Would you like a LOMS with your ILMS? Converging the Library and the Learning Management Systems

Anita Crotty
University Librarian
University of Canberra
anita.crotty@canberra.edu.au

Abstract:
Higher education institutions have traditionally purchased separate systems to manage library services and to manage content for online learning. These systems are often procured separately and managed by units within the organisation with somewhat different operational objectives and business processes. This paper explores the feasibility of extending the brief for a new ILMS by including requirements for integrated management and access to all 'learning resources' irrespective of origin and format and describes how the institutional context as much as the technical options may influence the success of the system selection process.

Introduction

Teachers want to incorporate digitised learning resources into their online learning activities, and librarians have been developing a great deal of expertise managing digitised bibliographic content and focusing on linking it to learning management systems. However, many resources now being employed in e-learning have not traditionally been managed by libraries. Teaching and research staff in educational institutions are looking around their campuses for the organisational unit that will provide the magic 'one-stop-shop' solution for organising all manner of digitised content.

In 2005 at the University of Canberra the following scenario evolved in a very short time.

- The Library commenced plans to upgrade the integrated library management system (ILMS) as well as improve systems for digital object management and copyright compliance.
- The brief widened to exploring the notion of procuring a system or systems that would support teachers and learners seamlessly navigating all types of digital content and online teaching and learning environments – the ILMS upgrade became the Learning Resource Management System (LRMS) Project.
- The Director of the unit responsible for educational technology and the learning management system decided to review the existing learning management system (LMS).
- The University executive announced an enterprise-wide review of the University's IT information architecture.

This was a once-in-a-career opportunity for all the players to align the various technologies that had the potential to contribute to high quality interactions between all members of the university community engaged in the business of knowledge creation and management. Why not take advantage of some 'common service' needs for digital object management and cooperatively scope the enterprise-wide requirements so teachers and learners could access and manipulate a range of learning resources more intuitively? Why not deliberately procure interoperable systems while we have the opportunity?

This paper is about exploring this opportunity from the perspective of enabling teachers and learners to choose "…the relevant learning process rather than being constrained by any given system."(Akeroyd 2005). Key players in the University soon realised the need to join forces to somewhat bravely embrace current developments and issues about system integration and interoperability that support learning and teaching and communication. The critical challenge was to appropriately inform the selection of any new system solutions with the institution's new enterprise-wide information architecture while also articulating the business needs of teaching and learning support systems so that the architecture enhanced their effectiveness.

The case for an enterprise-wide approach

In May 2004 Neil McLean and Clifford Lynch, released their joint White Paper about interoperability between library information services and learning environments. (McLean, Lynch 2004) This was a comprehensive summary, without deep technical treatment, of the aspects about which collaboration was necessary if professionals supporting learning

environments were to realise the expectations of teachers and learners in an increasingly online world.

They wrote:

> A growing expectation of making information resources available with an additional layer of service is becoming more ubiquitous. It is becoming less acceptable to have a range of resources available via different interfaces with a low level of interconnectedness. (McLean, Lynch 2004)

Their paper included issues for instructional management and library management as well as broadening the agenda to issues for digital object management and identification of common services that apply to all these activities. They spoke of an e-learning environment beginning to demand user-driven management of learning content – beyond the embedding and linking of information assets to specific packaged learning activities towards the ability for users to pull information into their online activity via a system designed to respond to their immediate information needs.

This was the ILMS being redefined as part of a larger framework for managing information across the educational community because it had something in common with other information management components in an e-learning environment – description and storage of information objects, allowing users to search for and request them, to manipulate them and restore them elsewhere. The case for interoperability appeared to be a more pressing need than an option. The challenges were clear and to what extent a single educational institution can realistically expect to exploit any of the available solutions in a coherent plan is the subject of much current literature. The 2004 VALA conference theme of *Integration and Interoperability* is just one example.

