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**A MODEL OF USER ACCEPTANCE OF
LEARNING MANAGEMENT SYSTEMS:
A STUDY WITHIN TERTIARY INSTITUTIONS
IN NEW ZEALAND**

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ABSTRACT

Digital technologies are revolutionizing the practices of teaching and learning at colleges and universities all around the world. With the emergence of internet and web technologies, tertiary institutions are increasingly exploring the potential use of e-learning technologies to cater for the ever growing demands of flexible teaching needs in distance education. The teaching institutions are making significant efforts in e-learning development and investing significantly in associated information technology infrastructure with the expectation of high return on their investment. However, in spite of this effort and investment the teachers and faculty do not always use the technology as expected and more often e-learning systems continue to be underutilised.

This research investigates the factors that influence or inhibit the adoption of e-learning systems in the universities, institutes of technology and polytechnics in New Zealand. A cross section of teaching staff from different tertiary institutions was surveyed to ascertain their views on adopting learning management systems (LMS) in their teaching process. The survey questionnaire is based on factors that are being advocated by well known practitioners and academics, which were identified through a literature review.

The study reveals three key groups of factors: individual, system and organisational, affecting the adoption of e-learning systems in the tertiary institutions. The report introduces a theoretical framework for user acceptance of e-learning systems and presents a detailed analysis for factors relating to: (a) individual characteristics (b) individual perceptions (c) LMS system characteristics (d) external system characteristics (e) organisational support and (f) organisational characteristics.

The results show that whilst individual factors have significant contribution to the LMS adoption, the system and organisational factors are most crucial for user acceptance in e-learning systems. The users ranked that release time for staff, the ease of use of LMS, perceived usefulness of LMS, training and support to develop online content and the reliability of information and communication technology infrastructure are the five most essential factors for staff uptake in e-learning systems.

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INTRODUCTION

1.1 Background

Economic, social and technological forces are placing enormous demands on tertiary educational institutions and call for increasingly flexible and diverse systems to cater to an ever growing range of learning needs. Flexible approaches aim to provide learners with greater choice over when, where and how they learn by adopting various flexible delivery strategies such as distance education, online learning, mixed mode delivery, self paced or self directed learning strategies.

Traditionally, tertiary institutions delivered their flexible teaching programmes to students with the aid of print based course material and with limited information technology support such as email and electronic discussion lists. However, with recent advances in the digital technologies, institutions are increasingly seeking the potential use of information and communication technologies (ICT) to facilitate their flexible teaching needs. In particular, with the emergence of internet and web technologies, tertiary institutions around the world have been seeking to exploit the use of e-learning technologies to support their distance teaching. Among the diverse e-learning technologies, the learning management system (LMS) is a popular e-delivery medium within institutions. Smith and Rupp (2004) assert that with response to growing needs of the student population, online education is increasingly common in tertiary education.

For some time now the tertiary sector in New Zealand has been investigating the potential uses of the e-learning medium for distance education. Over the past few years the universities and polytechnics in New Zealand have been investing in e-learning technology development and associated ICT infrastructure to embrace this new online delivery medium in their institutions. The preliminary survey conducted within the Association of the Polytechnics in New Zealand (APNZ) in 2003 confirms that all ten institutes of technology and polytechnics (ITP's) which participated in the survey used an e-learning

application or a LMS to facilitate online teaching (Nichols, 2003). There are government strategies to influence the uptake of e-learning technologies within the sector and there is a special collaborative e-learning development fund for New Zealand universities and polytechnics pursuing e-learning development (Ministry of Education, 2003). Whilst studies have shown that e-learning technologies extend the quality of face to face teaching (Bates, 2000), the introduction of e-learning technology in teaching institutions has often been complex and teachers and faculty do not always use technology as expected. With regards to online teaching, the US National Centre for Education Statistics reported that during Fall 1998, only 6% of faculty staff taught at least one distance education class (US Department of Education, 2002). In Australia, statistics from the National Centre for Vocational Education Research (NCVER) 2000 student outcomes study showed that only 2.2% of all graduates completing their studies had experienced some form of online delivery (NCVER, 2000). In New Zealand, the preliminary survey conducted in 2003 within ten ITP's confirmed that only 8% of their face-to-face courses had some form of online support (Nichols, 2003). A 2005 study within all ITP's, facilitated by the Ministry of Education e-learning research fund, found that over half (51%) of the 817 survey respondents were not involved in any e-learning course development. The study further found that, of the 49% staff that were involved, 20% were either developing or delivering only one online course (Mitchell, Clayton, Gower, Barr & Bright, 2005).

