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Learning Management Systems for the Workplace

A Research Report

Michael Winter

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Core Education Ltd

PO Box 13678

Christchurch

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Executive Summary

This report investigates the use and suitability of proprietary and open source learning management systems to support online and blended learning in New Zealand workplaces. The need for this study arose out of Christchurch Polytechnic Institute of Technology (CPIT) and Tertiary Accord of New Zealand (TANZ) experience with the Blackboard and Moodle learning management systems (LMS) for workplace delivery. Blackboard is a proprietary system, and Moodle is free open source software.

The report considers literature on the experience of facilitators, administrators and learners with using Blackboard and Moodle to support adult learning. It then describes research on user experience within New Zealand. The examples studied relate to programmes for management training in the public sector, and to support literacy tutors employed by the Workbase organisation. Data was also obtained on user experience of Interact, a locally developed open source learning environment.

Blackboard offered certain features which were lacking in Moodle. These included a drop box facility which supported users working in two locations, and a real time whiteboard function. However, Moodle was considered more user friendly, customisable and engaging. It was designed to support learning as a social event, and learner centred approaches. Moodle architecture is modular in nature. The Moodle development community includes the New Zealand Open Source Virtual Learning Environment project which has received several e-Learning Capability Development Fund (eCDF) grants. It is also involved in developing links to supportive software such as resource repositories and portfolio applications. The development community is large and global, and able to produce software solutions to fill both perceived gaps between Moodle and other LMSs, as well as innovations requested by users as their experience and expertise in e-learning develops.

Blackboard was initially designed to support programmes at US institutions. Blackboard has a large number of users and installations worldwide. Its original architecture was instructor centred and hierarchical. Blackboard has recently introduced social learning tools and some degree of modularisation with its Building Blocks feature. However, the Building Blocks modules are not available with the basic version of Blackboard, and is only available with the much more expensive Enterprise version (Tyler-Smith, 2006). It is perceived as being somewhat rigid and inflexible, particularly in terms of technical support and responsiveness to development and innovation in the New Zealand context.

Interact is a locally produced, open source learning environment. It is designed to support learning communities. However it has a small number of installations, mainly in New Zealand schools, and development is handled by the Interact Development Group at Christchurch College of Education (CCE).

Licence costs for Blackboard are significant. A typical cost for the basic version is \$16,000p.a. The more sophisticated Enterprise versions can cost up to \$80,000. There are no costs to install Interact and Moodle. All three LMSs require time to be allocated for installation and maintenance. In addition, there is a need for user support.

Sustainability of a Blackboard installation is likely to prove no problem for the foreseeable future. Ongoing costs include the annual licence fee, and the costs of maintaining and updating hardware to enable it to keep up with new versions of the software. Costs for open source solutions include labour for installation and maintenance. In all cases there will be a cost of preparing material for the LMS.

Blackboard has recently been granted patents to cover online learning, and has commenced

litigation against another commercial LMS company. This has changed the character of the LMS world.

In the absence of the Blackboard patents, the evaluator would recommend Moodle as an appropriate LMS for online workplace learning in New Zealand. In the light of the present situation, he cannot unequivocally make that recommendation. Organisations are advised to weigh up the implications of the Blackboard patent before making their decisions on learning management systems.

Introduction

Online and blended delivery of training and professional development is an important feature of the contemporary workplace. A wide range of corporate, public and educational organisations use ICT to support the education of their workforce. Online education has the advantage that learners can access learning without the expense and disruption involved in attending courses at a particular geographic location.

In New Zealand, TANZ, in conjunction with the Public Sector Training Organisation (PSTO) and Christchurch Polytechnic Institute of Technology (CPIT) have developed a number of blended programmes for workers, including management programmes for public sector employees and meat inspector supervisors. CPIT has also developed a blended programme for training community technicians under the Ministry of Education's (MoE) COMTEC project. TANZ is also involved in an online literacy tutors' support programme for Workbase, a workplace literacy organisation.

Such online programmes require some form of learning management system or virtual learning environment to support the teaching and learning process. There is a plethora of such systems available, ranging from proprietary offerings such as Blackboard, WebCT and Desire2Learn to open source solutions such as Moodle, First Class, and Interact.

The question of which software to use for a given educational situation is complex. Factors to be considered include the type of programme to be offered, the preferred pedagogy, the learner profile of the target audience, online accessibility and cost.

The programmes mentioned above involving TANZ and CPIT have been developed on the commercial Blackboard platform, or using the open source Moodle software.

The Researcher

This study has been carried out by Core Education Ltd, an independent e-learning and research consultancy located in Christchurch. The researcher is Dr Michael Winter. Michael has several years experience of carrying out evaluation research on a number of e-learning initiatives, including the TANZ eCDF Level 4 National Certificate in First Line Management Programme, and several Ministry of Education Digital Opportunities (DigiOps) projects. He is also involved with the TANZ eCDF online Level 5 Public Sector Middle management project; and is a research mentor for the MoE e-learning Fellowship programme.

Methodology

The present research comprises a review of the literature comparing various on line learning environments, and a case study of the experiences of users and developers of these environments.

The research proposal went through Core Education's ethical process, which involves seeking ethical advice from members of the organisation's ethical reference group.

Research Questions

The aim of the current research was to answer the following research questions.

1. To what extent are the various Learning Management Systems/Virtual Learning Environments (LMS/VLEs) effective as workplace based e-learning delivery platform?
 - a. What does the literature tell us about the suitability of various LMS/VLEs for use in workplace environments?
 - b. What are learners' and programme deliverers' experience as to their effectiveness?
2. What features do the various LMS/VLEs need to make them more effective workplace learning tools?
 - a. How amenable are the LMS/VLEs to customisation in relation to the above factors?
3. What difficulties or common problems do each of the LMS/VLE interfaces present to the learner?
 - a. What are adult learners' experience of the ease or difficulty of using the LMS/VLEs in a workplace environment?
4. What factors enhance flexibility and ease of use of the various LMS/VLEs for programme development teams?
 - a. What do the various LMS/VLEs enable a workplace based e-learning programme to achieve that the other LMS/VLEs do not?
 - b. What are the experiences of those involved in the design and delivery of learning (educational designers, content writers, tutors, assessors) in using the LMS/VLEs in a workplace environment in relation to the above factors?
5. What would be the features of an instrument which will enable us to select an appropriate LMS/VLE for a particular workplace application?

Question 5 was not addressed during this work. The researcher discovered the existence of a comprehensive online LMS selection tool, (Edutools, n.d.) and that an Open Learning Environment (OLE) comparison chart was under development for the MoE, and the New Zealand Open Source Virtual Learning Environment project (NZOSVLE) had carried out considerable work to select the most appropriate open source LMS for further development. The current researcher did not wish to invest time 're-inventing the wheel.'

Data Sources

Literature Sources

Most of the literature reviewed was obtained from the Internet via searches of Google and Google Scholar. Much additional valuable information was accessed from the Moodle forum. This source was useful for information on the Moodle LMS, and for comparison with Blackboard and other LMSs. Less information was available on line for Blackboard. Interact is a younger LMS than Moodle or Blackboard, and has a much smaller user base. There was very little published material on Interact.

The material published on line was supplemented by a pre-publication article kindly supplied by a polytechnic lecturer who has experience of migrating on line programmes from Blackboard to Moodle.

Interview Sources

A number of semi-structured interviews were carried out with a range of people who use the LMSs, as learners, tutors, or administrators; or who are involved in developing open source LMSs. Sets of guideline questions, based on the research questions, were produced for the different categories of users. Two examples are given in the Appendices to this report.

Interviews were carried out face-to-face or by phone, and recorded, with interviewees' permission. Notes were also taken during interviews. The guideline questions were used as a focus for interview. However, interviews tended to be fairly wide ranging around these questions. In all cases, interviewees' informed consent was sought and obtained.

Data Analysis

Data was evaluated comparatively in order to answer the research questions. Interview recordings were transcribed and compared to the written interview notes. Common themes from different interviews were combined to gain perspective on each of the research questions. A similar approach was taken to analysing written material such as Moodle forum postings, and published articles.

What does the Literature tell us about Online Learning Environments?

Introduction

There is a wide range of learning environments available, based on disparate pedagogical philosophies, having varied business models, and incorporating many features such as discussion forums, drop boxes for assignments, assessment tools and student tracking facilities. Several authors have carried out comparisons between different learning environments. For example, an on line comparison of a total of 65 versions of different commercial and open source learning environments can be found at the Edutools website. (Edutools n.d)

The present evaluation, tailored to the needs of TANZ and CPIT for learning environments suitable for on line and blended delivery of workplace training, studies three online environments. These are Blackboard, a commercially available LMS which has been used by many tertiary institutions both worldwide and within New Zealand; and Moodle, an open source solution which is the subject of an e-CDF project to develop open source solutions for use in the New Zealand tertiary context. The evaluation also considers Interact, another open source learning environment under development at CCE.

There are several studies which compare Blackboard with Moodle, in terms of features, ease of customisation, and suitability for specific groups of users. Interact is a much smaller product in terms of market size, at present mainly catering for the needs of aspects of the New Zealand educational sector. It is included in this evaluation, since it is a local product, and since its design is based on the pedagogy of learning communities. The present evaluator has been unable to find published work comparing Interact with either Moodle or Blackboard, although both Moodle and Interact feature in the draft New Zealand OLE comparison chart (Wenmoth D. 2006). The evaluator has had to rely on discussions with Interact developers and some users. He has also consulted on line manuals for Interact users.

