Factors in the deployment of a learning management system at the University of the South Pacific

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This paper describes how a new Learning Management System (LMS) was introduced into the University of the South Pacific with the aim of improving teaching and learning. The development process from test and selection of the platform through to project planning, gathering of political support within the institution, technical factors, the design and roll out of training, the impact and consequences, the growth and future prospects of the platform are discussed, with a focus on the university's redesigned online law program. The paper concludes with the main lessons learned, emphasising the point that the process was characterised by a lack of a formal process or deployment model *per se*.

Keywords: LMS deployment, management, law online, Moodle

Introduction

The University of the South Pacific is the only university of its type in the world, and the introduction of an online learning management system there was, in turn, a unique experience. The university is jointly owned by the governments of twelve island countries: Cook Islands, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu and Samoa (Figure 1) and offers almost 400 educational programmes through distance and flexible learning with a variety of media at fifteen campuses in the region. USP has been a worldwide pioneer in this area since the early 1970's.

Figure 1: University of the South Pacific region

USPNet, a satellite-based communications network, is used to reach over 10,000 students across the vast expanse of the Pacific Ocean. Distance and flexible learning students are provided with a mix of printed materials audio and video cassettes, CDs and DVDs, the Internet and live access to lectures and tutorials taking place at the main Suva Campus through video conferencing and broadcasting.

In 2006 the University converted USPNet into an IP-based system, so that all communications and data exchange would use a common standard platform based around Internet technologies. Until that time, the University maintained a variety of different analogue and digital technologies in a patchwork network.

One particular legacy, which is the focus of this paper, was that the University hosted three different online Learning Management Systems (LMS): a customised *Plone*-based content management system that served the Faculty of Arts and Law, called *EDISON*; the commercial *WebCT* system that hosted courses in education and other fields; and the open source *Moodle* system, that served the school of computing and information sciences.

Of fundamental importance to the University is the performance of its students and the quality of teaching and learning it provides. Maintaining three different Web-based LMSs was perceived as illogical and as having a negative impact on the overall effectiveness of teaching and learning, particularly to students in the distance and flexible learning mode. In this context, it was decided by the University's senior management that a process of evaluation and selection, testing and implementation of one single University-wide LMS was required. This paper reports on that process as a case study, drawing on evaluations, expert interviews, survey results and focus groups. The methodology used to prepare this paper is based on a case study approach and is reported in terms of key driving factors.

Literature review

The number of courses offered online at the university has grown rapidly, even though the processes for implementing online courseware do vary widely. In the US, according to the National Center for Education Statistics (Waits & Lewis, 2003), in 2000-2001 more than 56% of four-year colleges and universities offered distance education degree programs. In the academic year 2000-2001 for example, there were an estimated 3,077,000 enrollments in all distance education courses offered by 2-year and 4-year institutions, most were offered online (Phipps, 2004). At USP, online courses are expected to grow exponentially. As of 2007, USP's bandwidth consumption tripled in size in the last seven years, while the number of online ICT-based courses available to students is projected to grow almost 200% per annum, from 78 in 2007, to over 600 by the end of 2010, which will represent 75% of all courses offered by USP (Whelan, 2007, in press).

In this context, LMS deployment requires specific planning and attention. Different institutions have approached LMS deployment and integration differently. Some researchers take a pedagogical-theoretical perspective. For example, Papastergiou (2006) discusses and evaluates LMS usage from a social constructivist framework, emphasising the increase in workload on faculty and the limitations in terms of assessment and collaboration that such a theoretically-driven approach demands. Other researchers have reported on specific problem-solution approaches. For example, Gibbons (2005) discusses macro versus micro strategies for the integration of library resources into an LMS, discussing the pros and cons of each. A broader approach was taken by Ulmer and Leech (2005), who showed how to address university policy, federal guidelines, end user requirements, and technical potential within a single LMS solution.

Nevertheless, successful long term LMS implementation depends on addressing certain critical success factors. McPherson and Nunes (2006) addressed this aspect of LMS implementation, and using focus group interviews, identified leadership, structural and cultural issues, design issues, technological issues and delivery issues as being most critical. They concluded that stakeholders are prepared to embrace LMS introduction, but not if it adversely impacts their profession and their careers. They argue that if LMS implementation is to be successful, the university "must manage the change process by proposing and agreeing goals through consensual debate, supporting strategies appropriately and then realising these through common commitment" (2006, p. 1). This finding was reinforced by the work of Doherty and Honey (2006), who emphasised the key role that lecturers play in the LMS integration process.