The Nature of the e-Learning Environment

Teaching and learning practices are increasingly using information and communication technologies to structure and deliver content and manage learner-teacher interaction. This ranges from the basic ability to access information from the World Wide Web using search engines such as Google, to using web-based applications to integrate and present specific learning activities, embedding links to journal readings and other web-based resources, employing mechanisms for synchronous and asynchronous communication, providing administrative features such as assessment lodgement and enabling intuitive management of a range of content formats. But the real value of this technology for teachers is its potential to encourage relevant learning activities. (Biggs 2003)

Many educational institutions employ systems to manage course delivery online. These systems are variably termed learning management systems or virtual learning environments. Learning management systems provide tools for authoring and publishing content, managing administrative information, presenting information resources and facilitating communication**.** From the teacher's perspective, learning resources or content often extends beyond highly-structured traditional published material. Van Weigel makes an impassioned case against learning management systems as supporters of the behaviourist pedagogical approach and asks where are the systems that facilitate student development through discovery-based learning and provide the ability to create and modify learning "assets". The Wikipedia is

highly successful example of a system that provides individuals with the opportunity to dynamically create and preserve knowledge. (Weigel 2005)

Teachers creating learning packages would like to navigate a 'learning resource' universe. Teachers, as information users, want to customise their work environment as much as learners. Along with the integrated system view required for information managers (such as librarians) and for information users, other users of 'learning content' - curriculum developers and educational designers - also could benefit from the same 'seamless' view of this information environment. Academic staff are beginning to appreciate the value of digital learning object sources such as EDNA, AEShareNet and the Australian-New Zealand Learning Federation. (Long 2004) and LMS vendors are widening their offerings to include content management modules using middleware and standards-driven data structures to facilitate importing content from these external repositories into the LMS.

A more recent item on the wish-list is the ePortfolio – an electronic record of the learner's journey that showcases their intellectual experiences and achievements as well as recording how they took that journey in terms of inputs such as course documentation and outputs such as assessments. Any investment in this service depends at the very least on secure archiving and permanent URLs. The course or unit-centric approach of many LMS works against individual learners building such a portfolio.

LMS have sometimes been criticised for delivering such feature-rich commercial software that the product becomes a closed system for e-learning support and the LMS users have little control over the nature of e-learning processes and their management. (Siemens, 2004) ILMS have been candidates for similar criticism by library staff, who feel so constrained by the complexity of exploiting all available functionality that the system ends up determining the operational processes rather than supporting local requirements. (Skretas, 2005)

Akeroyd, in a 2005 review of the interface between e-learning, digital libraries and learning content, posed two reasons why an institution would want to flexibly manage learning content: potential re-use of material and provision of an institutional archive. (Akeroyd 2005) An enterprise-wide requirement to support online learning needs mechanisms for managing the structured content usually managed by the Library and the less structured content – course notes, images, sound files, etc. Hidden behind these apparent benefits of storing and re-using this content are the complex technical issues with object visibility across disparate systems, intellectual property management, granularity and federated resource discovery. (McLean, Lynch 2004) Creating metadata is time-consuming and so is ensuring its quality, whether it is done by information specialists (librarians, publishers, records managers) or by the creators of the works. There is a return-on-investment decision to be made about which objects to describe at what level. (How often will course notes need to be re-used?)

Many academic libraries are already using a number of technical solutions to expose structured information to the LMS with the aim of streamlining information discovery and access. This may be with an API (such as Docutek) outside the ILMS to create online reading lists - with links to a range of digital resources as well as links to drive searches in the OPAC - plus a federated search and link resolver (such as ExLibris Metalib and SFX) and an adapted cataloguing module or in-house application for electronic-use registration that may also act as facility to upload local and published digital content into a repository, recording copyright compliance status at the same time.

These are often very labour-intensive services requiring construction of 'pages' for each unit offered in a teaching semester, scanning the content, registering it for e-use compliance and embedding the URL into the LMS site – the last step perhaps being done by academic staff because there may a philosophical resistance to permitting Library staff access 'inside' the LMS course site. (Secker 2005) Some academic staff simply upload content into the LMS site because this reduces the risk of students becoming 'lost' when they click on embedded URLs that can take them, in a new window, off to third-party content sources (such as the Library's e-journals webpage or a publisher's web site). Once inside the learning management system, the Library-created page may be behind a button so the resources the Library can expose are only an optional click.

