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Web 2.0, Personal Learning Environments, and the Future of Learning Management Systems

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Overview

There is growing awareness in higher education of student levels of engagement in Web 2.0 environments, in contrast to their engagement in the learning management systems (LMSs) hosted by their institutions. Social networking sites, blogs, and wikis offer students unprecedented opportunities to create and share content and to interact with others. These sites are used regularly by the majority of students[1] and provide possibilities for customization and a sense of ownership currently impossible in LMSs. Lecturers increasingly complain of the distractions caused by the dynamic and compelling social networking sites their students use during lectures.

By contrast, it has not gone unnoticed that even the term *learning management system* suggests disempowerment—an attempt to manage and control the activities of the student by the university. There are various questions at this time for faculty and university information technology staff who believe in the benefits of e-learning and need to decide whether their LMS remains an appropriate medium in which to facilitate it:

- Can we bring some of the social networking facilities that students find so appealing inside the institution?
- Should we use tools hosted elsewhere on the Internet by others?
- Should we simply allow learners to select appropriate tools for themselves?

The communication features of LMSs are poorly utilized in most institutions, the LMSs being used primarily as storage facilities for lecture notes and PowerPoint presentations. LMSs tend to restrict students to content designed for a particular course and to interactions solely with participants in that course. Stephen Powell suggested in his blog *thoughts mostly about learning* (http://www.stephenp.net/) on June 14, 2006, that using LMSs in this way may consequently promote a culture of dependency rather than autonomy for our students. The shortcomings of LMSs may, however, have as much to do with institutions' lack of understanding about how to facilitate learning with them as with the inadequacies of the systems themselves.

This research bulletin details the arguments emerging in the blogosphere and elsewhere both for and against the LMS.[2] It examines whether the LMS is destined to continue as the primary means of organizing the online learning experience for university students. The bulletin is a companion to an earlier ECAR research bulletin that examines the factors leading to the selection of the open source learning management system at the Open University in the United Kingdom.[3]

Highlights of Web 2.0, Personal Learning Environments, and LMSs

Most learners are entering universities with increasing experience of the online world and competence in using social software in their leisure (or professional) activities. It has been suggested that learning providers cannot hope to compete with the developments that are happening so rapidly elsewhere on the Internet and that students will

consequently find LMSs and the tools within them inferior to those they are already using freely on the Internet—both in their look and feel and in the amount of functionality offered.

There is continual pressure on college and university computing service departments to make available familiar open source tools such as MediaWiki (the wiki system behind Wikipedia) and WordPress (a popular blogging system). These tools are feature-rich and already in use by many faculty who are often highly technically literate, visionary, influential, and prepared to make their opinions known widely in the blogosphere and elsewhere. They point out that the facilities in the LMS are more limited, and they either use these tools freely on the Internet or ask why the institution does not simply provide these systems for teaching and learning alongside the LMS. Even when the institution agrees to host such facilities, it can take a frustrating amount of time for the software to be installed, customized, and integrated with existing systems, and its use may be restricted in ways deemed unsatisfactory to teachers.

LMSs are relatively inflexible systems, with the standard organizational unit being the "course"—a term inappropriate for the hierarchy of faculties, departments, subject areas, programs, courses, modules, and other organizational concepts found in educational institutions. The Open University of the Netherlands, for example, does not have cohorts of students with fixed start and end dates and therefore has problems with a conventional LMS organized on this basis. Meanwhile, universities wishing to provide courses jointly with other institutions or businesses may find the license restrictions of commercial LMSs to be an impediment.

Rather than being minor irritations, the features of LMSs may overtly or subtly align the institutional processes with the software rather than having the systems serve the requirements of the institution.[4] An alternative but equally damning criticism of LMSs is made by Martin Weller in his blog *The Ed Techie* (http://nogoodreason.typepad.co.uk/) on September 4, 2007. Weller believes that when LMSs are adapted and integrated with institutional systems they may end up embodying institutional practices, stifling the innovation encouraged by the use of more rapidly evolving Web 2.0 systems.