By contrast, some researchers have noted the lack of clear driving principles in LMS integration. Pratt (2005), for example, discusses the introduction of LMS platforms into Australian universities in terms of "the lack of critical examination of their merit to these institutions, leading in some cases to wasted resources, unfulfilled expectations, program and organisational failures" (p. 1). Pratt describes the introduction of LMS platforms skeptically as an example of "management fashion".

Indeed, many countries without fully developed infrastructure, services or educational facilities face specific problems related to LMS deployment. At the University of the South Pacific for example, the 12 member countries vary widely socio-economically, and thus in terms of the availability of technical expertise and capacity, ICT infrastructure, policy development, learner support, management competence,

workflow and processes. Thus, the deployment of an LMS takes place across one institution but in a dozen very different contexts.

Given the range of possible approaches to LMS deployment, from theoretical or problem-driven, factor-based or management-dependent, this paper reports on another institutional experience where a range of specific factors, including those cited, came to define the LMS implementation process.

Choice of LMS platform: Factors and process

After a two-year 'beauty contest' involving a range of alternative LMSs (including *A-Tutor* and *Sakai*, aside from the *WebCT* and *Plone* systems mentioned above), and amidst ongoing resistance of the University's senior management to officially commit to its own stated policy of one single LMS platform, the *Moodle* LMS was selected to be the core LMS platform. The main reasons why the University considered *Moodle* to be the best candidate were based on its pedagogical fitness for the University's course delivery purposes, the extensive adoption of the platform by educational institutions around the world, and the overall usability, reliability and functionality of the platform.

Fitness for purpose

Moodle (Moodle, 2000) has been designed from the ground up as an online learning delivery tool to support a full range of teaching and learning activities conducted by universities and educational institutions (Dougiamas, 2000). It is based on a social constructionist approach to education that integrates a host of tools for online content creation and collaboration with a varied set of social and communication tools that support teacher-student, student-student, and teacher-teacher interactions[1]. *Moodle* allows learners to contribute to and collaborate in the learning process, while also being flexible enough to support outcomes-based learning and teaching. The LMS supports flexible testing and assessment, and ready access to grading and assessment information. *Moodle* thus provides a complete set of tools that help support the University's mandate to deliver high-quality education at a distance in the Pacific region.

Large, rapidly growing installed user base

The LMS has also been rapidly adopted by thousands of educational institutions and a worldwide community of open source developers. *Moodle* currently has over 15,000 registered sites worldwide, with over half a million courses, almost 60 million students and over one million teachers. There are 175 registered *Moodle* sites larger than 5,000 users. The figures on *Moodle* usage continue to grow rapidly, with a 10-15% increase noted in only the last few months.

In the broader field of distance learning, the UK's Open University is building a comprehensive online learning environment using *Moodle*. The £5 million programme will be meeting the needs of their 200,000 distance learners. The OU has pledged that "the innovations added by the OU will be available to the entire *Moodle* community" (Open University, 2005).

Belonging to such a large Open Source community has benefits and opportunities such as the sharing of technical expertise, especially in a regional context. According to the Pacific eLearning Observatory (2007), many of the University's regional partners have already adopted this platform. In the Solomon Islands, the University's Campus in Honiara is collaborating with the People First Distance Learning Centres Project to bring computer and Internet access to remote students. The LMS chosen was *Moodle*. Other institutions in the Pacific that have chosen Moodle for their LMS include the National University of Samoa, the Oceania University of Medicine, and the planned Australian Pacific Technical College.

Moodle platform

Moodle is noted for its usability and intuitive interface, and it supports various automated personalised services that are easy for faculty and students to access, create, deliver and present. The platform is a widely-tested, high-availability system, allowing tens of thousands of learners, faculty, and administrators to simultaneously log in and carry out their daily tasks. *Moodle* is interoperable with international and industry learning materials standards, and is IMS and SCORM-compliant This means *Moodle* will support content from different sources and multiple vendors' hardware/software solutions, for the

[1] Moodle's design is in line with best practices in eLearning http://en.wikipedia.org/wiki/Moodle and http://docs.moodle.org/en/Philosophy

authentication of users, enrolment, and for content such as reusable learning objects, quiz questions and forum discussions.

