Exploring content re-use: Technical and organisational issues sharing WebCT content via an online repository.

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Abstract

Much of today’s university teaching materials are delivered online via a Learning Management System (LMS) such as WebCT. Teaching materials and content stored within WebCT are difficult to share with other WebCT courses and impossible to share with other Learning Management Systems such as Blackboard or Moodle.

The University of Western Australia has implemented HarvestRoad’s Hive learning content management system as an online repository to store and manage teaching materials offered to students. A side project to implementing this repository is looking at storing the Library’s WebCT content in Hive for re-use across multiple courses.

The objective of the project is to be able to decouple content from WebCT and allow it to be used by any course in a standards-compliant LMS. We will then be able to author content once and share it between courses, without needing to copy or repurpose the content. This will introduce efficiencies and improved work processes, as updates to content will be immediately reflected across all instances reducing maintenance time and cost.

The project is exploring the technical issues of content re-use: software used, separating content from presentation, and technology and standards compliance.

As well as the technical issues, the project is shedding light on the practicalities of content re-use and how it requires an organisational shift in thinking to author reusable and effective training material.

This paper will outline why the UWA Library is migrating its WebCT content into Hive, the technical and organisational issues faced, and give an overview of how the content re-use functionality has had an impact on the Library and the implications for the wider academic community.

E-Learning and Learning Management Systems (LMS)

According to Williams the term “e-learning” emerged in the 1990’s and was initially used for the purposes of distance learning (Williams 2004). Richardson states that e-learning has since become broader than distance learning (Richardson 2005) and Papastergiou acknowledges that e-learning additionally offers solutions for addressing demand across barriers of time. (Papastergiou 2006, p. 594)
Further on this Lippincott discusses the emergence of “Net Gen” students who “clearly perceive the open space of the World Wide Web as their information universe” and notes that the “environment that is frequently the digital home of students’ coursework” is the Course Management System (CMS), or Learning Management System (LMS) as it is also often referred to. (2006) Common LMS’ in use are WebCT, Blackboard and the open source system Moodle.

Information Literacy courses at the University of Western Australia

The UWA Library offers a range of information literacy courses online via the University LMS, WebCT Campus Edition Version 6. Reference Librarians in the various subject libraries author the courses and are responsible for their ongoing maintenance and support. The courses largely consist of WebCT Learning Modules comprised of static HTML pages, as well as WebCT self tests and quizzes and several Shockwave Flash animations and activities created in the applications StudyMate and ViewletBuilder.

Current issues with this authoring model

With this current model of information literacy authoring there is a duplication of staff effort and time. The UWA Library employs approximately 20 Reference Librarians and all are expected to have skills to build and manage WebCT courses and author information literacy content in the form of HTML Web pages, Shockwave Viewlet animations and StudyMate activities. As these authoring responsibilities are shared among a large number of staff the time allocated to these tasks makes up a relatively small amount of each staff member’s total workload, which does not always allow the time required to create detailed, feature rich and interactive learning materials.

Information literacy principles span different WebCT courses. Content is not shared and therefore content is duplicated in each course creating potential inconsistencies in information delivered.

Library Pilot Project: Migration of WebCT Content into HarvestRoad Hive

In 2004 the UWA Library initiated the Learning Resources System (LRS) project to implement a course-related materials management system to facilitate the online teaching and learning activities of the University. The project sought to establish a digital object repository to store and manage digital objects. HarvestRoad Hive was the selected LRS for many key reasons including its flexibility to repurpose content. It was determined that objects stored in the Hive repository could be linked to from Web pages and LMS courses.

As an objective of the LRS project was to integrate the online learning materials stored in the LRS with WebCT, a side project was spawned in April 2006 to migrate the Library’s information literacy content that was at the time residing on the University WebCT server, into the Hive repository.