Library information resources are often are out of view when students are interacting online with the university via the learning management system. If academic staff simply paste the URL of the Library's electronic reserve service into the course notes on their LMS site, as a virtual reading list facility, learners may be completely oblivious to the other library-provided gateways to information resources that support their studies. Learners are increasingly likely to only 'reach' the Library via a portal that provides library access as only one of the options for seeking information relevant to their learning activity.

Both school leaver and work-skilled learners now expect their learning experience to be enabled and enhanced by a range of communication technologies. They are increasingly disconnected from the traditional academic library because useful and convenient alternatives abound via the internet. The nature of information access in daily life has significant impact on student expectations in a learning environment. The message is very clear in recent literature and well summarised throughout Educating the Net Generation, edited by Diana Oblinger and James Oblinger and published online in 2005 by EDUCAUSE. The Net Generation are mobile, manage different aspects of their lifestyle easily with the aid of communications technologies, are focused on personal development and will seek learning experiences that meet their specific needs. They are comfortable with maintaining relationships online and learning by exploring. When seeking information, their preference for the internet over books, newspapers, radio and television develops an expectation that most useful information will be easy to find, come in short, digestible packages and be a combination of text, sound and graphics, preferably with some interactive functionality. Today's successful learning environments depend on a response to this contextual and social change as much as they depended on responding to the development of the personal computer a generation ago.

The feasibility and challenges of an enterprise-wide approach

Initially, the challenge appears to be how to integrate the systems that support the administrative, content and collaborative requirements for e-learning systems – what can be termed as the ILMS, LMS and LOMS (learning object management system). The catch-cry is fast becoming 'forget integrated systems – it's time to embrace interoperability'.

In simple terms, integrated systems communicate and share data by means of software that allows data to be stored, manipulated and explored within contiguous information architecture. When that data needs to supplemented by data from another system, or needs to be exported to be used by another system, a process of 'translation' or 'mapping' occurs so that data in the 'language' of one system can be read by the 'language' of the other one.

Interoperability is about the data itself being 'described' so that a 'common service' can access it with less dependence on the translation process. The information architecture of the 'common services' drives the integration of the data rather than the capacity of each system to translate it. The 'services' allow the 'content' (metadata and digitised information) to be requested and delivered, and allow users to discover and view it. Ironically for interoperability to work at the system level, most of the hard work has to be done at the data level. The calibre of interoperability, real or virtual, depends on the standards used for data description and data exchange – SCORM, OpenURL, .50, CORBA for example – many of which have been developed by those working in the separate worlds of libraries and educational technology. Through the work of various groups generating frameworks for interoperability – such as COLIS, OKI (Open Knowledge Initiative), and IMS - we have become aware of the complexity of the work required to make these various digital environments interoperate.

'Common services' is the term for self-contained, reusable software components that interoperate over different technologies.

> The death-defying common functions, which can be used across library and nonlibrary services in service of a common user interface. (McLean, Lynch 2004)

They are designed to support interoperable interactions over a network and rely on open standards for interoperability, allowing services from different software products to be integrated and reusing components of those products.

An enterprise-wide information architecture for common services to support e-learning is expected to provide a robust solution to include rights management, archiving, and at the very least, the means to bring all an institution's learning resources, local and remote, under one "discovery" mechanism. (Akeroyd 2005) Many of the functional requirements for interoperability are common to the needs of libraries and learning management systems, - identification, presentation, metadata harvesting and distributed query. (McLean, Lynch 2004) It is the variety of ways these functions have been implemented in ILMS, LMS and LOMS (or not been addressed at all!) that underpins the technical challenges in achieving interoperability between those systems. Many aspects are not well addressed by ILMS - user authentication, rights management, relevance ranking of content from disparate sources and e-commerce transactions. (Payne 2000)