Selection process: comparative evaluation

As part of the LMS selection process, a comparative evaluation survey was conducted on18 features of the two top-choice LMS systems, *Moodle* and *Plone*. A survey was designed and delivered to students and staff users of each system. The survey questions addressed, for example, students' experience of uploading their assignments, finding help, taking tests, searching for materials and navigation, on a 1-5 Likert scale.

Data was analysed from groups of 116 students each for the *Moodle* and *Plone* systems. The survey was limited in that no students used both systems, so no direct comparison was possible, and there were a number of uncontrolled contextual variables such as server specifications, but the overall findings were nevertheless decisive. On each of the 18 categories, Moodle scored significantly higher than Plone at $p<.001$. The overall average scores for Plone were 2.6, and 3.7 for Moodle (Figure 2).

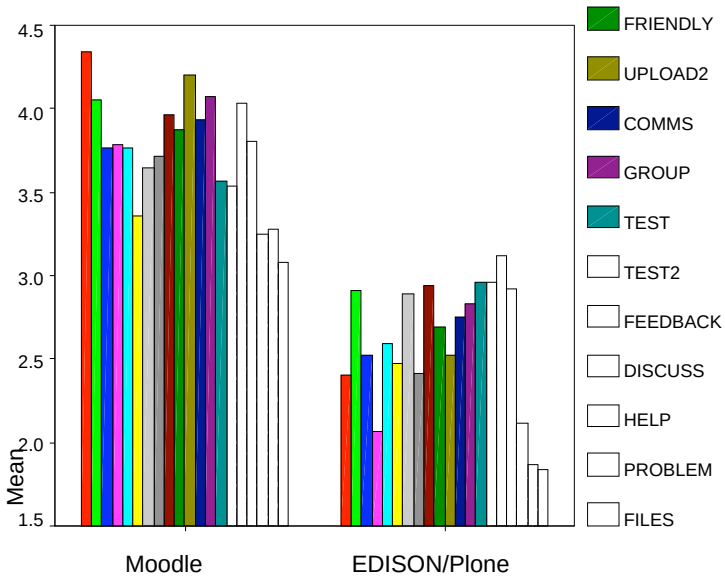

Figure 2: Ratings by students of the two LMS systems on a scale of 1-5

Large effect sizes in the differences between the two LMSs were noted with students' experience of carrying out important tasks and functions ($r2$=.256), logging in to and out of the system ($r2$=.388), saving and uploading assignments (r=.342), working well individually or in a group in the system ($r2$=.218), and finding help when a problem arises (r=.271). Faculty members also completed the survey and differences in the results were more marked. On overall average, *Plone* scored 1.8 out of 5, and *Moodle* 4.3.

In focus groups with *Plone* staff users, the issue of access speed was a major factor affecting perception of the system, causing an estimated 12hrs per week in lost productivity, while software-related problems were also noted with regard to creating, saving and editing documents, files and folders; managing tests and assessment; managing communication and discussion; understanding the student's view of the system; navigating to important system functions; saving and uploading files (including assignments); and finding help. Interviewees also noted the absence of a range of useful pedagogical tools in the *Plone* system.

Technical factors and server architecture

As mentioned, the university's satellite network has evolved since the early 1970's from a basic telephony and data transmission service into a complex patchwork of 14 international sub-nets delivering point-to-multipoint video and audio conferencing, internet connectivity for the delivery of course material, local and general online services, as well as telephony and other data services all now based, as

of 2006, on the IP standard. Up to 50 live satellite-based tutorials are currently delivered every week to 14 distant sites in 12 Pacific countries.

The choice of infrastructure to support the new integrated LMS was driven by the need for 24/7 uptime, speed, scalability, flexibility, reliability, cost-effectiveness, ease of maintenance and the preference for open source software. A common platform serves diverse needs across a vast area of the Pacific.

