.g. MERLOT)
    h. Students gather class presentation materials for use in e-portfolio tools

2. **Content types** (both public and licensed materials)

    a. Images
    b. Bibliographic resources
    c. Text – journal articles, books, other
    d. Audio
    e. Video

f. Pre-defined searches into content repositories, possibly using metasearch tools
g. IMS Content packs and other complex structured objects
h. METS objects

3. **Content Repositories** (that could provide representative content, explore important repository technologies or services, and provide connections to important educational technologies)

    a. UC California Digital Library (brings in multiple UC campuses)
    b. Stanford Digital Repository
    c. Indiana University's Library Collections
    d. Harvard University's Visual Resources collections
    e. DSpace (MIT, Columbia, and other institutions; and, in future, OCW materials from MIT)
    f. University of Virginia representing Fedora
    g. ARTStor
    h. JSTOR
    i. Luna collections
    j. Open Archives Initiatives (OAI) repositories
    k. Learning Object repositories: MERLOT, EdNA (Australia), EduSourse (Canada), SMETE
    l. MusicSTOR (Michigan State)
    m. Public Library of science and other open repositories
    n. NSDL collections
    o. Social Science dataset collections
    p. Unstructured web materials (while still trying to preserve context)
    q. Individual desktops / personal collections
    r. Johns Hopkins Project MUSE (humanities)
    s. Publishers, e.g., Blackwell Publishing

4. **Possible Models for Instantiating Gather-Create-Share Tools/Services** (these might take the form either of web or client based tools/services.)

    a. Integrated in Course Management Systems
    b. Portlet / tool in Sakai portal framework
    c. Component and/or closely coupled with digital library (able to talk to other digital libraries as well)
    d. Stand alone tool able to interoperate with educational technologies and digital libraries

5. **Authoring Tools with which to Interoperate/Integrate**

    a. Powerpoint
    b. EndNote
    c. Adobe Acrobat/PDF
    d. Weblogging tools/RSS

e. Reload – IMS Learning Design based authoring tool
f. Chandler/Westwood
g. VUE (Tufts)
h. TK3 (The Night Kitchen)
i. OpenOffice.org
j. Meta-search tools
k. UCB Scholar's Box tool (which is both an early version of a *Gather-Create-Share* tool and an authoring tool other *Gathering* tools might interoperate with)

6. **Other Integrative Environments with which to Interoperate**

a. Sakai (which then includes the CHEF / OnCourse /CourseWork CMS framework, research groupware, UPortal, OKI/ IMS Abstract Framework)
b. Chandler (as a platform)
c. LionShare peer to peer network infrastructure
d. E-Portfolio (Indiana and others)
e. Library Integrated Library Systems (including catalog, electronic reserves)
f. Library and other departmental portal environments
g. Semantic Web – for example, SIMILE project and their Haystack tools at HP/MIT)

7. **Repositories in which to Publish / Share Teaching and Learning Materials**

a. Institutional repositories
b. Campus departmental repositories
c. Learning Object repositories (e.g., MERLOT, GEM)
d. Course and learning management system repositories