Blackboard and Moodle History

Blackboard

The Wikipedia article on Blackboard Inc, gives a brief survey of the history of the Company. Blackboard was founded in 1997, and began its life as a consulting firm working for IMS Global Learning Corporation. Blackboard merged with Courseinfo in 1998. Courseinfo was formed at Cornell University as a small course management software provider. The merged company initially

produced e-learning products under the Blackboard-Courseinfo name. In 2000, the Courseinfo name was dropped, and Blackboard went public in 2004. A merger with WebCT, a Canadian company, and Blackboard's main competitor in the education market, was announced in October 2005.

Blackboard has many clients in the US public service, and has close ties with the Department of Defense through work with the National Defense University and the ADL Co-Lab which implements the Defense Department's Advanced Distributed Learning initiative. The aim is *to harness the power of information technology to modernise structured learning*

Early in 2006, Blackboard was awarded a patent to cover Internet-based education support system and methods.(U.S. Patent, 2006) Shortly after this, the company started a lawsuit claiming infringement of patent against the Canadian LMS company Desire2Learn (Court document, 2006).

Blackboard's product range now includes e-commerce software as well as applications to manage e-learning and on line communities. In the following discussion we will consider only Blackboard's academic software which consists of

- the Blackboard Learning System - a course management system
- the Blackboard Community System - a community and portal system
- the Blackboard Content System - a content management system

A relatively recent development is Blackboard Building Blocks - which is promoted as an open architecture initiative to extend Blackboard's functionality and ability to integrate with other systems.

In New Zealand, Blackboard has been used by many tertiary institutions as a learning environment , including TANZ CPIT for the Level 4 National Certificate in First Line Management (NCFLLM) and, more recently the Level 5 Public Sector Middle Management programme. Both these projects were developed with the Public Sector Training Organisation (PSTO) for national and local government employees.

Moodle

The name Moodle is an acronym of *Modular Object Oriented Dynamic Learning Environment* (Wikipedia 2006a). Moodle was created in Australia by Martin Dougiamas (2003) as part of a research project to answer the question *How can Internet software successfully support social constructionist epistemologies of teaching and learning?* More specifically, the research was designed to study which web features encourage or act as barriers to community based e-learning. The model of learning underpinning the development of Moodle is firmly based on social constructivist and social constructionist pedagogies. Dougiamas quotes other authors, and states that these pedagogies *focus on collaborative discourse and the individual development of meaning through construction and sharing of texts and other social artefacts.* (For introductions to constructivism, constructionism and social constructionism, the reader is referred to Wikipedia (2006b).) Dougiamas discusses the way that connected learners learn cooperatively, building on others' ideas; and importance of critical self reflection and transformative learning.

Moodle is freely available as open source software, and was designed to be flexible and easy to modify. It is highly modular, and supports a large active community worldwide, including programmers who are continually modifying and expanding its code. Such modifications are incorporated into the main software, and thus the project continually develops and expands to reflect the needs and interests of the Moodle community. Dougiamas' comments that he releases software *early and often*, and sees Moodle as a learning community *which keeps the pot bubbling*

so that people are having fun (sic).

The New Zealand Open Source Virtual Learning Environment Project (NZOSVLE) is an e-Capability Development Fund (eCDF) initiative whose goal is *to collaboratively establish an e-learning platform that minimises the financial, organisational, and technological barriers to sharing resources across the education sector* (NZOSVLE n.d.) This project was started in 2004, and one of the first objectives was to select a suitable open source learning environment to develop for use in New Zealand educational institutions. Over 30 candidate VLEs were considered, and finally three were shortlisted for detailed technical evaluation. These three were Atutor, Moodle and Ilias. Moodle was finally selected for evaluation (Catalyst IT and Open Polytechnic, 2004). The evaluation team cited Moodle's user-friendliness, flexibility, excellent documentation and evolution to meet SCORM standards. Accessibility to developers, and modular architecture were also important criteria. A further key criterion was the existence of a *lively developer community...a second criteria (sic) the other systems fail to meet.*

Currently, work in the NZVLE project continues with the development of e-portfolio tools based on Elgg, a resource repository using ePrints, and an off-line web authoring tool for tutors and students centred on Exe.

Interact

Interact is a free, open source learning management system, originally developed at Christchurch College of Education, from the LearnLoop software, which originated in Scandinavia. Interact's *main focus...is tools that facilitate online interaction and community building in an e-learning context.* It is *based around constructivist and Vygotskian views of teaching and learning.* (Davies, 2004) The developer of Interact commented that *the College was...disappointed with the functionality that was offered...by commercial providers...the available platforms concentrated too much on putting content in front of students, and the functions for providing interaction between teachers/students and students/students were just add ons. Most also separated content and interaction into separate web functionality areas and provided little option for easily integrating the two.*

Thus Interact, like Moodle, arose from a perceived need to develop a learning environment that is more in line with current ideas on teaching and learning. LMS News (n.d.) describes Interact as *better qualified for communication than to administrate (sic) or manage learning content like other LMS.* This article goes on to describe Interact as *the ideal choice...for...collaboration software.* It offers *common tools like discussion forums, weblogs and chats...drop boxes, collective files, notebooks and the possibility to create interactive quizzes.* However, the strength of Interact is balanced by some shortcomings: *for administering courses in terms of a calendar of events with registration, Interact is not a good choice. It is also not a holistic LMS which bundles management of courses, learning management and content.*

In the only published accounts of the use of the Interact LMS with adult learners taking part in a professional development pilot programme, participants commented on difficulties finding one's way around the site, locating materials, and the overwhelming nature of the site (Wenmoth et al, 2005). At this time, Interact was in an active development phase, and participants had difficulty coping with this development. One group contributing to this publication commented that participants found the *technical developments out of sync with the needs of the participants.*

Market shares

In February 2006, Rosen (2006) published the following diagram (Figure 1) which indicates that Moodle has over half the combined market for Moodle, WebCT and Sakai. His figures are based on

the number of known 'deployments' of the LMSs.

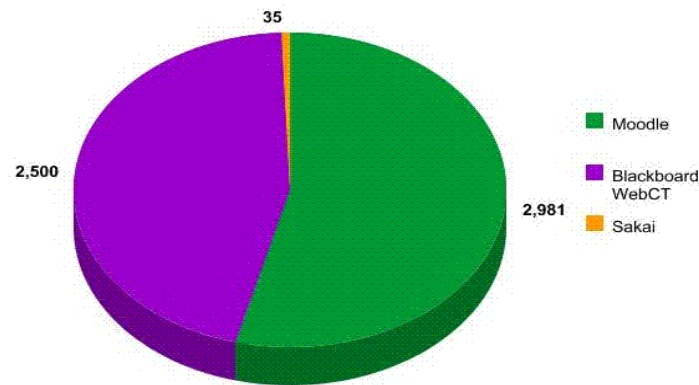
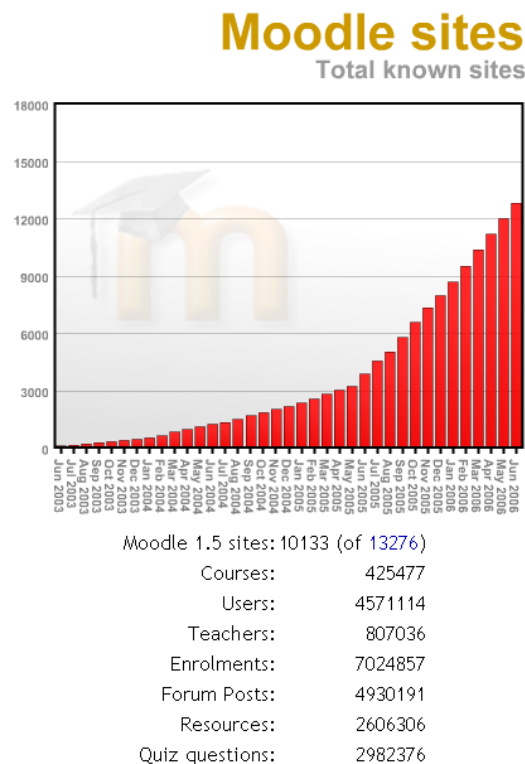


Figure 1: Market Penetration of LMSs

Moodle has had a rapid rate of growth from its inception. Figure 2 shows the growth of the total number of known Moodle sites since 2003 (Moodle Stats, 2006). The change in slope of the graph between May and June 2005 coincides with the introduction of an updated version of the LMS.



There are 139 registered Moodle sites that are larger than 5000 users. The site with the most users is moodle.org with 40 courses and 118997 users. The site with the most courses is [Online Campus](#) with 8282 courses and 54955 users.

Figure 2: Total Number of known Moodle sites since June 2003

There are around 100 Interact installations worldwide, mainly in NZ schools (Davies G, 2006). The present author has found little evidence of an active development community, although the Interact White Paper (Interact Development Group, 2005) comments that *third party development can be included in future versions of Interact for all Interact users to benefit from*. Ongoing development appears to be centred at the Interact development team at CCE.

Characteristics and Features

The brochure for the Blackboard Academic Suite version 6 (Blackboard Inc, n.d.) divides the suite into three 'systems' – a learning system, a community system and a content system*. These have the bylines learn, connect and share. The 'learn' section of the brochure states that the suite *enables instructors to create and manage course content, utilise world class publisher content, evaluate performance and communicate with students, whilst the 'connect' section talks of enabling educational institutions to connect users to vibrant online academic communities, to deliver targeted content to diverse user groups and to incorporate e-Commerce into the learning experience*. The function of 'Share' is that *instructors and students are creating digital content that can be shared and repurposed (sic) in diverse ways*. Thus the philosophy of the Blackboard system appears to remain based on a teacher centred model of teaching and learning.

The brochure reflects the history of Blackboard's development, commenting on having been *there at the beginning when one of the first steps in e-learning was putting courses online*. It also states that it has over 12 million users worldwide, and supports *more than 12 languages*.