Personal Learning Environments

Much of the debate regarding the shortcomings of LMSs is taking place in the blogosphere, and a good deal of it centers around the concept of a personal learning environment (PLE).[5] Proponents of PLEs agree that there is a need to harness the power of a range of tools, services, and content outside of the institution that learners can use during their studies. The movement diverges in three distinct directions, however, when it comes to the implementation of a PLE. The first group[6] argues that client software can be developed to mediate between the learner and the many resources and facilities on the Internet. A second group, which includes initiatives such as Elgg (http://www.elgg.org/), is attempting to achieve this by providing sophisticated web servers and enabling participation by learners via their web browsers without additional software. Finally, some people argue that PLEs are essentially here already and that many online learners already make effective and customized use of a range of online facilities.

The PLE as Client Software

One motivation for developing tailored PLE client software is that if students are to take ownership over their learning they must own the software that manages it; the software should not sit on a server controlled by an institution. A second argument for this approach is that until we have near-ubiquitous online access, many students will sometimes find it necessary to learn from their computers or mobile devices without being connected to the Internet. The system cannot, therefore, be solely based on a web browser with assumed Internet access. One vision of the PLE comprises a piece of coordinating software seen by the learner that interacts through web services with a variety of educational tools and data sources inside a service oriented architecture.[7]

The client PLE group argues that open source PLEs will emerge, as will vendor products, and that learners will be able to download the PLE of their choice. To deal with the issue of how PLEs interact with institutional systems, Derek Morrison suggested in his blog on June 2, 2006, that the learner may request that his or her PLE "docks with a VLE [virtual learning environment] mother ship" every so often to refuel—that is, to bring in content and submit its own to the wider world. A student learning with more than one provider would be able to dock his or her PLE into other institutional "mother ships" as appropriate.

A PLE of Multiple Externally Hosted Systems

An argument is increasingly being voiced that institutions should no longer try to provide e-learning facilities for their students and should instead tap into free resources on the Internet. In a blog entry on October 6, 2006, (http://remoteaccess.typepad.com/remote_access/2006/10/small_pieces_ve.html), Clarence Fischer reports on the use of different systems for blogs, wikis, podcasts, instant messaging, e-mail, and photo sharing with his students. The multiple systems accessed through a web browser PLE model encourage learners to draw the best from every environment. They also arguably reduce the institutional risk of a single point-of-failure, where a crucial system such as the LMS or authentication system going down can mean that all student-facing systems are inaccessible. However, Fisher has serious concerns about this approach because his students are required to remember multiple URLs, usernames, passwords, and user interfaces. It is clearly not a robust or scalable solution for larger institutions, particularly where students are paying for services and the systems are critical in the assessment process.

Online facilities such as Elgg provide blogs, wikis, and other facilities for self-organized groups of students and avoid the problems of tools distributed across multiple sites. Elgg bears similarities, though, to the evolving LMSs that increasingly incorporate social software.

Is the PLE Already Here?

It is worth considering what tools students require to carry out their studies effectively. Many already have laptop computers that are networked at home and connect wirelessly to the Internet at their place of study. These machines have large hard disks and

hierarchical file systems allowing them to store vast amounts of learning content as well as their own work. Systems such as Google Desktop allow them to search and retrieve data on their machines using the familiar Google interface. Familiar office software includes applications for word processing, e-mail, calendar, spreadsheet, database, and presentations.

The web browser gives access to learning materials either via the institutional LMS or from the growing repository of free content. It draws administrative information from the learning provider, such as course syllabi, reading lists, times and locations of classes (online or face-to-face), examination timetables, results, and so forth. It is the window to a massive range of social software and communication facilities, some provided by the institution, most of them available elsewhere. Dictionaries, thesauri, scientific calculators, and all the other necessities of a learning environment can be found online. Another particularly effective tool is Google search, which, in a blog posting on June 1, 2006 (http://project.bazaar.org/2006/06/01/personal-learning-environments/), Graeme Atwell argues facilitates learning more than any other. Additionally, emerging e-portfolio software is set to provide a vital bridge between the content on the user's hard disk and central storage and backup facilities hosted professionally.