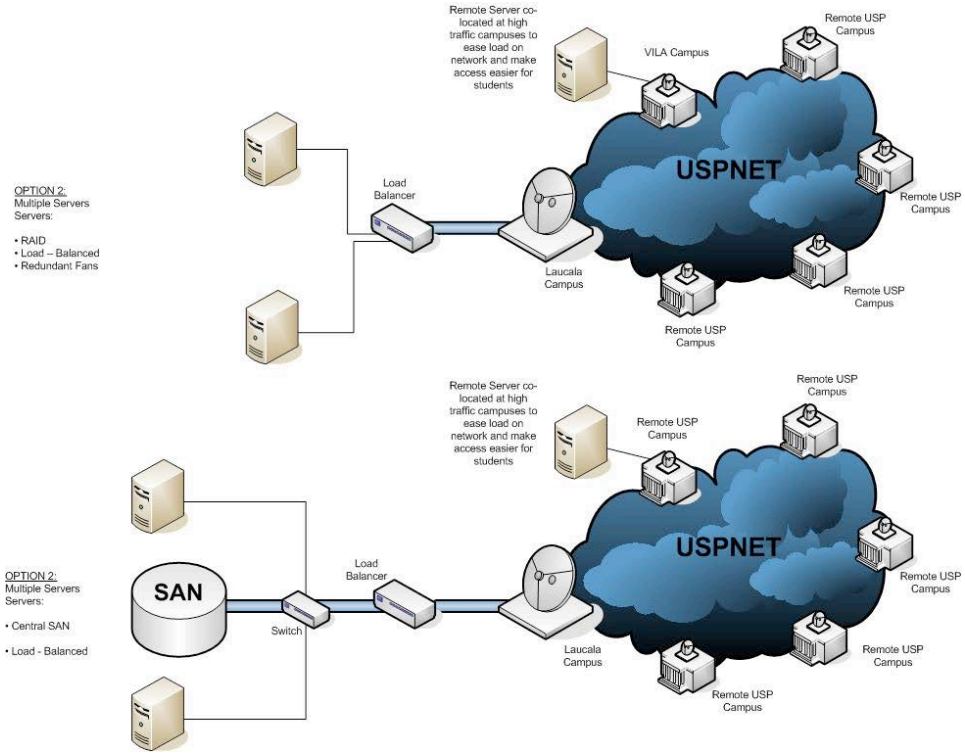

Figure 2: USPNet architecture schematic

The University's main campus is the heart of the platform, serving all sites and countries. The core systems are housed here, and the platform's backbone Internet service via the *AARNet* Australian Academic Research Network is enabled via the *Southern Cross* undersea optic fibre cable. This link provides direct access to research and education networks in Australia, North America and Japan via AARNet's interconnection points in Sydney, Hawaii, and Seattle - and from these to the global research and education community worldwide. The other 13 sites of the University network receive their Internet connectivity from the main campus.

At present the *Moodle* LMS server is based in the main campus (Figure 2). It is a standalone IBM x3650 *eServer* with two dual-core *Xeon* 3.2Ghz processors, 6Gb of memory and four 146GB hard disks. This server was tested with a variety of operating systems and client software and it was found that using a complete family of open source software brings additional advantages in terms of integration and reliability. *Moodle* is best designed to run on *MySQL* and *Apache*. These come with *Linux* as core services but for *Windows*-based services it is necessary to perform extra installations and run the platform as a secondary service. Furthermore, open source platforms offer increased security with less likelihood of malicious attacks on *Linux* than on *Windows*. Thus, *Linux Centos* was chosen as the open source OS, with the *MySQL* database and *Apache* web server. *Firefox* was installed on the university's 1,000+ client PCs.

Building political support

The LMS coordination team used the findings of the evaluation to mount a 'grassroots' effort to win over support for the *Moodle* platform. Conversations with lecturers, other individual deans and members of the senior management group, combined with 'road show' visits to the faculties, helped to bring about a general consensus about the advantages of *Moodle*. It also became essential to engage support from the top down, by persuading the vice-chancellor of the University to agree to endorse the LMS coordination team's findings. This was a key critical success factor (McPherson & Nunes, 2006).

As soon as this decision was made, and the official endorsement made by the University's vice-chancellor in an 'all-users' email, the University then embarked on an institution-wide change in workflow, skills development, and implementation process needed for moving all courses online by 2010.

Planning the costs for the training, infrastructure, monitoring and evaluation, management and support of transitioning to the new LMS was a complex project in itself. International aid moneys made available to the University were to be used, in combination with existing departmental resources. However, to make matters more difficult, a political coup in the country affected the University both directly and indirectly, and brought about a recasting of financial priorities and capacity management at the institution. Nevertheless, the general 'mainstreaming' of the distance and flexible learning mode was recognised as a matter of overall priority, and support slowly grew enough to guarantee financial support for the project, although the release of budgets to support the LMS implementation was a process fraught with delays.