However, the brochure also appears to reflect some conflicting viewpoints. It speaks of Blackboard providing *the crucial enabling technologies to power a Networked Learning Environment (NLE), where any student or teacher can view instructional content, collaborate with educators, evaluate academic performance and access learning resources...* The brochure also describes *the largest e-learning community of practice, believing that the real engine (sic) behind learning is community and the ability to reach and communicate with people*. It also mentions *200 independent designers at educational institutions and software companies, and countless others who develop solutions with the free Blackboard Building Blocks SDK*.

It appears that some of these developments may be a response to the threat posed to Blackboard by open source solutions such as Moodle. As mentioned earlier and discussed more fully below, Blackboard has recently responded to a perceived threat by court action against another North American company supplying learning management software.

As mentioned earlier, Moodle was designed to *support a social constructionist epistemology of teaching and learning within Internet based communities of reflective inquiry* (Wikipedia, 2006a). According to Wikipedia, this has *strongly influenced some of the design of Moodle, providing pedagogical aspects missing from many other e-learning platforms*. Features which support learning in an environment that everyone builds together include those that *support role sharing, such as permissions that allow each participant to be a teacher as well as a learner. The task as a 'teacher' can change from being the 'source of knowledge' to being an influencer...* This approach is seen as being *at odds with accountability-focused ideas about education*. However *Moodle is also useful in an outcomes oriented classroom because of its flexibility*. Among other features, it includes forums, resource management tools and quizzes.

A large number of content management systems are compared on a wCet Edutools website (Edutools, 2006) A comparison of Moodle 1.5.2 with Blackboard 6 indicates that Blackboard 6 had some features which were missing from Moodle. Notable among these are an online journal, video

* Blackboard is in the process of releasing a new version – v7.0. The brochure for this version was accessed after this section of the report was completed.

streaming and whiteboard function. The only features of Moodle not shared by Blackboard were those related to its being a free, open source product.

The lack of certain features in Moodle is not necessarily a permanent limitation, since the Moodle development community is extremely active, and produces software solutions to fill important 'gaps.' Thus the latest version of Moodle, 1.6.1, does address some of the features of Blackboard perceived as 'missing' in Moodle.

Interact was also designed with cooperative pedagogy in mind. LMS News.com (Edutools, 2006) comments that *Interact is not a course management system. (It) is for the creation of (an) environment for group work as well as learning content (the latter is limited to a certain degree).* Interact's tools include discussion forums, weblogs and chats. It is *not a good choice ...for administering courses in terms of a calendar of events with registration.* Despite the cooperative vision underpinning Interact, learners have restricted rights, being unable to change certain attributes or tools.

Interact is not supported by a large development community. Development appears to be restricted to the Interact Development Centre (IDC) at Christchurch College of Education. One concern to be addressed by institutions contemplating adopting Interact as a learning solution is the impending merger of CCE with Canterbury University, and the possible implications in terms of sustainability of the Interact project.

User Experience

A number of authors have written about tutor, administrator and student experiences with using Blackboard and Moodle. In the New Zealand context, Corich (2005, 2006) has written of the experiences of one polytechnic that has recently migrated courses from Blackboard to Moodle. In the United States, Munoz and Duzer (2005) published a comparison of user satisfaction with Blackboard and Moodle; and Kennedy (2005) discussed Hong Kong students' perceptions of Moodle.

Munoz and Duzer (2005) compared users' experiences with Blackboard 6.0 Basic Edition with that with Moodle 1.3.2, using a course previously taught in the classroom. The course facilitator reported that Moodle's advantages over Blackboard included the ease of providing feedback for assignments, and of tracking students' activity. Blackboard was considered to have a more polished appearance, a better grade book, more prominent display of announcements and ease of differentiation of read and unread posts to threaded discussions. The developer found that some of the advantages of Moodle were that it was easier to manoeuvre, than Blackboard, required less area for navigation, could incorporate multimedia elements more easily, and had more tools. Disadvantages of Moodle included wasted space at the top of the screen; whilst Blackboard seemed to have more intuitive features for beginners. In addition, Moodle had *excellent local support*, and better results were obtained when incorporating video. A number of customisations were made to Moodle. Overall, student satisfaction somewhat favoured Moodle: 57% would like another Moodle course, whilst 46% would like another course based on Blackboard. 36% were reported to prefer Moodle overall, and 21% Blackboard.

Kennedy's Hong Kong study (2005) involved student teachers and lecturers at an Institute of Education. Kennedy states that schools in Hong Kong are rapidly taking up the use of LMSs, and that student teachers need the skills to incorporate using LMSs into their teaching and learning. Several features of Moodle were seen to be advantageous in the Hong Kong school context. These include the fact that Moodle is free open source software designed from a pedagogical perspective consistent with the aims of education in Hong Kong. Another advantage is that there is a Chinese version. Moodle is simple to deploy, suits different teaching and learning needs, and is well

supported by the international Moodle community.

Moodle was used in two ways in Kennedy's study. Firstly, it was used as an alternative to Blackboard for delivery of courses; and secondly, it was used by student teachers to link a series of lessons. In the first case, Moodle was perceived by the lecturer as overcoming some shortcomings of Blackboard. Thus the need to log in before checking forum postings was seen as a hindrance to communication using Blackboard. Moodle also allowed content and activities related to a particular lesson to be grouped together, whereas Blackboard organises material into areas designated Forums, Content etc. Another advantage of Moodle perceived by Kennedy was that Moodle allowed all postings to forums to be forwarded to students' e-mail accounts. Students thus received all forum postings, whereas with Blackboard, some students had missed postings. Not all students saw this feature as a blessing, however – some saw it as spamming.

Overall, Kennedy's findings showed a partial preference for Moodle over Blackboard. All of the student teachers had previous experience with Blackboard, and they did not find it difficult to switch from Blackboard to Moodle. 49% of student teachers surveyed had no preference for using one LMS over the other in their own studies, a figure Kennedy attributes to cultural reticence to revealing a preference. Kennedy further analysed the responses of those who had stated a preference for one LMS. Most of these student teachers appeared to like the features of Blackboard, but around seven times as many preferred Moodle as favoured Blackboard. Student teachers' comments about the best features of Moodle addressed some of the complaints they had when using Blackboard. Features mentioned included ease of grouping information together, e-mail notification of forum postings, and improved communication between teacher and students, and from student to student.

Kennedy also reported differences in student teachers' linked-lesson assignments using Moodle. Their designs were more constructivist in nature, and were better integrated with face-to-face teaching than was the use of Internet resources alone. Groups of student teachers worked together more effectively, and had a greater sense of achievement.

Corich's studies (2005, 2006) looked at experience at the Eastern Institute of Technology (EIT) in Napier from the viewpoint of an IT lecturer facing the prospect of migrating to Moodle; and the experience of degree students, experienced with Blackboard, on introduction to Moodle.

Much of Corich's first paper is concerned with migrating a course from Blackboard to Moodle, and setting up Moodle itself. He reports that, despite claims that Moodle was capable of importing courses from Blackboard, he was unable to import content. It is not clear from his paper which version of Moodle he was using, and he comments that *importing problems should be solved with the next release*. Given the date of his publication, it is likely that he was using version 1.5 or earlier. The current version is 1.6.1. However, the question of migration of courses from Blackboard to Moodle is still problematic and continues to be a topic of discussion on the Moodle forum. Thus, Penney (2006) comments on having converted 400 courses from Blackboard 6 to Moodle, which took around 30 minutes per course. On the other hand, Wyatt (2006) mentions that conversion works *fairly well* if the folder structure in Blackboard is only one folder deep, but is not so good with nested folders, which end up in the same topic.

Corich found it *relatively straightforward* to set up a new course. It was easy to change the visual appearance of the course in Moodle, and students preferred the week by week format, compared with the topic based approach of Blackboard. Moving quizzes from Blackboard using Moodle's import process was also unsuccessful, it being simpler to create new quizzes. The author found it easy to work with forums in Moodle, and students discovered that they could create their own forums. Moodle communicates news to participants using a forum, rather than announcements. Students preferred Moodle's chronological display of messages.

The administrative tools in Moodle include a scheduler which links to the news forum and assessment tools, sending students prior notification of assessment activities. Moodle's grade book and reporting tools appeared to be adequate to the task, but the version of Moodle tested did not include similar graphical reporting features to those of Blackboard.

Once Corich had selected the group work tool, he found chat, virtual community and other features easy to set up. He concluded that Moodle duplicates all the features he had used in Blackboard, and offered other features not available in the standard (basic) edition of Blackboard.

Students who had experience of both LMSs *found Moodle easy to use and preferred the way Moodle presented materials week by week rather than by topics*. Overall more than 80% of Corich's students preferred Moodle. One is quoted as saying: *Moodle is a million times better than Blackboard, way easier to navigate through and find stuff...*

With regard to migration from Blackboard to Moodle, 90% of 20 students responding to a questionnaire stated that they had no difficulties adjusting to Moodle, and the remainder stated that they had minor difficulties. Responses to other questions were similarly positive. However, Corich points out that students had been shown how to use the features of Moodle, which was new to the Polytechnic, whereas they had not had similar instruction with Blackboard. Overall, Corich *moved from being a skeptic...to an enthusiastic supporter of Moodle*.

One of the key reasons cited by champions of proprietary software is the supposed sustainability of commercial organisations, and the customer support service. Blackboard makes a point of describing its 'exceptional service and support' in its brochure for version 6. (Blackboard Inc. n.d.) Not all Blackboard users share this view of the support provided by the company. Thus Apthorp (2006) in his blog lambastes Blackboard, both technically and in terms of service, writing that

*Maybe if I felt your company would actually support me during upgrades I'd work harder to coordinate with your support people, but I'm so soured on the response I get when I do call support, I don't even bother. Open source projects typically have better support than what we're getting from you, dollar for dollar and Moodle installed on a comparable server in 64 minutes total, counting download time and one 24 minute interruption...It takes us **weeks** to build a new Blackboard server and **hours** to build Moodle. (author's emphasis)*

As previously mentioned, there is little published work on Interact. Kent et al (2006) commented on the size and complexity of the Interact site used in their study, and ongoing site development. Participants in this study felt that technical development of the site was *out of sync* with their needs. Kent et al comment that *many participants found the navigation of the site too cumbersome and time consuming*.