Some current responses to interoperability requirements

Vendors are attempting to develop their systems in response to these new expectations for a 'one-stop-shop' facility to manage digital content that spans the management of structured and unstructured learning content. ILMS vendors are offering digital object repository modules and LMS vendors are offering electronic reading list modules. At some point, where the complexity and lack of interoperability become resource-intensive, one asks whether a single system should be expected to deliver the range of requirements. (Maquignaz, Miller 2004)

One current example attempting that delivery is Sentient DISCOVER. It comes close to addressing McLean and Lynch's real-world e-learning scenarios. It supports OpenURL and Z39.50 interoperability standards, provides some ability to search library catalogues, has an OpenURL resolver and it operates in a frame from within the learning management system. However, it is not seamlessly integrated with the LMS and the operator can lose track of their original workspace – in the same way a searcher using a link resolver can lose track if they need to navigate via a native interface because the information's source is not OpenURL compliant. (Richardson 2005) Recently reported at AusWeb 2005, Sentient DISCOVER v.2 is being trialled at Griffith University as part of the Learning@Griffith initiative to better support enterprise-wide e-learning management. The drivers for Griffith University are no doubt the same for many institutions– the number of files representing information content that are being uploaded by academics to the LMS, the digital duplication of content already available in the library's licensed databases and the impossibility of enforcing copyright compliance. (Richardson 2005)

The literature, especially in North America, tends to avoid issues about ILMS core functionality relative to LMS and DOM systems at the enterprise level while the literature from the UK appears to embrace it. For example, The Joint Information Systems Steering Committee (JISC) has funded a series of projects about the integration of electronic libraries and virtual learning environments (the UK term for learning management systems). (Joint Information Systems Committee 2003)

The trend away from long winded 'comply – doesn't comply' technical specifications as the core of the ILMS procurement process is growing. (Hopkins, Richardson 2004) The process undertaken by the University of British Columbia is a widely reported example. Their RFP deliberately focused on campus wide strategies for system support of administrative, teaching and research activities. It included requirements for interoperating with a portal, a single-sign-on system, and ID card systems but it did not go as far as including management of digital objects created or sourced for inclusion in learning activities. (University of British Columbia 2003) UBC has since joined the EduSource Canada initiative focused on the creation of a network of linked and interoperable learning content repositories across Canada. (http://www.edusource.ca/english/home_eng.html) and in January 2005 reviewed its LMS in terms of interoperability with their new ILMS and institutional digital repositories.

Metadata

Many academic libraries are providing links between LMS course sites and the library electronic reserve system (as part of the ILMS or as a separate application). This can work well for resources already within the control of the library. However, when the institution turns to the library to provide the same level of service for material not get digitised (or which doesn't use MARC as its metadata schema), the overheads of developing and sustaining the necessary digital repositories and access services can be crippling. The University of Auckland implemented a mechanism for connecting specific relevant information resources with course sites in the learning management system. Staff soon realised that the labour to provide this level of service was unsustainable. Their solution was to construct a 'knowledge base' outside the ILMS, using OpenURL standards to 'link' to information resources located elsewhere. In theory, this meant that no-one was encroaching on anyone's else's 'work space'; a single entry in the knowledgebase could be linked to

multiple course sites and all interactions for the purpose of sourcing learning content were brokered outside the existing system territory of the ILMS and the LMS. (Flaherty 2005)

Another option for enhancing interoperability is Open Source compliant software where the software (free or purchased) includes the original code so that it may be modified for local use. The benefits include low-start-up costs, greater flexibility to meet local operational requirements and system development driven by local user needs rather than commercial offerings. MyLibrary and Koha are successful implementations of Open Source ILMS products. (Chawner 2004)

The potential disadvantages of Open Source software include the level of technical support and staff skills needed to reap these benefits. Library staff without ICT training may require a working knowledge of Linux, Apache, PHP and Perl. (Cargile 2005) Vendors do offer Open Source products – WebCT is Open Source – and this can benefit the stability of a product. Access to critical code means that many people are checking it to ensure it works and fixing it if it doesn't. (Balas 2005) If there is no one in an institution prepared to be responsible for developing the software for local requirements, the system may at best be a vanilla-flavoured.