Effective online learners know how to make the most of the services available and may resist further client software to mediate on their behalf. There is strong evidence that students now see the personal computer as their primary learning tool, and this can be regarded as a de facto PLE.[8] Research demonstrates that learners are increasingly comfortable switching between a wide range of tools and sites, making simultaneous use of locally installed applications, books, and the Internet, and participating in a variety of online and face-to-face communities of practice.

Proponents of PLEs, motivated by a lifelong and informal learning agenda outside the boundaries of current institutionalized education, attempt to position PLEs as a replacement for LMSs. The whole PLE debate can indeed be seen in this light: the PLE as a concept (in the sense of the range of digital tools at a learner's disposal rather than as a concrete system) being appropriate for—and already used extensively by—the lifelong and informal learner. Mark Van Harmelen, in Seb Schmoller's blog *Fortnightly Mailing* on June 8, 2006, identifies the underlying motivation behind PLEs and their fundamental limitation, which is that they "can only be used to full advantage with a fundamental change in pedagogic practice [including] greater autonomy, diversity, openness and connectedness" (http://fm.schmoller.net/2006/07/personal_learni.html). Josie Fraser, in a comment on *Stephen's Blog* on September 11, 2006, also finds the key aspect of PLEs to be the "conceptual shift/challenge the model represents to mainstream education" (http://artemis.utdc.vuw.ac.nz:8000/pebble/2006/09/08/1157664630904.html). Ironically, while the PLE is portrayed as a way to reduce central control, it is itself an attempt to systematize and bound the vast, dynamic, anarchic set of tools and resources to be found on the Internet.

In contrast to the client software approach, the web browser presents the most significant learning tool ever devised in terms of its ability to provide access to a vast range of tools and content and to connect learners to each other using a single interface. The browser continues to develop as the primary tool for news, entertainment, business, commerce, administration, and communication. Any attempt to devise systems that mediate between the learner and the outside world through means other than a web browser is risky. Additional client software imposes an unnecessary burden on institutions and students, and locally installed systems will have to be trivial to install, configure, and maintain if students are to use them in addition to or instead of institutionally supported LMSs.[9] The Horizon Project Wiki in 2006 suggested that support issues could be unmanageable for institutions where students using one of a variety of proprietary or open source PLEs are required to interact with tutors and other members of a course group. While independent learning is an admirable aspiration, many learners will continue to require considerable hand-holding in the online learning world. Leaving the management of their formal learning activities entirely up to them will result in increased drop-out rates.

PLEs and Web 2.0: A Reality Check

In addition to the installation and adoption difficulties already discussed, there are two further fundamental assumptions in the client PLE approach. First, there would need to be a high degree of interoperability between the various systems. PLE open source developers and vendors would have to agree on a set of common interoperability standards, and *these would also need to work with LMSs*. There is, however, limited adherence to current standards by e-learning system vendors, which often have good reasons for ensuring that their systems are not interoperable.[10] Even mainstream product vendors cannot agree on how their instant messaging systems should work together.[11] This is mirrored in the open source arena, where widely adopted systems such as Moodle have as yet failed to integrate many key e-learning standards and specifications. PLE interoperability therefore currently seems a utopian vision.

The second assumption of the client PLE approach is that learners can be technically responsible for looking after their own learning materials. Many of them will in fact fail to back up this content on their home devices, and a large proportion of it will be lost, particularly in the lifelong learning context, where there are multiple opportunities throughout life to lose or damage hardware and data. Docking on a regular basis with some kind of “mother ship” is therefore going to be critical for the lifelong learner, whether the service is provided by the state, the current educational provider, or a commercial third party.

PLE advocates also fail to provide a solution for how PLEs can be applied in the existing institutional context of learning organized into units with specified content and learning outcomes, scheduled assessments, and classes in which a discrete group of students interacts with a teacher. These units are grouped into qualifications that increasingly

incur a financial cost to the student and years of ensuing debt theoretically mitigated by enhanced employment prospects.