Project management

The LMS coordination team moved forward on implementation and addressed the main challenges facing the LMS project. One vital challenge was *time*: the senior management group of the University was determined to see positive results from the LMS project and was itself under pressure from the governing council of the University to improve the overall quality of teaching and learning.

Another constraint was human resources. Several hundred existing online courses had to be migrated and rebuilt in the *Moodle* LMS – with a limited number of educational technologists and instructional design staff, with undetermined financial resources, few or no formal policies in place, a large-scale training programme yet to be designed and implemented, and without any exemplary precedent or model as to how to proceed in this uniquely vast geographical and political landscape.

Given the University's developing environment, the evolving infrastructure, and the relative lack of coordination and control structures, the LMS coordination team faced a complex and challenging task. Regular bi-monthly meetings were held with the team, consisting of senior departmental managers, technical managers, instructional designers and ad hoc input from specialists, senior library representatives, open source software project managers and other experts from across the institution.

The issues addressed by the team during this period included: how to design and implement a new set of policies on the use, ethics and maintenance of the new LMS for students and staff; how to define, procure and deploy a technical infrastructure that would meet the University's ballooning LMS requirements and bandwidth resource planning in a future-proof (5-year plan) way; how to define and roll out training programmes (face-to-face, online, and media-based) that meet the needs of new *Moodle* users at the University; and of course most importantly, how to provide pedagogically effective instructional design that would help to ensure that senior University managers would be satisfied that the quality of student performance was improving and the project was worthwhile.

In this sense, the LMS project was an axis around which University reform and the improvement of teaching and learning could revolve. This was a key point. The LMS itself was not a silver bullet that could improve student performance by itself, but it was the catalyst that would underpin much-needed reform and improvement in teaching and learning.

Having said this, no formal model of LMS deployment was explicitly used to support the work of the LMS coordination team. The geographical, infrastructural, political and institutional factors on the ground gave rise to a working culture where priorities were defined by constraints such as time, human capacity and finance that all but decoupled the project from the specific goal of improving student performance. With senior management facing complex political, financial, communication, administrative and managerial challenges, the model that defined the LMS deployment might best be characterised in terms of urgency, the forced merging of established working practices with a new technology, and the lack of functional capacity in a rapidly if clumsily evolving institutional setting.

Pedagogical factors

The stated policy objective at the University of improving student performance by improving the quality of teaching and learning was a response to high attrition rates, particularly amongst distance and flexible learning students, and remarkably low student performance in many programmes, where 50-80% failure rates are commonplace. The reasons for such chronically low student performance are often debated, and are sometimes even attributed to so-called Pacific cultural traits that define student and classroom

behavior as passive and reactive. When students arrive at University, they are often ill-equipped in an environment that expects curiosity, participation and responsible scholarship. Plagiarism, for example, is widespread in spite of repeated education and warnings about the risks it presents, and some departments at the University routinely report that 90% or more of the student work submitted for assessment is plagiarised. The ease of use of the Internet is a strong contributing factor.

Student apathy, plagiarism, a rigid culture of non-critical thinking and a faculty-centred institution that is too busy to address priority needs combines with the fact that the business of the University, including all teaching, is done in English, which is most students' second, third, even fourth language. The quality of language skills varies widely across the University's geographical region and students face different types of challenges with respect to their language capabilities when they begin their studies. At the very least, language fluency has an impact on the quality of students' work and creates an additional challenge in terms of pedagogic achievement.

With these kinds of challenges, it was believed by the LMS coordination team that the new platform would be an invaluable aid for renewed support of students and an emphasis on improved teaching and learning across the University. *Moodle's* use of classroom metaphor, its sophisticated support for interaction and collaboration, especially in group-work, its support for conventional file management as well as its general ease of use would at least set the best possible conditions for the broader improvement of student achievement and performance. One key pedagogic aim is to go beyond the use of an LMS as a document repository, and to use the USPNet as an *interactive* learning system, where the emphasis is on student communication, activities, collaboration and exchange in one-on-one, group and class settings.

Once again though, it can be noted that no explicit pedagogical implementation model was utilised in this regard. Although the LMS is perceived as an axis or fulcrum for change, the deployment process was driven by urgent top-down political pressure, and by management that did not always understand the implications or the affordances of the technology.