The Procurement Plan

In 2001, Sarah Currier, writing about the INSPIRAL group of projects in the UK (Investigating Portals for Information Resources and Learning) posed a critical issue for institutions wanting to blend their library and learning environments.

> "Who in a given institution will control the funding and management of these wonderful new online learning experiences? How will academics, librarians and IT professionals begin to work together as partners in these endeavours?"(Currier 2001)

The desired return on investment, at the enterprise and business unit levels, was improved quality of service via the appropriate technical tools, for all functions that support e-learning. Attempting an enterprise-wide approach clearly meant a partnership at the enterprise-level was necessary.

The University already had several digital archives comprising research publications, learning content and local resources such as theses and content scanned on request for specific LMS course sites. The key to harnessing the potential of all these digital repositories for seamless exposure to learners is how that content is described and stored. Undertaking that work to enhance interoperability requires a range of expertise – librarians, educational technologists, course designers, ICT staff and teachers. (Akeroyd 2005) It was a reasonable expectation, in a single organisation, that this expertise would be applied so all manner of digitised information was available for teachers and learners without them knowing where it was stored, without knowing how to use different mechanisms for discovering it, and having found it, without having to negotiate multiple technical gateways to use it.

With so many desirable requirements for interoperability, the updated enterprise-wide information architecture needed to contribute some foundation capabilities before proceeding to evaluation of the available ILMS, LMS and LOMS solutions. There were clear

instructions that any new systems were not to be ICT labour-intensive. The days of writing in-house code to facilitate data exchange with other enterprise systems were over. So a number of the options for establishing and maintaining an in-house integration layer (such as free Open Source software and in-house development of APIs) were all but closed. But how far could the commercial vendors meet our desire for interoperability within a framework of common services?

Happily, there were few organisational barriers to collaboration. The Library and the Technology and Educational Services (TEDS) were units within the Division of Learning and Teaching, reporting to the Pro-Vice Chancellor (Academic) who had a clear vision about e-learning. The individuals directing the units had already collaborated on other initiatives and were both members of a university-wide advisory committee for learning and teaching development.

Two steering groups were formed – one for the LRMS (ILMS plus LOMS incorporating all aspects of digital object repository management) and one for the LMS. The directors each chaired a steering group and each was a member of the other's group. Each steering group reflected the depth of expertise required to specify the unique business requirements of library and e-learning management processes. However, to ensure that 'common services' requirements were indeed considered in common, the requirements documentation for the LRMS and the LMS would have some common requirements for standards-compliance at both the data-structure and content-description levels and for interoperability with the enterprise-wide information architecture services such as access management, rights management, and ecommerce transactions.

New approaches to the RFI Process

An important tool for maintaining collaboration across the units involved in evaluating the options was an agreement to talk about shared goals in terms of user experiences. Prior to specifying requirements at the functional level for a formal tender document, the initial Request for Information to potential vendors would include "scenarios" describing types of learning and teaching interactions and ask if and how the vendor's system could contribute to these outcomes. For example,

- Students experience a holistic view of learning content that is capable of being explored laterally and vertically without the sense that multiple systems are being used;
- Teaching and learning activities are supported by standards-driven integrated management of all print/media/digital information resources;
- Academic staff can locate required content, easily incorporate it into a learning activity, with copyright, access and license status verified or harvested or short-term licenses brokered online;
- Library staff can conduct the business of sourcing, ordering, paying, cataloguing/indexing/configuring and providing access to content by re-using verified data throughout the workflow, including importing and exporting data with other university systems;
- Content authors (university staff) can efficiently create, publish, aggregate, manipulate, discover and archive 'learning objects'.

The players helped each other by taking the time to explain, first to each other and then to their respective staff - concepts and processes about their core business functions and their own profession's current response to e-learning requirements. This often forced people to be absolutely clear in their thinking and communication – a discussion between an educational technologist experienced in harvesting content from an external learning object repository such as EDNA and a librarian experienced in configuring a federated search engine such as Metalib to retrieve citations and link them to content requires some patient facilitation before they understand each other's world let alone realise they may have something in common. A shared glossary of terms was one of the first 'tools' created by the steering groups to enhance communication and reduce misunderstandings.