The literature on academic staff's attitudes towards adopting e-learning technologies highlights various individual, system and organisational factors affecting the system adoption in their teaching and learning environments (Graves, 2001; Vrasidas, 2004; Levine & Sun, 2003; Hitt & Hartman, 2002). The common issues highlighted are: lack of knowledge required to develop online content; lack of reliable infrastructure and support to deliver content; individual perception towards e-learning; lack of flexibility in student administrative and support systems to complement the online delivery; lack of organisational support and incentives for staff; and lack of organisational direction and leadership for e-learning development. Further, educators claim that LMSs have functional limitations and they can not be adapted into their varying teaching needs. Clearly e-learning systems will not be readily embraced by the teaching staff in New Zealand's tertiary sector unless their concerns are addressed. It is therefore important to obtain the views of the teaching staff in order to implement a system that would meet the requirements of all users.

1.2 Research objectives

This research aims to achieve two objectives. Firstly, the study intends to identify the factors that are significant for e-learning system adoption, in particular the LMSs, in New Zealand universities and the polytechnics. The research results will assist to determine the most significant factors, including the most essential, for e-learning system adoption which in turn will provide an insight to New Zealand academic communities and institutional leaders to address any barriers to user uptake.

The second objective of the study is to introduce a theoretical framework for user acceptance in e-learning systems. The study intends to build a framework integrating the factors that are directly relevant for e-learning adoption as well as the factors from recognized information systems user acceptance models. It is therefore anticipated the proposed framework, embedded with theories from information systems acceptance, would provide a credible source for academic institutions to understand all key drivers for user acceptance in order to proactively design interventions (including system characteristics, training and support) targeted at populations of staff that may be less inclined to adopt, resulting in higher uptake and higher return on their e-learning technology investment.

The study was carried out within universities and ITP's in New Zealand. A total of ninety five teaching staff from a cross section of different academic programmes were surveyed to ascertain their views on adopting a LMS in their teaching practice. The survey questionnaire was based on the factors contributing to e-learning adoption as well as the factors from information systems user acceptance models that were identified during a literature review from various journal articles and publications by well known practitioners and the researchers in the field.

1.3 Research questions

This study considers two facets of e-learning during its system adoption by institutions: content development and content delivery. Each aspect will have different stakeholders, cultures and technologies and the study seeks to answer the following questions:

1. What is the current organisational setting in relation to e-learning development in New Zealand tertiary institutions?
2. What is the current degree of e-learning technology, including LMS adoption rate within the tertiary sector in New Zealand?
3. What are the key determinant factors for LMS adoption?
4. What could be the appropriate framework for LMS system acceptance?
5. What are the individual characteristics that staff see as important for online content development and delivery process?
6. Does individual perception and organisational culture towards e-learning influence the staff uptake in e-learning systems?
7. Could the degree of flexibility and functionality attributes within LMS have an impact on staff uptake?
8. Do flexible student administrative and learning support systems within the institution influence the staff uptake in LMS?
9. What are the organisational support factors that could influence the individual uptake in LMS?
10. What are the organisational characteristics that could influence the individual uptake in LMS?
11. What are the most significant factors that staff see as essential for their e-learning system adoption?
12. What conclusion could be reached on the validity of the LMS acceptance framework introduced?
13. What approach should institutions take when deploying e-learning systems?
14. What measures should institutions take to address barriers to e-learning system adoption?

1.4 Research area: technology innovation and user acceptance

With rapid advances in digital technologies many innovative systems and solutions appear in the market with the promise of enhancing the business competitiveness and productivity of their users. Organisations are making significant investment and commitment to adopt new technologies in their workplace with the expectation of a high return on their investment. However despite remarkable advances in technologies they often fail to meet business objectives and systems continue to be underutilized (Venkatesh & Davis, 2000). Research on technology adoption in the workplace indicates that lack of user acceptance has been one of the major barriers to overcome when deploying newer technologies in organisations.