Training the trainers, choosing 'champions'

As mentioned, for the University's 3,000 staff and 20,000+ students needing training on a new platform, the LMS coordination team faced a priority task with complex difficulties at the political, geographical and budgetary levels. In addition to the need to provide users of the system with adequate training, there was also a lack of skilled expertise to provide the training, and a common feature of well-trained individuals in developing countries is that they are more likely to emigrate if they have more marketable skills.

Nevertheless, the LMS coordination team began the process of designing and developing appropriate course materials to train first staff, and then students, in the pedagogically effective use of *Moodle*. Courses were designed for beginner and advanced users, as well as for system administrators. This involved drawing from existing *Moodle* training materials and localising them to suit the needs of the University, with special attention given to the particular types of existing online learning, the activities, the assessment and other learning conventions in place at the various faculties. This process took approximately one year from inception to the successful training of 'champion' staff. Student training began when *Moodle* was launched.

The lack of sufficient numbers of expert staff, tight budgets, and the vast geographical distribution of the University allowed it to benefit from the development of a fellows system, whereby enthusiastic lecturers were seconded on a half- or full time basis to work with the LMS coordination team to provide support on the ground to their colleagues, usually in remote locations in the region. This created another 'champions' system for the LMS project that effectively extended the reach of the LMS coordination team while allowing it to effectively focus its available internal resources and provide much needed support for less enthusiastic or less technically adept staff.

Case study: The Law School

The University, as mentioned, includes 14 campuses in 12 countries. The main campus, Laucala, is in Fiji. The Alafua Campus in Samoa is where the School of Agriculture and Food Technology is situated, and the Emalus Campus in Vanuatu is the location for the School of Law. In fact, the law school has been offering online courses for several years, and therefore the new LMS platform has a particular impact on this school.

As a remote campus, the law school has evolved a somewhat different set of working practices, values and culture. Consequently, it is not directly involved with the work of the LMS coordination team and special attention of the team was focused on providing support for the law faculty to begin effectively using *Moodle*. In many respects, the law school became a case study for the LMS project in terms of training, course migration, student achievement, and the fellowship scheme mentioned above.

Almost one year prior to the official adoption of *Moodle* across the University, the LMS coordination team appointed a representatives to the law school to lead workshops about online instructional design, to support the law faculty and to determine the needs of the school with respect to the new LMS. A year later, when the LMS decision had been made, a series of scoping and training visits began, and a full time staff member associated with the LMS coordination team was seconded to the law school to support the course migration process. At the same time, a fellow from the law school was appointed to function full time as instructional designer, staff liaison and LMS 'champion'. The instructional design of law materials presents specific challenges to the LMS coordination team because of firmly established academic conventions in the field and the set way of 'doing things' that the law school had itself evolved over time. In this way, organisational coordination intersected with instructional and pedagogical factors.

Moreover, the law faculty were, by their own admission, battle-weary lecturers who had spent years struggling against inadequate Internet infrastructure, poor departmental communication, poor management, and the range of side-effects typically associated with being a remote 'outpost' far from the institution's heart and headquarters. Thus, some 40 law courses were already being offered online within a disliked LMS platform that created pressure on the existing infrastructure while generating extraneous obstacles. For example staff and students were forced to use the system as an online library where materials need to be individually reformatted and then printed, rather than as a purpose-built learning management system.

Because of the challenges of working within the old LMS and its inadequate infrastructure, lecturers were in fact obligated to be efficient and precise without knowing that they were earning invaluable online teaching skills through the experience. The 'battle-weary' lecturers had found innovative solutions to online teaching problems, had banded together to share their solutions in relative isolation from the rest of the University, and had overcome the limitations of the LMS to such an extent that they had built a solid base of implicit knowledge.

For the LMS coordination team, the aim was to extend the capacities of the law faculty within the new LMS. A basic 18-month project plan was designed to migrate the courses into *Moodle* in a way that was at first familiar, but that presented the broadest possible scope for innovation when the courses themselves came up for revision (a standard feature of the distance and flexible learning course development process at the University). The emphasis was on moving away from placing course materials such as readings and topic guides online in library format – they would be delivered as printed materials – and using the new LMS for *interactive*, communication-based collaborative work.