Costs

It proved quite difficult to obtain details of the relative costs to users of Blackboard and Moodle. Information on the costs to organisations of Blackboard and WebCT was collated by Harry Smith (2006) and posted on the Moodle forum. The cost of licensing Blackboard varies from institution to institution, depending on the number of students enrolled, and the type of Blackboard installation. Blackboard is currently available in several different versions, referred to in Smith's posting as Levels 1, 2 and 3. Smith also refers to Blackboard Basic. Here it is assumed that Level 1 is a synonym for Blackboard Basic. The data pertaining to Blackboard is given in Table 1. These data are in line with the comment by the e-Learning manager at CPIT who estimated the cost to the Polytechnic of Blackboard basic to be approximately \$NZ 16,000.

Moodle is an open source LMS. As such, institutions using Moodle do not pay licence fees. However, there is a cost to organisations of using Moodle. Wyatt (2006) estimates that costs (note

that it is assumed that these costs are given in \$US) for her institution of 1400 students include \$US3,000 for hardware, and \$US1,500 for administrator costs. These costs are likely to be similar for both Moodle and a 'proprietary system', probably Blackboard. Wyatt estimates conversion costs for each course to migrate from the 'proprietary system' to Moodle to be around \$US30 per course plus \$US450 per course instructor. Each instructor is assumed to teach 3 courses and to take 15 hours to learn how to use Moodle. In presenting these figures, Wyatt assumes that instructors do not completely rebuild a course. In practice, many instructors do spend time rebuilding courses, and in adding new activities. Thus the costs quoted are conservative.

Blackboard Level	Numbers of Students	Cost \$(US)	Cost \$(NZ) (\$1 US = \$1.60NZ)
Basic or 'Level 1'	1,400	9,500	15,200
	7,500	7,500 plus extras totalling 9,626 = 17,126	21,000
	?	5,000	8,000
	?	10,000	16,000
'Level 2'	?	25,000	40,000
	?	25,000	40,000
'Level 3'		50,000	80,000
		50,000	80,000

Table 1: Smith's data on Blackboard costs to institutions

The overt costs of developing Moodle have been quoted as \$12,000(Aus?) per year from individual donors. However, many developers have committed large amounts of time to Moodle, and the NZOSVLE project had eCDF funding of \$1.5M to 2005. Langhoff estimates that the 'real' cost of developing Moodle is in the region of \$6.2M. The present author has been unable to find details of development costs for Blackboard. However, it is known that Sakai, an open source LMS developed by a number of US universities has received funding totaling \$US6.6M (Rosen, 2006). At that time, the number of known installations of Sakai was reported as 35, compared with 8,900 for Moodle.

Interact software is open source. This means use of the software is free. The Interact White Paper (Interact Development Group, 2006) states that *services and support are available for a modest fee*. Interact was designed for school use, and examples of fees for a school include: setup \$720, annual hosting \$660-900 + GST, depending on the size of the school.

Implications of Blackboard's Patent of Internet-based Education Support System and Methods.

On June 30, 2006, Blackboard Inc was granted a US patent (2006) which covers:

A system and methods for implementing education online by providing institutions with the means for allowing the creation of courses to be taken by students online, the courses including assignments, announcements, course materials, chat and whiteboard facilities, and the like, all of which are available to the students over a network such as the Internet. Various levels of

functionality are provided through a three-tiered licensing program that suits the needs of the institution offering the program. In addition, an open platform system is provided such that anyone with access to the Internet can create, manage, and offer a course to anyone else with access to the Internet without the need for an affiliation with an institution, thus enabling the virtual classroom to extend worldwide.

Patents have been granted or applied for in well over 100 countries including Australia and New Zealand. As soon as the patent was granted, Blackboard filed a court action against Desire2Learn, a Canadian company producing and marketing its own learning management system (Court document 2006). The patent, and its implications have resulted in considerable discussion in blogs and online forums. Thus Schmoller (2006) in his Fortnightly Mailing draws attention to a range of 'prior art' predating Blackboard's original application in 1999. He also refers to the area of Wikipedia dealing with the history of virtual learning environments. This article traces the origin of virtual learning to 1960, and cites the first use of an online interactive course management system to 1966. Furthermore, in response to Schmoller's article, Bacsich, and Low, separately document online courses run in the early 1990s which used features claimed by Blackboard. Other comments discuss the likelihood, or otherwise, of the patent being enforceable (See for example Feldstein, 2006).

It is likely that Blackboard took out their patent in response to a perceived threat posed by Moodle and other open source solutions. Essa (2006) comments that

*Blackboard's real threat is open source. By filing a patent infringement lawsuit against Desire2Learn Blackboard has at the same time fired a shot across the bow of open source projects such as Moodle, Sakai, and .LRN, which are slowly emerging as disruptive innovations in the e-learning space. In the long run Blackboard knows it can't win on product quality or innovation. Therefore, it will exploit patents as its WMD...In order to "win" against open source Blackboard doesn't need to sue existing users or go after open source projects. (It doesn't mean they won't). It just needs to create the **Fear of Patent Litigation** among potential adopters. By suing Desire2Learn it has achieved that objective. If your competition can't get any new business, you have effectively eliminated them. (author's emphasis)*

Blackboard seeks to blur the situation with its 'open source' Building Blocks project. This encourages developers to produce and contribute resources to support programmes developed using Blackboard.

The question of whether Blackboard's patent will hold up will be determined in the courts. In the meantime, the wisest course is probably to wait and see...

Research Findings

Data Sources

Data for the present descriptive study was mainly obtained from face-to-face and phone interview of a range of people who have used one or more of the LMSs. The interviewees included participants in the blended Level 5 eCDF TANZ programme, people involved in the Workbase Online Professional Development in Literacy programme, tutors and administrators of online programmes; and LMS developers involved with Moodle and Interact. Specific sets of questions were used for each group of interviewees. Appendix 1 shows a set of key questions used with the Workbase participants, who used Moodle, but have also used Blackboard, whilst Appendix 2 shows questions used with an on line tutor.

Findings

Programme Participants

Six learners taking the blended Level 5 TANZ Leadership in Management programme were interviewed. These people had succeeded at the level 4 National Certificate in First Line Management programme over the preceding 18 months, and thus were reasonably experienced on line learners. Both these programmes are delivered via the Blackboard learning management system, and no interviewees had used another LMS. Thus none of them were able to compare Blackboard with any other LMS.

All of these learners reported initial difficulties with Blackboard. One remarked that the LMS was *really scary*, whilst another said that her first impressions were:

Oh my God – a totally new way to learn that I was not comfortable with, because it was a lot of reading. No pictures, and there wasn't the people interaction I am most comfortable with. The whole programme was foreign to me. It was a challenge that took me out of my comfort zone, but I stuck with it.

These learners *took a while* to get used to the system, but now it is reported as being *really user friendly*. Several users reported difficulties with accessing and printing resources at first, and some were unable to use audio files because of lack of sound on workplace computers. Sound files were slow to download on home dial up connections. Other users had difficulties with drop boxes at first. Only one learner had suggestions for improvement. She asked:

Is there a way to make the information flow a lot easier? One place to pick up all you need for one course? And one step to submit your work? (Another thing) when you go into a discussion board, you have to hit a few buttons to go back to where you started.

Generally speaking, however, learners found the LMS easier to use as time progressed. Another learner commented that *submitting assignments is easy now I've got it sussed*.

Two tutors from a private training establishment were interviewed. These tutors were involved as participants in the Workbase programme, and both had previous experience of using Blackboard. The Workbase programme required them to work with the Moodle learning environment.

One interviewee had taught online using Blackboard, as well as taking courses through both Moodle and Blackboard. Her last experience of using Blackboard was approximately two years ago. She reported that she had problems taking both courses, saying that *I am not an online learner. I need someone to ring me and tell me to get on with it;. (With the) discussion board, I view the material, but I have difficulty making contributions*.

As an on line tutor, the interviewee enjoyed using Blackboard. She enjoyed customising the design of her own course, using Blackboard *as my own website. I found it great. I could send resources home and work on them at all hours day or night...I loved that it opened up delivery. Opened up a whole new world*.

However, she does recognise that *Blackboard can be very boring (depending on the) nature of the subject and tutor*. She thought that some universities had the attitude *don't expect pretty stuff...(we'll just) put notes up there. Would you expect students to want to do this stuff?*

This interviewee was *frustrated* by her first impression of Moodle as a learner: *I didn't have tutor rights and couldn't change things*, whereas on Blackboard, as a tutor, she was *in overall control*. However, she thinks that Moodle is *perhaps a bit more user friendly. There's more functionality to it than my impression of Blackboard... Moodle is a bit more interesting (but) there are ways round it in Blackboard*.

In comparing specific features of Blackboard and Moodle, this tutor commented that navigating through Moodle was *different*. She *had trouble finding where I am*, but *things got clearer at the end of the course*. She found submitting assignments to be relatively easy, and *I suspect that Moodle would be a lot easier for the general Joe Bloggs*. Communicating with tutors was easy, and discussion boards were simple to use in both LMSs. However, *in Moodle you can make your discussion board (more interesting). You can add colour and that sort of thing...make it look more interesting*. Moodle is *probably easier* to incorporate multimedia content, but *at times it is a bit slower*. She felt that *the LMS definitely affects the structure of courses people feel they can use*. Moodle is *easier to put in colour*, whereas in Blackboard you have to have a certain amount of knowledge of web design.