The LMS Fights Back

Milligan argues that the LMS is "a conservative technology [for] managing groups, providing tools, and delivering content."[12] Given that formal education remains in strong demand from learners, is supported by governments throughout the world, and is unlikely therefore to disappear in the near future, there will continue to be a need for online systems that provide administrative functionality, such as allowing students to register and pay for courses, and provide information, such as course descriptors, syllabi, reading lists, class times, examination dates, and results. Centrally hosted systems are also required for the submission and marking of assignments online—and the return of marked scripts to students. LMSs can be used to restrict access to content and services for those enrolled in the course and to group learners together with the teacher allocated to them, encouraging frequent contact throughout their studies with a single set of robust communication tools. The correct list of online contacts for the course should be set up automatically for the student in the LMS. This is already a considerable challenge for institutions responding to late registrations, and it would be an unacceptable burden on students if there were no data transfer between student record systems and online learning systems.

LMSs enable institutions to ensure a consistency of service for students and backup facilities, particularly for e-portfolio content and lifelong learning records. Recent doubts about the viability of a hosted service for Elgg, expressed by commentators such as Brian Kelly in his blog *UK Web Focus* (http://ukwebfocus.wordpress.com/) on December 16, 2007, demonstrated the vulnerability of leaving the provision of core educational services to third-party suppliers with whom the university has no contractual agreement. LMSs also allow institutions to protect minors against unsuitable materials and permit the removal of pornographic or copyright-infringing materials and defamatory, racist, or otherwise illegal blog entries. In addition, institutions have moral and legal responsibilities for accessibility of learning content and services; it is difficult to ensure that these are met adequately unless systems are centrally hosted.

The real costs of supporting multiple "free" online learning systems, whether hosted in-house or externally (usually funded by advertising) are regularly underestimated. Most universities have built up considerable expertise in their LMSs and the ability to keep on top of the developments happening to those products. It would be a complex task for information technology and computing service departments to maintain a similar understanding of a broader range of open source products, their functionality, code base, and release cycles. There is also resistance from many of the less technically literate faculty (and some students) to being expected to use multiple systems with varying interfaces.

Offering products with widely differing user interfaces that have not been checked for accessibility and usability may be inadvisable. The integration possible in a single LMS allows a forum contribution or a blog entry to be transferred instantly to the e-portfolio, for example, or a term appearing in the glossary to be highlighted within the forum, blog,

quiz, or any other module. Achieving such integration across multiple, continually evolving systems would be a highly complex and costly software engineering task. In addition, with an LMS, there is no need to replicate user databases or access permissions across multiple systems, and the user need authenticate only once. Finally, it is far easier to track usage from the single database of an LMS than to have to trawl for data through the databases of multiple e-learning systems—and this may be impossible if the systems are externally hosted.

How LMSs Must Evolve

There are ongoing debates as to what an LMS should consist of and where the boundaries lie with content management systems, e-portfolio systems, search facilities, synchronous collaboration systems, and student portals. At the Open University (OU), these five systems, together with an electronic tutor-marked assignment system, are clearly delineated from the LMS, although the aim is to provide a unified interface for the students and give the impression that they are accessing a single system.

The e-portfolio system called MyStuff, developed at the OU for Moodle, is a good example of the debates that take place. Development of the system began shortly after the decision to implement Moodle was made. At that time, there was skepticism among some developers about whether Moodle would prove to be sufficiently robust and scalable for the OU (no longer a concern). While there was an institutional push to build the system as a Moodle module, the developers wished to build a system that could be sustained even if the institution changed its LMS at some stage in the future. MyStuff was therefore built to be fully integrated with Moodle but also able to be run as a stand-alone system, if necessary.