The steering groups participated in each other's development of requirements specifications - by using the same reference groups for enterprise-wide common service requirements and by encouraging reference groups to keep the 'big picture' of the e-learning environment in sight while considering functionality for business functions. They planned to use quite standard methods to gather information about user needs and business needs to inform the system specifications. A survey of academic staff enlisted their desirable and essential needs in an LMS and reference groups were formed based on broad functional areas to document specific business needs.

The significant deviation from standard practice was the scope of the terms of reference for groups informing the requirements specification. They focused on the e-learning environment rather than the core business of the existing organisational units and the groups included representatives from the variety of roles involved with e-learning - online teachers, LMS trainers, educational technologists, library staff, course designers, computing systems staff, and website developers. The "Inquiry Reference Group" includes staff from the Library and the corporate web management unit in ICT Services. The "Access Reference Group" has library staff responsible for circulation and document delivery joined by an academic staff member who uses the electronic reserve service extensively in their LMS sites and a Technology Services staff member responsible for LMS training. The "Resources Management Reference Group" includes staff managing electronic journal access and an educational technologist who helps academic staff design new courses for online delivery. The "Learning Objects Management Reference Group" includes staff responsible for copyright compliance, a graphic designer who manipulates learning content and several academic staff who are already using external learning content repositories as they create learning activities. It fell to the "Interoperability Reference Group" to consider the business requirements articulated from the other reference groups and define the required or preferred method of interoperability. The plan was that staff looking at the acquisition of structured and unstructured content would not have to concern themselves about how the nature of the content allowed it to be discovered by the LMS. It was the role of the Interoperability Group to look at the business processes for acquiring content and translate that into criteria for data storage and harvesting.

Another shared activity was the briefing of all staff who were being asked to contribute to the procurement process. A number of ILMS and LMS vendors were invited to make a presentation to the members of the steering groups, reference groups and senior University staff. The expectation was that the reference groups would find it easier to communicate if they had at least some shared knowledge and that the final tender specifications would be much more realistically informed. A general invitation was also extended to the wider University community not only to be as inclusive as possible about opportunities for input but

to encourage an informed awareness about a serious attempt to improve the quality of learning support. The presentations were intended to be an educational opportunity, to bring all the participants up to date with the current offerings across the ILMS, LOMS and LMS markets.

At the time of writing, the process is only in its first stage –awareness-raising of the project participants and University stakeholders. The logistics of maintaining effective communication and documentation between the participants is eased by the physical characteristics of the university (a single campus), the location of the main stakeholders and players within a single organisational unit (the Division of Learning and Teaching) and the shared vision of the Pro-Vice Chancellors ranging across teaching and research.

Conclusion

The University of Canberra intended to test whether multi-system procurement focused on improving the quality of the total e-learning experience would indeed result in a much more usable, functional and interoperable e-learning environment.

Attempting to bridge the gaps between library, digital repository and learning management systems requires attention to both the functional and technical attributes of the component parts and a perspective beyond the subsystems to the enterprise-wide information architecture, the 'common services' that support the interaction between teachers and learners. (Long 2004) In an institution where core business is learning and where technology is expected to seriously support that core business, attempting to procure a single product that tries to cover every business function in the e-learning environment is unrealistic. Even while many of the tools for interoperability are still in development, the e-learning agenda demands closer collaboration between organisational units when decisions are being made about how they manage the information relevant to their services.

When an educational institution has the opportunity to review all the system requirements for the support of e-learning, an enterprise-wide approach at the very least should provide a framework to ensure that each technology-dependent business function within that environment is well informed by the principles of interoperability. Integration of the effort being made by staff providing the services is now a more powerful success factor than integration of system functions.

The hypothesis is that the will and the means to collaborate is as vital a success factor as the opportunity to align the technologies. It remains to be seen if this is proven as the University progresses with its plans.

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