This interviewee did not have any suggestions to make either system easier to use, commenting that *you get to know the system and work round it*. She finds both LMSs to be *really good* tools for teaching and learning. When using Moodle, she misses the whiteboard feature of Blackboard, because she *really likes the real time teaching in Blackboard...you can get all the trainees to come online in the whiteboard*. She found this feature *invaluable* when teaching maths:

if the students are having problems with an idea you can say 'let's all meet at 10am. We are going to have a teaching session.' You could have the students working away and you could see them write it all down, and teach them so everybody else could see it as well...You can draw, and everybody else can contribute to your picture. You could take screen shots and record it for posterity. You often lose that sort of thing. A record of learning and evidence for assessment. Personal professional development. A very good tool which I haven't seen in Moodle.

In contrast, she noted that in Moodle, *you have all the chat sessions where you can have real time chat with colleagues and with anybody else...In Blackboard you can (only) post things (to discussion boards)*. Moodle is *quicker than Blackboard*.

This tutor does most of her work *outside work hours at home*. *I don't get time at work... I'm a bit of a nerd. I am best working at 5am, or last thing at night – 11pm – 3am*. Hence she found the drop boxes in Blackboard very useful to move material between her work and home. She thinks drop boxes are less important now that USB storage devices are readily available.

The other participant in the Workbase programme had previously used Blackboard two years ago as a university student, mainly to access information on assessment results. She has not had experience of teaching online, and accessed the Workbase course at work *because I can work uninterrupted and the Internet access is paid for*.

Her impression of using Blackboard was one of *having to run around for a password*. She found *usability OK, once inside...I could see discussion boards but did not take part. I could access lecture notes and submit assignments through e-mail*.

This participant's first impression of Moodle was *good*. She found it *easy to use once (I got used to it)*. *I have a hands on approach rather than reading about it*. Thus she did not use the instructions on how to use the LMS. She found it easy to find course material, which was hyper linked, and downloading and printing resources was simple. She found it easy to use the forum facility. Multimedia material was not a problem – it was easy to access, and there were no bandwidth problems.

Overall, this interviewee found Moodle to be *very effective* as a tool for teaching and learning. She appreciated *having modules laid out so you could collect each module and have the one you are working on open*. She thought that a synchronous chat area, which could be both text and voice based *for slow typists* would improve Moodle's effectiveness. She regarded having the modules visible in Moodle to be a point of difference, compared with Blackboard, where material was ordered by dates.

Programme Facilitators and Administrators

Several programme facilitators who between them used all three LMSs were interviewed. Two of these were also involved as LMS administrators. In addition, an interview was carried out with an online learning administrator.

One facilitator of the online Level 5 Management Leadership programme had *briefly looked at Moodle two years ago, but had only really used Blackboard*. When asked of her experience of using LMSs with adult learners, she commented that as a learner, she learns best *when I have the need. She needs time at the beginning to become familiar with how to do things. It's not at all obvious (in Blackboard). If I go through the Control Panel, some levels do not tell me what's there – e.g. The Grade Book. It needs logical labels. (You) can get lost*.

As a facilitator, she was able to see how the learners used the Blackboard LMS. They used the facilities, such as the drop box, well. However, she commented that it was necessary to click for resources, and then again for associated activities. She felt that it *needs to be set out as clearly as possible for newbies... (there is a) lot of learning (which) depends on their level of ease with technology*. She added that it *can be a big deal and cause fear and anxiety for some*. Many of her workplace based learners are older – in their late 40s - and not technologically literate. For these people coming back to learning involves a significant adjustment. The programme needs to be clearly work centered, and to be tailored to fit learners' learning styles.

One of the facilitators for the Workbase project had used a variety of LMSs including Moodle, Blackboard, Prometheus and First Class, as teacher, designer and learner. His most recent experience of using Blackboard was 18 months prior to the interview. He commented that *the big advantage of Moodle is that it has much more functionality for social interaction in teaching and learning, with better tools for collaboration. It is also customisable and more flexible, and attractive for small providers because of its free setup*. He also mentioned that teachers find Moodle easier to use than Blackboard, and that most can start to use it in class *straight away*.

From a teacher's point of view, when he first used Moodle, it was easier to edit and modify material *on the fly*. He commented that it was now easier with Blackboard, but he felt that he was more in control with Moodle. The ability to have social interaction made Moodle a more effective environment. Other differences included the fact that Blackboard required a separate teacher home page for each course. In Moodle, teachers required a single profile page. This he found more user friendly.

This facilitator saw Blackboard as a *more hierarchical tool based on a less democratic model*. Blackboard is produced in the United States for American institutions, and the interviewee believed that this was a result of the dominant institutional model in the US system being less focused on social collaboration. This bias was reflected in the tools. Thus, Moodle has for some time offered a *flawed but workable* wiki, whereas only now does Blackboard offer a *clunky* wiki tool. Moodle also offers a valuable glossary tool to which anybody can contribute. The facilitator regarded this as a *powerful tool*.

As a designer, he has felt that if he had problems working with Blackboard, he was working with a big corporation. With Moodle, he felt that if he had problems, he could do something about them himself, or contact a large, responsive community. This was another powerful feature of using Moodle.

From a learner's perspective, there have been features available in Blackboard which were not available in Moodle. For example, it was not possible for a learner to go into Moodle to go into a forum and see what (s)he had already read; whereas that has been possible in Blackboard for a long time. New versions of Moodle have that feature.

With regard to comparative costs, the facilitator did not have definitive figures. However, one advantage of Moodle for small providers was that it is able to be scaled down. A provider can set a budget and make the system as small as it needs. Of course, with a lower budget, levels of support and installation would be lower. Because Blackboard requires the payment of annual licence fees for different levels and features, it does not have the ability to be down scaled. *There is no way around it*, commented the interviewee.

He had used Interact. He thought that it *looks admirable*, but Moodle had the advantage of a much bigger community. This he saw as being better for his clients – especially not-for-profit organisations.

At Eastern Institute of Technology (EIT), the author interviewed the writer of a couple of papers in which he described his experiences in migrating courses and students from Blackboard to Moodle. This institute has made the decision to move all its online offerings from Blackboard to Moodle. Under the old agreement, the interviewee believed that Blackboard had cost EIT around \$35,000 per year, and that the cost was likely to rise to around \$75,000 under a proposed new contract. However, he said that the decision to shift from Blackboard was *not based on finance, but on the the constructivist learning approach inherent in the design of Moodle. Blackboard originated as a document management system, which evolved; whereas Moodle was based on a constructivist vision right from the start.*

Most course instructors at EIT put up some content on Moodle. They are not yet fully using the constructivist potential of Moodle. However, it appeared that an exception was the Early Childhood Education group who *use the constructivist potential to the full.*

Of 35-40 staff, made up of tutors, support staff and administrators, some had initial adverse reactions to the Moodle system; but after three months none wanted to go back to Blackboard. At the time of interview, 17 courses had been transferred to Moodle.

Students initially complained about the absence in Moodle of a digital drop box. This is a useful feature of Blackboard for those who want to access material in different locations – e.g. at work and at home.

From a technical point of view, the interviewee realised that the GUI environment of Moodle was not as good as that of Blackboard; but he commented that *everything is there and functional in Moodle. Once you know how to use it you can do everything, including bringing in graphical stuff.* He found it more difficult to work out some procedures in Moodle than in Blackboard – the instructions are not quite as explicit. Import of some content from Blackboard to Moodle is not yet simple. For example it is not possible to import embedded content or quizzes. However, it is possible to use the Respondus quiz management software to manage the migration of quizzes. The ability to use other software in conjunction with Moodle is a valuable feature that is currently being explored. Another example is the development of eXe as a learning object repository in a TEC funded project involving Auckland University of Technology and Tairāwhiti Polytechnic.

Another facilitator/educational designer had worked with Blackboard and Moodle; and was currently involved in educational design using Interact, and in supporting development of the learning environment. He has also tutored courses in Moodle design and use. He has used Interact with a range of adult learners including clinical health educators, learning designers and teachers and teacher trainees.

This facilitator *really enjoyed* using Interact. He commented that it *was designed on the principle of devolved power. We...talk of participants and facilitators rather than students and tutors. We do not use the term course – we are community oriented.* Interact is *easy to use – most of what you need to know is on screen.* Features of Interact include that it is designed for low bandwidth, such as afforded by 56K modems. Interact has *good learner centred tools*, including sharing areas for

uploading and downloading material, a knowledge base for posting ideas, tagging and instant messaging/chat areas. Sound recording is also possible.

User feedback on Interact is *very good*. The interviewee commented that it *suits an adult educational model (as it has) the feel of a learning environment as opposed to a course*. He saw Blackboard as *very institution centred and inflexible...Moodle is good but still has a course to lecturer to student paradigm...it is not a great community environment*.

The environment of Interact was seen to be *warm, inviting and easy to use*. The program allows self-enrolling groups; and students can form their own. This helps Interact's usability and effectiveness with adults. A surprisingly important feature for some learners was the ability to brand pages linked to a particular space. Other helpful features are that it allows users to create their own profile, and to *post stuff up here*. Moodle and Interact are both able to forward forum postings to participants – *Blackboard does not give the same level of user freedom*.

Another interviewee had used Interact both as a participant and as a facilitator. She had also taught adults to use Interact for group interactions. Features used included forums, drop boxes and journals. The adults had found the program *not very intuitive*. She had *needed to hand out step by step instructions...people did not really get how to use Interact. It's not something you just go in and use. They needed instruction on how to use it and how it works. I've not found the forum particularly easy to track and to follow*.