The objective of the project was to investigate all issues with storing content for use in WebCT courses within Hive. Additionally the project aimed to implement or recommend solutions to these issues, as appropriate.
Expected benefits were that content would be authored once and shared between multiple WebCT courses without needing to be copied and/or re-purposed. Changes made to this content will be immediately reflected across all courses reducing maintenance time and cost. Library-authored information literacy material would be more easily incorporated into any WebCT course. WebCT content would be created and published in a format which is independent of a particular LMS such as WebCT – a concept known as “future-proofing”. Should versions of WebCT change or the University decide to implement an alternative LMS such as Blackboard or Moodle, this content will not require re-authoring. Additionally the migration would allow WebCT content to be managed in a robust learning content management system that offers features such as version and access control.

Initial testing was done using the Library’s most sophisticated WebCT course “Introductory, Research and Information Skills” for the Faculty of Arts, Humanities and Social Sciences. Migrating the content of this course into the Hive repository uncovered technical issues, assisted in devising a procedure to perform the migration, raised some organisational issues about the way the UWA Library worked and made some proposals about how to work in the future.

Technical and organisational issues

**SCORM compliance**

The Shareable Content Object Reference Model (SCORM) was developed by the US Department of Defence (DoD) in 1996 when they explored standardising web-based training to increase quality and reduce duplication of training efforts (Shackelford 2002). Barker states that the “purpose of SCORM is to create content that will run on any conformant LMS” and that it additionally “facilitates the discovery and reusability of content” (Barker 2004, p. 21).

SCORM acts as a “technical architecture that permits the reuse of web-based learning objects” that it encases in packages. (Barker 2004, p. 22). These packages allow course creators to author content that can be transported from one course to another without re-authoring. WebCT can link to these packages effectively creating portable “Learning Modules” – a WebCT term for a series of pages or files bound by a left-hand table of contents.
According to the SCORM 1.2 standard it should be possible to create a SCORM Manifest (the table of contents within the SCORM Package) which specifies content that is remote to the package, and in the case of the UWA Library that would be content stored in the Hive repository. During initial testing it was discovered that WebCT Campus Edition 6’s implementation of SCORM is broken, as it does not display remote content. WebCT have acknowledged this bug and that a fix will be provided in a forthcoming WebCT Application Pack, however a date for the fix has not been released. Until this is resolved SCORM Packages stored in the Hive repository or anywhere else, cannot be used to populate WebCT courses.

The SCORM Package model offers advantages such as being able to construct a complete module of sequenced content that could be shared. A disadvantage of this model is that it does not use the WebCT table of contents structure and rather navigation is provided by the SCORM Player, and therefore the content is not able to be tracked by WebCT’s Tracking module. Also SCORM packages draw in content from the Hive repository as-is and therefore the presentation or “branding” of the pages, in the form of template images and CSS styles, is inherited and cannot be customised to suit multiple courses. This “branding” issue is discussed further below.

Due to WebCT’s lack of SCORM compliance an alternative model of WebCT – Hive interaction had to be pursued. The UWA Library constructed Learning Modules in WebCT out of individual objects stored in Hive.

![Diagram of SCORM Package model](image1)

**Figure 2: Packaging remote content within a SCORM Package (not currently possible).**

![Diagram of WebCT Learning Module model](image2)

**Figure 3: Packaging remote content within a WebCT Learning Module (possible).**
To create reusable content following this model generic content has to reside as a separate object in Hive to course, discipline or subject-specific content. The result this has in WebCT is that the generic content displays on a separate page or screen to the course, discipline or subject-specific content which was identified as unsatisfactory by some UWA Library staff, as discussed further below. Additionally there remains presentation or “branding” issues with this model that are also discussed further below.

**Sharable content**

Whilst “SCORM provides the technical infrastructure to facilitate the creation of reusable content”, it doesn’t “prescribe or offer guidance on how to produce effective content and sequence it in a way to produce pedagogically sound learning material.” (Pasini, cited in Lukasiak 2005, p. 152)

Therefore there is a challenge for authors converting existing learning material to be able to structure the content in context-free objects whilst still aggregating the objects into meaningful learning sequences. (Lukasiak 2005, p. 152)

This challenge proved true in the case of the UWA Library where content created for existing information literacy courses has not been authored with sharing in mind. Existing content is not granular, often because the generic content has been mixed on the same page as course, discipline, or subject-specific content. Existing content needs to be rewritten to create granular, reusable content and therefore improve its shareability.