Meanwhile, another e-portfolio system for Moodle called Mahara was being built with funding from the New Zealand government. The architecture is similar to that of MyStuff, although the feature set is different. There is a proposal to allow both systems to be plugged into Moodle but to keep them out of the core architecture of Moodle. There are no rights and wrongs about whether such systems should be part of an LMS or left out of it, but there is a concern that Moodle may become bloated with too many features and that certain large pieces of functionality are better left as separate systems.

MyStuff draws from social software innovations elsewhere and allows learners to store and tag content and to share and discuss it with others. Any educationally useful feature of a Web 2.0 system can potentially be incorporated into an LMS, although the smaller cohort using it (based around an institution or a course rather than a global set of users) may restrict its usefulness. The key question is not whether LMSs can or should evolve into collections of the social software tools found elsewhere on the Internet but *what is the most appropriate context of use for the learner at that particular time?* A student in a software engineering course might use a university-provided wiki for tasks relating to that course, a proprietary wiki for collaboration with colleagues in their workplace, and Wikipedia for leisure pursuits. These systems are likely to differ at the functional and user interface levels. Effective wiki users know the basic features of a wiki, however, and should be able to master a new wiki system rapidly. Bringing these different arenas together via a mediating interface may have some value for the learner but will not

always be necessary or appropriate and may result in a lowest common denominator of functionality.

It is possible that the LMS will evolve into more of a management information system, working away in the background, with its information exportable to a variety of other systems under the control of students who wish to view it in environments they prefer. LMSs may therefore increasingly have to allow data to be exported to and imported from other systems. There is likely to be a core set of functionality, however, that the institution will have to continue to provide for the reasons described earlier, including for the many faculty and students who prefer to access learning and administrative content via consistent, simple, institutionally hosted systems.

E-Learning Standards

If data are to be transferred increasingly between the LMS and other systems, then the further development of e-learning standards by standards bodies is crucial. The implementation of interoperability standards is a key element in the checklist when an institution is selecting an LMS. One of the main drivers behind standards is so that universities will not have content stuck in proprietary formats in case they wish to change their LMSs in the future. However, the adherence to standards by most vendors is less than perfect, and there are serious problems in exporting content from most LMSs into platform-independent formats. Open source LMS communities arguably have no commercial interest in stopping institutions from moving to a different LMS that may ensure the institution's future viability. Ironically, however, there is often little inclination in open source communities to implement learning technology standards. Why should a Moodle user, for example, care about content becoming trapped in Moodle when it is unlikely that his or her institution will switch to a commercial system after it has enjoyed the advantages of an open source product? So long as the content can be extracted from the system in some XML format, it should be relatively easy to transform it into a different format for a system with more or less the same functionality. Does it matter, therefore, whether Moodle properly adopts interoperability specifications?

Meanwhile there are encouraging efforts to develop social networking interoperability standards, such as Google's Open Social, which promises to allow the transfer of data such as contact information freely between different sites. This will have implications for evolving LMSs where there is a desire to exchange data with other systems.

Distributed LMSs

Learning technologists—such as Martin Weller in various postings to his blog—argue that LMSs as large applications are unsustainable. Weller says that the future is a range of components built by different organizations that interact with each other over the Internet (or intranet) via web services. These components will operate as a distributed learning environment. The e-Framework for Education and Research (http://www.e-framework.org), the focus of a large amount of investment from government-funded bodies in the United Kingdom, Australia, New Zealand, and the Netherlands, is an attempt to tackle the interoperability issues and to build the underlying architecture of a distributed LMS. The development

of different applications within the framework is being funded. The concept is that if an institution wants to change the forum system it is using, for example, it can plug in a different one, and the distributed LMS will continue to appear as a single system to the user. However, there are considerable logistical issues to overcome with this approach. The e-Framework is also beginning to look like a monolithic model itself, where the implication is that institutions will still control the student experience in the way that LMSs arguably do currently.