However, she appreciated the journal and the drop box. She found the site *easy to set up*, but to be *very linear. You can't have that much character to it, and it's not very visual, so it's not really catering for all the different sorts of learners*. She had *struggled with some of the tools. The editor does not always work. I've not been able to get frames and tables to work. I find that extremely frustrating*. She also found it *difficult to personalise* and to make visually different.

At a face-to-face workshop, a group of Interact users reported that they had not found it easy to use – *very few people responded in the forum*. She did not find it to be a *friendly environment. To me it's kind of sterile – you go on and write something and someone else responds – you don't see that friendly social thing happening*. She found the writing in the forums to be quite *academic* in style and *not social* in its approach. However, she did appreciate the ability to set up the program to send an e-mail whenever someone added to a forum.

In summary, this interviewee did not find the program easy to use. She liked the journal and drop box, but *certainly did not like the forum – not easy to use. As a visual and tactile person, it certainly does not meet my learning needs*. She *did not enjoy it*, and saw going into Interact as a *chore*.

The e-learning and web support manager at CPIT said that many of the polytechnic's programmes used Blackboard as a basic educational medium. Some courses involved blended delivery, whilst others were fully online. Blackboard was used in a variety of ways, from being merely a repository of content to fully supporting course delivery. The Polytechnic was in the process of testing Moodle, and was *on the brink* with it. She had *inherited* Blackboard when she took over her current position. For many staff it may have been too soon to change LMS, although higher end users seemed to be looking for added functionality, such as socialisation software and collaborative tools which the current basic edition of Blackboard did not offer. Some of these, such as blogs and wikis, were being worked on by Moodle's active development community. Currently, she saw the institution as building up its capacity to host its own open source solution, but she thought that an open source LMS may not be suitable for everybody. She intended to run two systems concurrently for a time.

When asked about the costs of running Blackboard, she commented that the major decision as to which course goes on which platform was based on a different set of criteria. If a programme was

running happily on Blackboard, it made no sense to have subcomponents running on another platform – *if it aint broke, don't fix it*. On the other hand, if people who were moving courses to blended learning were confident of their technical backup, or were risk tolerant, they were likely to move straight to Moodle. This was the case with the School of Business which had a staff member with previous experience with Moodle.

The manager saw pedagogy and social presence as being critical to working with adult learners. Just putting course literature and tasks on to an LMS is not enough to engage adult learners. They may have greater intrinsic motivation to learn, and be interested in learning for learning's sake, but they want quality and real benefits from their learning. They need an active online presence of the tutor to avoid a sense of isolation. *People can get thoroughly engaged and absorbed in online communities – you only have to look at other examples of social uses of online environments to see that people can be very connected*. She saw the future as involving M-learning using mobile phones to reach learners in the workplace. She commented that it is important to know who the learners are, what their needs are, and how they might learn best in order to tailor the learning environment to them.

When asked what aspects of a learning management system help, and what hinder online learning, the manager commented that many students do not have to be taught how to use Blackboard. Their issues are more often concerning passwords and access.

In general, online discussions work well. However, online activities do not work as well if tutors have not thought through the implications in terms of technology. Thus it is frustrating for students on dial-up access to be asked to access resources which require too great a bandwidth. Other problems some tutors have is due to the fact that material prepared with a WYSIWYG editor does not quite live up to their expectations when opened in a browser.

The manager's concern with Blackboard was that the system drives the pedagogy, and the system is very rigid – *we have discussion boards like this, we put our documents in folders like that...* She liked the Interact system because it was an attempt to create a socialising tool, where *you can have some effect on the content as well. Putting yellow stickies on things, and hard links to things that are important to you and inviting others to come in. That to me is really powerful, and I can't see that happening very fast in Blackboard, whereas the open source community is very active in trying to bring in other sorts of functionality*.

Another important goal is the creation of a seamless system for the students – not having multiple logins and authentications, so it is less arduous for students to use the overall system of an institution. This is another reason for using an open source solution such as Moodle.

Open source systems tend to give students the ability to work collaboratively on documents and resources. With the basic version of Blackboard (6.1.0) that CPIT had, *a student's a student with certain rights, and an administrator's an administrator with other rights*. Moodle offered more options.

CPIT pays \$16,000 per year for the basic version, and has no plans to upgrade to the Enterprise version which costs around \$70,000 per year. Tutors were currently not even using the basic version to its full potential.

CPIT has not costed out the time needed to run Moodle. There have been costs in helping staff migrate from Blackboard, and there is a need for professional development. The manager has to find a staffing budget for Moodle, rather than a licence budget. Although cost is not a factor in deciding whether to migrate from Blackboard to Moodle, it is a factor in deciding not to scale up to the Enterprise edition of Blackboard.

The manager commented that CPIT was not looking for a quick fix, or a system which will answer

all their dreams and problems. She commented that one still had to take a pragmatic and problem solving approach. The polytechnic sector is agile. At CPIT, the IT department was unique in having academics among its staff. This reduces misunderstandings between academic staff and the IT department. Academic staff know that they can get backup.

This interviewee found the way Blackboard sought to divide learners into courses to be frustrating. Other systems made it easier seamlessly to create cross-course umbrellas, such as home-rooms which cut across cohorts by offering a joint shared space. She commented that Interact helps with the community building aspect: *you are all in a central room and can go off into your own spaces*. By contrast, she saw Blackboard as wanting to link everyone with the student management system and to know their course numbers, etc: *We need to ensure that Moodle doesn't grow that way. We need a way of coping with (for example) a foundation English course that draws students enrolled across a number of programmes. Having them enrolled in a space that meets their needs. These are the sort of needs currently emerging that have to be met.*

Learning Environment Developers

The developer of the Interact Learning Environment, and the manager of the New Zealand Open Source Virtual Learning Environment (NZOSVLE) were both interviewed. No one involved in the development of Blackboard was available for interview.

The NZOSVLE project was set with eCDF funding up in order to identify, and then develop, an open source e-learning environment suitable for use in New Zealand. As mentioned earlier in this report, Moodle was chosen for further work, after evaluation of over 30 candidates. During this time, the NZOSVLE team was under great pressure to make a quick decision from institutions who wanted *to deploy it as soon as you have made a decision*.

One of the criteria for selection was the existence of a large, vibrant, global supporting community – a criterion which Interact failed to meet. The NZOSVLE manager commented that *we wanted to see something bubbling along*. As we have seen already, Moodle has a large, global user base, including installations varying from a few users to tens of thousands. Recently, the UK Open University announced that it will be adopting Moodle as the LMS of preference. The author of the present report has joined the Moodle user group, one of several Moodle discussion groups. Over the past three months, he has received postings to the user group at the rate of approximately three per day.

The NZOSVLE manager commented that the project was *not too worried about lack of features – we can always build more*, but that *it is much more difficult to rebuild the system architecture. The architecture is the key*. The responsiveness of the development community was important: *We looked hard at the code (of the three top candidates) and identified a security breach in each. We wrote a patch for each (candidate). Moodle incorporated the patch the next day, (another candidate) took several days, and we had no reply from (the third)*. He commented that this gave the team an indication of the seriousness of each group about improving their code.

The strength of Moodle lies in its modularity, whilst other LMSs were built to have a tightly coupled architecture and set of features. The manager noted that Blackboard was moving towards modularity with its building blocks.

One key aim of the NZOSVLE is to reduce the barriers to entry into the e-learning field. Smaller institutions have financial and barriers, and often lack in-house technical expertise. The Tertiary Education Commission (TEC) required a major cut in the total cost of ownership for institutions becoming involved in e-learning.

Some institutions experienced *sheer frustration* with Blackboard. *With an open source solution, you*

can economise not just on the licence fee, but on hardware setup, which can't be done with proprietary systems.

The NZOSVLE manager emphasised the customisability of Moodle by pointing out the development of a role play module, a question and answer feature associated with forums, e-portfolio capability, and My Moodle This is available in version 1.6 and *is basically a palette for students to build their own online campus.*

Several other LMSs were seen to be *too rigid*, whereas Moodle allows people to *create a virtual classroom in many different ways*. Other aspects of Moodle's flexibility were also perceived as important such as linking with Elgg, a social networking software solution which *provides each user with their own weblog, file repository (with podcasting capabilities), an online profile and an RSS reader* (Oliver, 2006). Elgg can be used to manage e-portfolios. Other innovations include a collaborative wiki area, so that learners can jointly contribute to building their knowledge and understanding. The project is also interested in linking in with mobile technologies – so that people can access learning from their mobile phones.

The manager saw great potential for Moodle in the school and commercial sectors as well as the tertiary education sector. The ability of users to configure Moodle to suit their circumstances made it widely applicable. He saw applications for work based learning – for example in government departments, and commented that the Leadership Development Centre, which currently uses a commercial package called Sum Total, have selected a customisable form of Moodle, *but have not deployed it yet.*

Moodle was very easy for tutors to pick up *from scratch*, and has *a solid reputation for being intuitive*. Tutors and administrators *see a similar screen to end users*.

The manager commented that the users forum *used to get comments about the contrast between the different tools in Moodle and Blackboard, but not very often now*. He thought that open source offerings were becoming competitive to commercial software *so they (producers of proprietary LMSs) have to bring in innovative stuff quickly themselves*. He also thought that commercial solutions were being pressured to become *a lot more compliant in terms of interoperability*.

There are several features of Blackboard which the manager appreciated. One was the ability to preset the time of release of course materials so that a tutor could say to himself *I don't need to be in on Monday morning to announce it to the class*. Although he recognised that there was *some good stuff* in Blackboard, and that the minimum package was not very expensive, most New Zealand institutions could only afford to deploy this version. If they wanted to use extra features, they would have to pay for them by upgrading, and *for an institution this size it could cost several faculty members' salaries. This must be taken into account.*

In contrast to Moodle, which originated in Australia, and now is increasingly deployed globally, Interact is a local product from Christchurch College of Education (CCE), with a much smaller user base, small user community, and about 100 deployments largely related to the New Zealand school sector.