Additionally Reference Librarians expressed concerns over creating sharable content. It has been established that placing content within a subject-specific context assists learning, and Reference Librarians have been striving to embed information literacy within a subject-specific context for the last few years. There was concern that the creation of content with sharing in mind will force content to become too generic. It was argued that truly generic content is an insignificant component of our information literacy courses.

Feedback from Reference Librarians indicated that a more effective model would see two pieces of content being sourced from the Hive repository displayed on a single WebCT page. An example would be sourcing a generic information literacy principle or instruction on a concept and then following it immediately within the same page with a discipline-specific example.

![Figure 4: Packaging of content within a single page (theoretical).](image-url)
It is likely that this solution would also solve the “branding” issue, as outlined in the section below. However there are other technical hurdles to overcome before this can be a viable solution.

1. The HTML 4.01 and XHTML 1.1 standards offer two HTML tags which include external content within a single page: the OBJECT and IFRAME. Both require the HTML author to specify a fixed height for the included object, i.e. sizing of the embedded content is not dynamic and must be known prior to authoring the course page. This limitation can create ugly, unusable pages.

2. The IFRAME tag acts like an inline frame. It has similar accessibility issues to normal frames, i.e. the embedded content may not be able to be read by some screen readers.

Alternative solutions may be forthcoming with the XHTML 2.0 specification, currently in draft form before the World Wide Web Consortium (W3C). It is anticipated that this specification will allow greater scope for including external content “inline” within a page. However, before this technology can be used the specification must be ratified by the W3C, adopted by Web browser software manufacturers, incorporated into a new version of their Web browser, which then needs to be downloaded and installed by a sizeable proportion of the Library’s clients. This process may take several years.

**Lack of rich content**

It proved difficult to demonstrate the benefits of sharing existing Library WebCT content as much of it consists as text within HTML files. This content is straightforward to create, and straightforward, but time-consuming, to update and maintain. There was an organisational perception that it is easier to re-create or re-write content for a particular purpose rather than re-engineer it to be more granular which will therefore facilitate re-use and sharing. Staff could perceive more value in sharing content which was more time-consuming and difficult to create, such as high quality graphical material, audio-visual or interactive material. The UWA Library creates little of this content at present due to the fact it is time-consuming and sometimes difficult to author.

**Authoring team**

As it was determined that existing content would have to be re-written to be made shareable, and that a shift in thinking was required to create effective shareable content, it has been proposed that a core group of Reference Librarians be formed to create an authoring team. This authoring team would then be responsible for creating the bulk of the Library’s information literacy content and would subsequently become more proficient in authoring content in this new style.

Additionally this team would have more time to focus, and therefore become more proficient, in creating rich content such as graphical, audio-visual and interactive material.

Content re-use raises issues of content ownership and editing control. When a shared piece of content in the Hive repository is modified all instances of this content in WebCT will be automatically updated. Whilst this is an efficient model it is important that the right users are performing the updates. Another advantage of having an authoring team is that it would solve these issues of content ownership
and editing control as the responsibilities to create, modify and update content would all lie with this small, central and proficient team.

There was some resistance to this proposal as some felt that it was important that all reference staff retain these authoring skills. However, it was acknowledged that in the UWA Library’s current scenario it really was only one staff member from each subject library that performed the bulk of the information literacy authoring.

It was therefore decided to have as many reference staff as possible involved in the migration to get an understanding about the new way of working and to assist in meeting the Semester 1 deadline. Looking into the future it was proposed and agreed to have one representative from the key subject libraries involved in information literacy authoring on this central authoring team. This totalled six staff members, down from approximately twenty, from the Business, Education, Architecture and Fine Arts, Humanities and Social Sciences, Law, Medicine and Dentistry and Science libraries. All Reference Librarians are still to be trained in creating basic information literacy content but this team would be responsible for creating the bulk of the content, including the more sophisticated and feature rich material.