The e-Framework is an interesting concept, and many of its building blocks are now in place, but it lacks certain key features of a successful open source community. Successful communities tend to be led by charismatic individuals such as Linus Torvalds or Martin Dougiamas who have the skills and personality to harness the efforts of others to enhance the product. Such leaders understand the entire application, insist on optimizing the performance of the product at every opportunity, can spot new requirements and ensure they are fulfilled, and are natural leaders.[13] There is no such guru to follow for the e-Framework, but, even more fundamentally, the framework is composed of many unmaintained pieces of code written by different individuals using a range of languages and technologies through projects with temporary funding. Unlike the foundations of Apache or Linux, there is no common purpose that motivates developers and users continually to enhance a system of key importance to themselves or their institutions.

Moving On from Course-Based LMSs

As stated earlier, the course-based metaphor of the LMS is only appropriate in certain educational contexts. LMSs need to be able to support the concept of sub-courses, such as tutor groups, and meta-courses in which learners can be enrolled in addition to their individual courses. Students may have finished one course and not be ready to start the next one, but they still wish to be part of a subject community, retain contact with other students, and continue to have access to domain content. These groupings are very much under the control of the institution, which may not always be able to put students together in the best way or allocate the appropriate tools to them.

In an attempt to make the LMS more flexible, appealing, and useful to students, the Open University is working on a fundamental change to the architecture of Moodle from the students' (and tutors') points of view, allowing them to set up their own forums, wikis, blogs, and other tools and to invite others to join them in ad hoc groupings—in addition to those provided for specific course purposes.

Offline and Mobile Access

Virtually no student has the Internet available 100% of the time, and PLE advocates are right to argue that there is a need for offline access to learning services and content. As more interactive course content, administrative features, and formative assessments become available online, and as students engage more with others through forums and blogs, they will become increasingly disadvantaged if they do not have reliable Internet access. A few LMSs have offline client facilities that allow learners to continue to access critical parts of their courses at times when they are not connected. Students can then

make forum postings, carry out an online assessment, view a calendar, or play a podcast. When the student next logs in to the Internet, the client computer synchronizes with the institutional LMS system. The drawbacks of supporting client software have already been mentioned, but the LMS will increasingly need to be accessed offline and will require associated client software. In addition, students will expect access to educational content and services via devices such as mobile phones; LMSs must therefore present content acceptably on small screens, and institutions will have to design content with this in mind.

University Use of Social Networking Sites

Some universities are encouraging the use of the social networking site groups set up in their name, many of which are not under the direct control of the institution. There are convincing arguments for this approach: it reduces the burden on the institution for hosting the service; students are using sites such as Facebook anyway, so why not have the institution represented where the students are going; and these sites are likely to be more dynamic, up-to-date, and engaging than systems hosted in-house. However, there are dangers for institutions in giving implicit or explicit approval of such sites. A high-profile newspaper article[14] outlined some of the drawbacks of social networking sites, and these concerns should be clearly pointed out to students where institutions are encouraging the use of groups set up in their names. These drawbacks include intrusive advertising and the fact that private information posted to these sites can potentially be used for commercial purposes. Online student profiles are being actively sought out by potential employers, who may use inappropriate content as a reason for not recruiting the students.

There are emerging attempts to integrate LMS functionality with social networking systems such as Facebook. These concentrate either on drawing information out of Facebook and into the LMS or providing LMS facilities inside Facebook. The latter is a more popular option because it is believed that if students are highly engaged in that environment, it makes sense to provide them with educational facilities in the medium where they feel most comfortable.

However successful these experiments may be, it is evident that some students do not necessarily want their education—which they may see as quite a separate part of their lives—to mix with their social environment. Moreover, while learners will continue to use the environments they find most engaging and useful, institutions need to be careful that they do not lose the opportunity to track what students are doing. If they fail to record valuable data on how students are using learning tools and content, it will be far more difficult to enhance the courses and provide remedial assistance to learners with difficulties.

Key Questions to Ask

- What is the appropriate blend of in-house and externally hosted online learning systems for my institution?

- What are the support implications of using free software either hosted externally or on local servers?
- What legal, technical, and other issues should be incorporated in an institutional strategy for the integration and use of social networking sites for our students?

Where to Learn More

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