The developer of Interact was interviewed. When asked why Interact was developed, he commented that *in 2001 the existing commercial products did not deliver what we wanted, and were too expensive. There were no real open source alternatives. First Class was more appropriate to our needs, but the discussion forums were not very flexible. We wanted to make discussion a bigger part of our online (programme).*

The first trial version of Interact, called Latté, was developed from the LearnLoop software developed in Scandinavia. It started with *discussion forums as a key point, and added basic content and drop boxes. A key was the ability to mix discussion and content.*

Interact's development is supported and hosted by CCE. The developer said that most feedback from facilitators and learners as to Interact's effectiveness *has been positive*. The development process involves suggestions for improvement from College staff, and evaluating how many people want a particular improvement before incorporation in to the development plan.

As the LMS is open source, organisations can download and install it on their own server. Schools not wanting, or unable to do this can pay \$600-900 for setup and help.

Development goals for Interact for the next two years are *to build a network and international user base, and to develop it much more as a learning community platform rather than as an LMS, with tools for people to interact with each other*. A feature being developed is a *tagging system to link people with similar interests*.

Discussion

During the course of this evaluation, the evaluator has looked at the literature on the three learning management systems Moodle, Blackboard and Interact; and has collected interview data from users and developers. The aim of the study has been to answer Research Questions listed in the Methodology section of this report.

The present research addresses the use of LMSs to support workplace learning and professional development. In general, there appears to be relatively little published work dealing specifically with online learning in the workplace. However, there is information on using LMSs in adult learning – for example to support polytechnic or other tertiary students.

During the data collection phase of this evaluation, it proved difficult to collect comparative data on workplace learners' experience with several LMSs. The TANZ Level 5 learners who were interviewed had only experience of using Blackboard, and thus were not in a position to compare benefits and drawbacks of this LMS with Moodle or Interact.

Some data was forthcoming from two Workbase participants, who were involved in online professional development using Moodle, but had some experience with Blackboard either as a student, or as a tutor. This data was supplemented by information collected from facilitators and administrators who tended to have experience of more than one LMS. Interviews with two LMS developers gave further insights into Moodle and Interact.

The research questions will be considered in turn during this discussion.

1. To what extent are the various LMS/VLEs effective as workplace based e-learning delivery platforms?
 - a. What does the literature tell us about the suitability of various LMS/VLEs for use in workplace environments?
 - b. What are learners' and programme deliverers' experience as to their effectiveness?

It is clear that both from the literature, and from discussions with interviewees who had used both Moodle and Blackboard, that the design of these LMS addressed different needs and arose from different pedagogies. The aim of Moodle was to develop a learning environment which would support social constructionist pedagogy, whilst the original model for Blackboard appears to have been very instructor centred. Blackboard seems to have been well adapted to content based, transmissive styles of teaching. This slant appears still to be present, despite the emphasis on modularity and learning communities in recent Blackboard literature. Interact is designed from a pedagogy more like that of Moodle, and is intended as an example of social collaborative software.

Whilst both Moodle and Interact were designed from learner centred perspectives, both have facility for working with documents, and Blackboard increasingly incorporates facilities designed to support social interaction. Blackboard and Moodle both have the ability to handle assessments and

the resulting reporting tasks.

In the workplace, training and professional development requirements can range from simple transmission of practical knowledge, for example safety procedures and regulatory information, to development of complex skills and attitudes as in management and leadership programmes. These diverse needs are suited to differing pedagogical approaches.

Discussion in the Moodle forum has centred on the relation between the philosophy underlying the design of an LMS and its use in the classroom. The consensus seemed to be that, whilst a determined facilitator would find a way to adapt the use of an LMS to suit his/her teaching style and pedagogy, the design could make the task easier or more difficult. Thus, taking these considerations into account, it is likely that the various virtual learning environments will be more or less suited to different training and professional development needs.

It is difficult to evaluate the 'effectiveness' of the various LMSs. Criteria for making such an evaluation are not clear, and could include such factors as the overall performance in terms of facilitating learning, accessibility of resources, ease of use and ability to support socialisation within a learner group. This discussion will touch on some of these factors.

In general, learners at first found it challenging to use Blackboard. Some interviewees thought that Moodle was easier to use. A couple of learners appeared happy using both Moodle and Blackboard, although some, including interviewees who had only used Blackboard, expressed frustration at how material was arranged in this LMS. Several learners commented that they preferred to have material organised in modules or topics, as is possible in Moodle, rather than chronologically, as in Blackboard.

One of the interviewees, who has used both Moodle and Blackboard, perceived the Blackboard interface as being *boring*, whilst Moodle gave the facilitator more scope to use colour and other visual techniques to make the screen more interesting. This probably contributes to the perception that Moodle is more user friendly, and to be more *inclusive*. Literature studies indicate that, after migration from Blackboard to Moodle, learners marginally preferred to work with Moodle.

From the point of view of tutors and facilitators, Moodle was seen as being more empowering than Blackboard, which was seen as being *rigid*.

One facilitator reported that learners found Interact to be *inviting* and easy to use, and learners to be *happy* using it. However, another facilitator found the environment *uninviting* and parts of it to be *difficult to use*.

Both Moodle and Interact, being created from social and learner centred philosophies, emphasise learner collaboration. Thus Moodle was perceived as having better collaborative tools than Blackboard, and Interact to have flexible socialisation features.

2. What features do the various LMS/VLEs need to make them more effective workplace learning tools?

a. How amenable are the LMS/VLEs to customisation in relation to the above factors

Moodle has been reported as lacking some features of Blackboard. Thus one facilitator appreciated Blackboard's whiteboard feature, which was helpful for explaining specific points to remote learners. Other interviewees commented on missing Blackboard's drop box facility, which makes transfer of work in progress from one location to another convenient. On the other hand, the ability to set up both Moodle and Interact to send e-mail notification to participants of forum postings was appreciated by some people, although one paper has reported learners considered this to be the equivalent of spam.

A significant advantage of open source solutions such as Moodle, and potentially of Interact, is the sharing of source code and the existence of user and development communities interested in

collaborating to improve the product through adding to, and modifying the code. Moodle's architecture is modular, specifically to facilitate this. Its development community is large, global and active. This means that important features perceived as lacking can rapidly be developed by the community, and incorporated in the code. It also means that bugs in the software are rapidly identified and eliminated. As flexible approaches to learning develop, the ability to link a learning environment with other types of software, such as image and text repositories and facilities such as voice over Internet and video communication become more important. The flexibility of Moodle encourages such links.

Blackboard's response to this flexibility has been to introduce their Building Blocks programme, which exists to enable Blackboard users to develop new functionality and integrate other software with the Blackboard suite. Blackboard mentions *open, collaborative development* and of the programme producing *open source Blackboard Building Blocks applications*. These statements which appear to support the concept of community development of open source software seems ironical in the face of Blackboard's recent patent and court action, and in view of the fact that Building blocks are not available for users of the basic version of the LMS.

It is difficult to comment on the potential for customisation of Interact. There appears to be no active user or development group outside Christchurch College of Education, and modifications to the code seem to be carried out by the Interact Development Group located at CCE, despite its public availability. Several interviewees have commented that the existence of a large, active support community is an important factor in Moodle's favour as an LMS.

3. What difficulties or common problems do each of the LMS/VLE interfaces present to the learner?

a. What are adult learners' experience of the ease or difficulty of using the LMS/VLEs in a workplace environment?

It was clear during the course of interviews of learners for this evaluation, and for previous evaluations, that many adult learners had initial difficulty coming to terms with the Blackboard environment. Learners reported feelings of disbelief and overwhelm, and were challenged in learning how to navigate the environment, and use its features. After a time, these learners grew more comfortable with the LMS, and discovered how to accommodate to what they had perceived as being barriers.

However, there were recurring comments, even among experienced users as to dissatisfaction with the way items were organised on Blackboard sites. People with experience of both environments favoured the chronological and thematic approaches possible with Moodle to the more rigid course based arrangement of Blackboard.

Feedback on Interact from a tutor and the developer indicated that learners liked it, found it inviting and easy to use. However another programme facilitator reported that she found it uninviting, and parts to be difficult to use, in particular the discussion forums. She found that her participants needed professional development to be able to use and track the forums.

When considering migrating programmes from Blackboard to another VLE, it is usually necessary to move content, resources between the two systems. Moodle claims to have an application to handle this, but reports in the literature, and postings on Moodle user group say that this feature is only of limited use. It is not able to handle quizzes, nested lists or embedded content, making it necessary to re-create them for the new environment.

4. What factors enhance flexibility and ease of use of the various LMS/VLEs for programme development teams?

a. What do the various LMS/VLEs enable a workplace based e-learning programme to achieve that the other LMS/VLEs do not?

b. What are the experiences of those involved in the design and delivery of learning (educational

designers, content writers, tutors, assessors) in using the LMS/VLEs in a workplace environment in relation to the above factors?

Blackboard has a number of features which were appreciated by learners and facilitators which were not yet available in Moodle. Such shortcomings of open source solutions are not necessarily permanent, however, because the development community is active, and can produce additional features where required.

Learners who had made the transition from Blackboard to Moodle missed the digital drop box facility, which was useful for people wishing to work in two different locations. Interact has a drop box feature.

Another feature that was missed was Blackboard's whiteboard facility, which was very useful to guide students through calculations in real time, and in correcting their mistakes.