**Structure of content**

The migration project raised an interesting issue on how to structure content in the Hive repository. Storing content in folders corresponding to each Library WebCT course would make content very easy to find for that course however, it would in effect keep the content in course silos, which would not encourage sharing. Whilst it is technically possible to share content in this structure, it is less likely that staff will look for content in another course’s folder.

It was therefore proposed to structure the course in folders according to outcomes. Therefore if you are browsing for a piece of content to address a particular outcome it is more likely that you will re-use an existing piece of content if a suitable object exists, than create an additional piece of content that addresses the same outcome. This was quite a contentious proposal as many authors didn’t think that their content would fit under any of the outcomes suggested, or that their content object addressed multiple outcomes so they weren’t sure which folder to place them and didn’t want to have to modify or break up the content in order to make it fit. They were also concerned that this would make their content hard to find despite assurances that they could search for the content based on metadata.

After much liaison with staff the following outcome and generic folders were created:

1. Administrative instruction
2. Recognising information need
3. Planning search strategies
4. Locating and accessing information
5. Types of information
6. Keeping up-to-date
7. Evaluating information and resources
8. Organising information
9. Presenting information
10. Assessment

Staff were still concerned about being able to modify their content to suit this outcomes structure, and that they would be able to perform the migration in time for the Semester 1 deadline. Therefore it was decided to additionally create subject library folders to assist in making the migration as quick and easy as possible for the Reference Librarians.

It should be noted that Hive folders can be renamed and content objects can be moved from one folder to another without affecting any existing links in WebCT. It is therefore planned to move content from the subject library folders to the outcomes based folders within the Hive repository when there is sufficient time available.

**Branding**

Whilst the project has been successful in decoupling content from WebCT it has not been successful decoupling content from its presentation or “branding”. The UWA Library’s WebCT courses all employ a different “brand” or visual look and feel to suit the Faculty they are purposed for. This branding is applied by linking the HTML file to a specific style sheet and particular template images.

The style sheet, images and HTML file can all be published to the Hive repository so that they are shareable. However, the HTML file is not re-usable as it is always associated with the same style sheet and images, and therefore will always be branded with the same style.

![Figure 5: Linked HTML file and style sheet sourced from Hive.](image)

Initially it was thought the HTML file could be written using “relative URLs” to point to a style sheet and template images stored within each WebCT course. Different courses could then store and use different style sheets and template images but share a common HTML file from the Hive repository. However, subsequent testing proved that these relative URLs could not be constructed to point to a local copy of a style sheet or template images.

**Implications for the wider academic community**

With only a small number of WebCT courses, potential for content re-use within the Library is minimal, particularly considering the branding issue discussed above. Therefore the real benefit will come from letting academics know they can use
Library content in their own WebCT courses. As long as their content is also styled to suit their Faculty branding there is no longer an issue.

Therefore promotion of using content stored in the Hive repository is required. A simple instructional guide for academic staff on how to link to Hive content from WebCT has been produced and distributed. Additionally Reference Librarians will continue to liaise with academics in their faculties to promote the use of Hive content in WebCT. This promotion should hopefully encourage more academics to store their own content within the Hive repository to use in WebCT and therefore cascade the use and benefits of the repository and content re-use.

In order for academics to be able to locate the content they require it needs to be able to be easily found within the Hive repository. Work is currently being performed to implement a suitable metadata schema so that required content can be searched for and located easily.

Conclusion

The migration project has uncovered many issues whilst exploring content re-use. Whilst there are technical issues that present us with certain hurdles to overcome the more noticeable issues are of an organisation nature. A shift in thinking and attitude is required to create effective shareable content. As a central authoring team becomes more proficient in creating effective re-usable content the impact of this issue should be lessened.

Technically we’re not at the point where all, or even majority of the content that we create can be re-used. We still have a major hurdle in de-coupling the content of a learning object from its branding. Currently the solution to this hurdle is that of presenting multiple content objects from Hive on a single WebCT page. As a solution to this relies upon a forthcoming XHTML 2.0 specification, currently in draft form before the World Wide Web Consortium (W3C), it is likely to take at least a few years to implement and even then there is the possibility it still may not produce the solution we require.
References