The authors of Unified Theory of Acceptance and Use of Technology (UTAUT), Venkatesh, Morris, Davis & Davis (2003) assert that “the presence of computer and information technologies in today's organizations has expanded dramatically. Some estimates indicate that, since the 1980s, about 50 percent of all new capital investment in organizations has been in information technology (Westland & Clark 2000). Yet, for technologies to improve productivity, they must be accepted and used by employees in organisations”.

Venkatesh and Davis (2000) assert that information systems adoption, and use in the work place remains a central concern of information research and practice. He noted that despite impressive advances in hardware and software capabilities, the troubling problem of underutilised systems continues. Low usage of installed systems has been identified as a major factor underlying the “productivity paradox” surrounding low returns from organisational investments in information technology (Sichel, 1997).

The successful use of information technologies is dependent on many factors of end users. There has been considerable research on the factors that predict whether individuals will accept and voluntarily use information systems. The literature in user acceptance of technology identifies various theoretical models and frameworks on how users come to accept and use a technology. The commonly cited models in the literature are: (1) Technology Acceptance Model (TAM) (Davis, 1993), (2) TAM2 (Venkatesh & Davis,

2000), (3) The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al, 2003) and (4) Diffusion of Innovation by Everett Rogers (1983).

The TAM suggests that when users are presented with a new software package, a number of factors influence their decision about how and when they will use it. The most notable are perceived usefulness which is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" and perceived ease-of-use which is defined as "the degree to which a person believes that using a particular system would be free from effort" (Davis, 1993). Venkatesh and Davis extended the original TAM model to explain perceived usefulness and usage intentions in terms of social influence and cognitive instrumental processes. The extended model is referred to as TAM2 (Venkatesh & Davis, 2000). The Unified Theory of Acceptance and Use of Technology (UTAUT) presented by Venkatesh et al (2003) explains that four constructs would play a significant role as direct determinants of user acceptance and usage behavior: performance expectancy, effort expectancy, social influence, and facilitating conditions.

The Diffusion of Innovation framework published by Everett Rogers (1983, 2003) states that an innovation was conceived of as an object with five perceived attributes—relative advantage, compatibility, complexity, trailability and observability—that help one to explain its adoption.

These models express that there are various social and organisational factors influencing the user acceptance of technology and it signifies that such factors should not be considered in isolation from technical aspects. This is particularly important when deploying complex inter organisational systems, such as e-learning systems or distributed systems which cut across various user groups and units within the organisation.

1.5 Current practices in adopting e-learning technologies in tertiary institutions

Institutions are adopting e-learning technologies for two purposes: 1) to enhance the flexibility of traditional classroom based face to face courses with web access to syllabi, materials and discussions or 2) as a sole channel of distance education modality that eliminates or reduces “on-ground” classroom time (Graves, 2001).

Educators rarely have all the technological skills needed to develop custom web sites for online classes. Therefore, many educational institutions have adopted online course-building applications, or a LMS to facilitate online learning (Vrasidas, 2004). The popular LMS systems in use are Blackboard, WebCT and Moodle applications. Vrasidas (2004) described that two major functionalities associated with LMS are course administration and management and course pedagogy, teaching and learning (Vrasidas, 2004).

Staff development

All staff involved in flexible and online learning requires a wider scope of knowledge. However the literature suggests that relatively few institutions have organisation wide staff development programmes in place to provide for varying skill development needs for their staff (NCVER, 2000). Well developed skills in writing, communicating, interpreting, conveying and providing logical concise information, are just as important as technological skills such as ability to use email, internet and power point applications. In addition staff need to acquire organisation and administrative skills to design and develop online courses. More importantly, faculty need to understand new pedagogy for teaching online, that is, most effective practices for teaching when much of the learning environment is online.

It is common in large institutions to establish a well developed learning technologies unit to assist staff in teaching online. These units provide instructional development services including training faculty members to use e-learning software, assisting them in understanding online pedagogy, assisting them with instructional design, helping them develop courses and so on.