Moodle's and Interact's architectures are both based on learner-centred constructivist philosophies. One of their strengths is the focus on social interaction. By contrast, Blackboard, whilst currently promoting its social and collaborative features, was initially designed around a transmissive model. The language in Blackboard's recent brochures indicates some conflict between the two philosophies.

Moodle's collaborative tools were perceived as being better than those of Blackboard, and the system was seen as more flexible and customisable. An example was that it was easier to set up virtual home rooms and small groups. Another was the ability to arrange content and resources thematically or chronologically, which was difficult to achieve in Blackboard. This program favours a course based arrangement, and was seen as *hierarchical* and *less democratic*.

The Blackboard environment was seen to be *boring*. By contrast, it was easy to make the Moodle environment engaging and inviting by using graphics and colour. This may be a factor in the perceived greater user friendliness of Moodle.

From the start, Moodle's architecture was designed on a modular basis. This makes it very easy for the development community to produce open source solutions to add to the Moodle suite, and to create links with other software such as resource repositories, wikis and portfolio tools. A significant part of the activity of the NZOSVLE project is directed to building these links. In recent years, Blackboard has launched its Building Blocks project which enables tutors and developers to produce their own 'open source', publicly available software to supplement the Blackboard suite. In the light of Blackboard's patent claim regarding virtual learning systems, and its litigation against Desire2Learn, its embracing of the open source concept seems somewhat bizarre.

Other considerations

There are several other considerations which need to be taken into account when deciding whether to adopt a proprietary or open source LMS. The first is finance. Blackboard requires that its users pay licence fees based on the number of users, and the number of features included. For CPIT, running the basic version costs around \$16,000 in annual licence fees, whilst higher level versions can cost up to \$80,000p.a. (depending on currency exchange rates). By contrast, open source solutions are free of licence fees.

The licence cost of Blackboard restricts the ability to scale an installation to suit the requirements of small institutions without financial penalty. However, Moodle, being free of licence fees is more easily scalable, and can be used by a single teacher, or large institutions with thousands of learners.

The licence fee is not the only financial cost to be considered. The costs of installation and ongoing administration and maintenance of the system is also important. This means that the financial advantage of open source software may not be as great as it appears. On the other hand, it is easier

with open source solutions to set a budget for the installation and tailor it to meet the funds allocated.

As mentioned above, on migrating programmes from Blackboard, there is a need to move materials from one environment to the other. Account needs to be taken of the time required to achieve this.

An argument for the use of proprietary software is the existence of a dedicated, professional support service, which is not available to open source users. In the case of Blackboard, not all users are satisfied with the level of customer support they receive, contrasting it unfavourably with the support available to Moodle.

Moodle is supported by an active, innovative global user community, which includes the New Zealand Open Source Virtual Learning Environment project. This community runs active user and development forums, and Moodle has good online documentation. In addition, there is good online support material. There are also businesses that can offer hosting and support services for Moodle users.

By contrast, Interact does not appear to have an active online user or development community. Development of the software appears to be carried out exclusively by the Interact Development Group, located at Christchurch College of Education.

Another consideration to be considered when choosing an LMS is that of sustainability. Commercial solutions are often considered to be more sustainable than open source. This may not be the case – businesses do fail, or get taken over. Sustainability can cost – not only in terms of annual licence fees, but also in terms of ongoing costs to keep the hardware current to handle software upgrades.

A factor supporting sustainability of an open source solution is the size and activity of the user community. Moodle is obviously an excellent candidate in this respect with its worldwide community. The author of this report has been a subscriber to the Moodle user group for three months, and has received an average of three e-mails per day from the group. The Interact community is much smaller and localised. In addition, it will be interesting to observe the effect of the merger of Christchurch College of Education with the University of Canterbury on Interact's sustainability.

The recent Blackboard patent and litigation puts another perspective on the sustainability issue. Open source LMS groups are delving in to the history of online learning in order to discover prior art which existed before Blackboard's claim of priority, and a Wikipedia site documents the history of virtual learning environments. The first entry is dated 1945. It is likely that the court action will be prolonged and that the only winners will be the lawyers. However, the implications of this action on long term sustainability of open source solutions must be considered.

Recommendations

When deciding on the learning management system of choice for supporting a particular workplace learning solution, there is a number of factors that need to be taken into consideration. The consequences of the decision are likely to be far ranging and long lasting, and changing from one system to another later on is likely to be costly.

Careful consideration needs to be given to the following:

- The nature of the learning to be carried out – e.g. is it to be simple assimilation of facts and information, such as safety or operating procedures; or is it to involve deeper personal development such as occurs in management or leadership programmes?
- What are the characteristics of the learners (age, gender, educational background, computer

literacy and accessibility, geographical spread)?

- How many learners are there to be?
- What pedagogy is appropriate (transmissive or learner centred)?
- How much social interaction is there to be?
- What is the level of IT support within the organisation?
- What experience do facilitators have in creating online courses?
- What is the budget (time, resources, money)?
- What software is available that appears appropriate?
- What are the installation and maintenance issues (hardware considerations, skills available, server space)?
- What user support is available?
- How scalable and sustainable is the solution likely to be?
- Is the solution likely to cope with developments in technology (e.g. use of mobile phones and PDAs for learning?)

The research has demonstrated that there is no ideal solution. For those organisations that want the security of a proprietary solution, can afford the cost of licencing and can work with the constraints of a course based LMS, Blackboard offers a ready made system.

On the other hand, it appears clear that Moodle appears to be more engaging, has better socialisation features, is more flexible and has apparent cost advantages. The existence of the active user and development groups and the adoption of the environment by the NZOSVLE group as well as the online support materials makes Moodle an attractive option.

Interact, the locally developed solution, has interesting socialisation features. However the small size of its user base throws into question its long term sustainability.

The author considers Moodle to be the preferred solution for online learning in New Zealand workplaces, especially where modules are suited to a learner-centred pedagogy. This researcher would recommend the use of Moodle if it were not for the Blackboard patent and litigation.

Appendix 1

LMS Evaluation Questions for Workbase Learners – Phone Interview

Name of Interviewee _____ Workplace _____

Interviewed by _____ Date _____

1. Briefly describe the online learning programme(s) you are involved in.
2. Do you teach online? If so, please describe briefly what courses you teach online.
3. Do you do most of your online learning at work or at home?
4. Please give reasons for your choice.
5. Do you do most of your online teaching at work or at home?
6. Please give reasons for your choice.
7. Please describe briefly the environment in which you do this online learning and teaching.
8. What Learning Management Systems have you had experience of using
 - a. as a learner
 - b. as a tutor/administrator
9. What were your first impressions of these LMSs? (Usability, aesthetics?)
10. How easy have you found these LMS to use as a learner?
 - Ease of navigation
 - Clarity of instructions as to use
 - Finding material and resources
 - Downloading material and resources
 - Submitting assignments
 - Communication with tutors
 - Communicating with peers
 - Ease of use of discussion board

Ease of use of multimedia (audio and video) content

Course structure

11. What changes would you want to make the LMS easier to use in the workplace?
12. How effective do you find the learning management systems as tools for learning and teaching?
13. What changes would you want to make the LMS more effective as a tool for learning in the workplace?
14. For you as an online learner or teacher, what are the key points of difference of each LMS?
e.g. What does each LMS enable you to do that the other(s) do not?

Appendix 2

LMS Evaluation – Questions used to interview on line facilitators

Name of Interviewee _____ Organisation _____

Interviewed by _____ Date _____

1. What LMS have you had experience of using
 - a. as a learner
 - b. as a tutor/facilitator/course administrator
2. What are your experiences of using these LMSs with adult learners (in the workplace?)
3. What are learners/programme facilitators' experience as to the effectiveness of the LMSs?
4. What features of the LMSs help, and what hinder their usability and effectiveness especially with adult learners?
5. What do the various LMSs enable an adult (workplace based) learning programme to achieve that other LMSs do not?

Glossary

Abbreviation or Term	Meaning
Blackboard	A commercial e-learning platform, partly owned by Microsoft
Blog	An online journal
CPIT	Christchurch Polytechnic Institute of Education
Desire2learn	A commercial e-learning platform, recently sued by Blackboard for alleged patent infringement
DigiOps	Digital Opportunities
eCDF	E-Learning Capability Development Fund
EIT	Eastern Institute of Technology
Elgg	A social networking software used for e-portfolios
ePrints	An archiving software program
Exe	Software designed to help teachers produce web content
First Class	an email, online conferencing, and bulletin-board system
GUI	Graphic User Interface
Interact	An open source e-learning platform developed at CCE
ICT	Information and Communication Technology
IT	Information Technology
LearnLoop	A groupware aimed to support education and collaboration.
LMS	Learning management System
LRN	An open source e-learning platform
MoE	Ministry of Education
Moodle	An open source e-learning platform, the basis of the NZOSVLE project
NCFLM	National Certificate in First Line Management
NLE	Networked learning Environment – a Blackboard term
NZOSVLE	New Zealand Open Source Virtual Learning Environment
OLE	Online learning environment
PSTO	Public Sector Training Organisation
Respondus	A tool for creating and managing exams that can be printed to paper or published directly to LMSs
RSS	Really Simple Syndication – An XML format for distributing news and other content on the Web.
Sakai	An open source e-learning platform developed in the United States
SCORM	Sharable Courseware Object Reference Model
SDK	Software Development Kit

Sum Total	A commercial e-learning platform used in corporates
TANZ	Tertiary Alliance of new Zealand
TEC	Tertiary Education Commission
USB	Universal Standard Bus – a hardware standard for linking external devices to PCs
VLE	Virtual Learning Environment
WebCT	A commercial e-learning platform recently taken over by Blackboard
Wiki	A website or similar online resource which allows users to add and edit content collectively.
WMD	Weapon of mass destruction?
WYSIWYG	What you see is what you get – a term used for describing editing software

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