The overall process of change in teaching and learning catalysed by the new LMS was ultimately to take place over a three year period. Each course and each lecturer were individual and treated on their own terms, but within a broader context of 're-branding' and redesign of the law courses in line with the core aims of the LMS coordination team to improve student achievement. Once again though, no formal or detailed model for *Moodle* deployment was used. Rather, the process was reactive, trial-and-error, and constrained by the need to adapt to existing working practices.

Impact and consequences

The initial response at the University has been a rapid uptake and steady stream of requests for *Moodle* course environments. Indeed, the LMS coordination team found it necessary to limit and to not advertise the new LMS because of the interest from staff who wanted to experiment with it. It was felt by the LMS coordination team that quality control and process management – whatever form it might take – should come in tandem with the formation of policies on best practices and pedagogical effectiveness of course development in the new LMS.

At the same time, the University and the LMS coordination team were acutely conscious of the digital divide experienced by its students. Urban students, who may be better-off economically, were more likely to have computers at home with Internet connections, whereas remote, rural students enrolled in the same course were often without shoes and text books, let alone electricity or a computer.

The LMS coordination team, also faced difficulties in developing a coherent policy for use of the LMS by students and staff. This reflected the nature of a rapidly changing system with little or no formal deployment model and sparse, overloaded managerial priorities at the top level of the institution. The consequence of the lack of a policy for University use of the LMS led to confusion and inequity at times, as problems and questions were dealt with on a case-by-case basis while the LMS coordination team formulated its positions in relation to emerging patterns of needs. One particular concern was the policy with respect to instructional design consistency, where pedagogical strategies were designed on the fly.

The University faced ongoing concerns about bandwidth control. With a private satellite network, the institution is responsible for all traffic across the wide area network, and must pay penalties if the bandwidth cap with AARNET is exceeded, up to hundreds of thousands of dollars per annum. On analysis, some students were found to be downloading movies, music, games and other content unrelated to education. The University then implemented a data cap for each student, and began monitoring student usage, charging them for excess use. In turn, this cap affected the amount of digital content within each LMS course, and a process of analysing and negotiating appropriate bandwidth requirements for any given course was orchestrated by the LMS coordination team. This is crucial to the long term viability of the LMS offerings by the University, as the goal of moving all courses online becomes more pressing.

Finally, integrated with the LMS project is a new programme to measure student performance. This is in line with the University's needs to demonstrate improvement in student achievement and teaching and learning. As mentioned though, it raises the broader issue faced by the LMS coordination team: how to address such a complex issue through the relatively narrow prism of a new LMS. Student achievement depends on a range of variables and the LMS, as an 'axis for change', may be able to address some of these concerns, but meaningful improvement can not be addressed through one 'silver bullet'.

Future steps

The LMS coordination team has begun a process of adding customised plugins for the LMS to support improved collaboration, information retrieval and mobile services. Plans are also being finalised for the implementation of next-generation mirroring architecture across the region, to reduce bandwidth bottlenecks and distribute the load of content delivery closer to the student. Ever-increased bandwidth demands requires continued forward planning and management to keep costs down while providing an improved service to LMS users. In terms of infrastructure, the University is also planning to increase access to computer labs by installing more machines in more locations.

Most importantly, the University has embarked on a comprehensive evaluation of the impact of its LMS in terms of teaching and learning quality and student performance. This includes analysis of results and performance indicators, the use of focus groups, interviews and survey-based evaluations, all taking place within the overall framework of the University's "quality audit". Specific data mining tools such as GISMO (2007) will be used to analyse LMS usage patterns.

In this way, the LMS has been implemented as a lever for broader improvement in teaching and learning. In some respects the process followed a formal process in terms of critical success factors, pedagogic needs and problem-solution demands. In other respects however, the process was marked by the pressing demands of time and money, the constraints of political exigencies within a complex institution, and a general initiative to invent a unique service almost entirely from the ground up.

Top priorities now will be to continue to formulate a clear strategic vision and plan, model student, faculty and institutional needs for the medium and long terms, and prepare wherever possible for needs in advance. Even without the benefits of any specific implementation model, *planning* has proven to be the key to successful deployment, and if there were only one lesson to draw from for other similar projects carried out beyond the walls of this University, it would be that top-level management must agree not only to a clear vision for change, but also to a specific implementation plan that will concretely deliver that vision.

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