Individual perception and faculty culture

Individual perception and faculty culture plays an important role in tutors acceptance or rejection of e-learning systems. Faculties express much apprehension towards online education. In particular they perceive that online dialogue will replace the face to face interaction. There is also a concern that online teaching would be mandated rather than a supplementary option for faculty and students.

Information and communication technology infrastructure

Sound information and communication infrastructure play a key role in successful delivery of online content to distance students. Lack of reliability, performance and timely support on infrastructure could inhibit both tutor and the student from accepting this technology. More often institutions have at least core ICT infrastructure needed to support distributed learning. However developing online courses will require additional equipment and specialised software, for example, additional servers and a course management system. Student access requires network bandwidth and modem pools or internet service provider connections. These facilities need to be well managed and maintained to achieve a high degree of reliability.

Access to flexible administration systems and services

With the increase in courses being delivered fully online, students today expect much more than online access to course material or to courses. They expect access to both academic and administrative services. Graves (2001) asserts that most institutions have adopted e-learning technologies, however, they lack sufficient integration to other administrative systems within the organisation. He stresses the importance of integrating academic and administrative services on the web through a single and personal point of contact for students, instructors and other stakeholders.

In addition to providing online courses, the institutions needs to provide electronic access to student services such as distance library services, course enrolment, student advice and support services, financial aid and the book store. Britin, Liber, Perry and Rees (2004) assert that many current student support systems in teaching institutions are designed to

support the on-campus students and that organisations shifting to deliver online courses need to revamp their existing administrative systems to support students with single sign-on to all learning and administrative resources.

Staff time for distance teaching

While distance learning provides a host of teaching and learning practices that may be convenient for students, it is far more labour intensive than traditional face to face teaching practice; creating courses, maintaining discussion forums and responding to e-mails from students around the clock requires far more time than effort from educators. Educators point out lack of time to design, develop, maintain and support online classes is a major barrier in adopting e-learning systems.

Institution strategy in e-learning

Institutions are investing a large amount of money in e-learning development with little progress towards organisational outcomes (Graves, 2001). Organisations lack an enterprise-wide strategic approach for e-learning development across the organisation. There are random acts of progress or “pockets of excellence” within various faculty units by those who are keen on this technology. Graves (2001) claims “ Far too often the idea is to throw technology onto the playing field and cheer for those who pickup the ball and run with it. Relatively few institutions take a strategic approach to ensure a pay off at the institutional level”. He points out that to achieve real progress, e-learning development should tie back into the institution mission, and that institutions must have strategies that are enterprise-wide in scope.

1.6 Current status of e-learning technology development within the tertiary sector in New Zealand

A recent study conducted within all 20 ITP's in New Zealand found that e-learning is a reality for all of the institutions, although each institution is at different stages of their development (Mitchell et al, 2005). The results of the survey in 2004 with e-learning managers from 18 ITP's highlighted that almost half (8) of the institutions manage their e-learning development centrally, with another one third of institutions (6) opting for a model of devolved responsibilities within institution wide integration. Two institutions are making progress with the initiatives of individual staff members and another two institutions have planned the development, however, they have not commenced the work at the time of the study (Mitchell et al, 2004).

In terms of technology adoption, the 2004 study found that all ITPs are using a LMS to facilitate e-learning in their institutions. The most common LMS was Blackboard (within 8 ITPs), followed by Moodle (within 4 ITPs), WebCT (within 1 ITP) and a further five institutions are using other LMS systems. The study identified that two institutions had decided to move to Moodle at the time of the study. The report further highlighted that with recent improvements, it is likely that Moodle LMS will become the preferred system within the ITP sector in New Zealand in the near future. (Mitchell et al, 2004).

Of the eighteen e-learning managers who responded to the 2004 survey, the majority (12) believed that the e-learning adoption rate was slowly increasing within their institutions. Four managers considered that the rate was rapid and two considered that it was plateauing, while none thought it was decreasing.

In relation to e-learning knowledge within teaching staff, the results of the 2005 survey found that of the 809 staff who responded, almost half (46%) of tutors had an understanding of e-learning tools and that they used a selection of them (Mitchell et al, 2005). They were in the process of exploring the LMS and were mainly focused on transmission of the content. Another one third (33%) of staff was identified themselves as having limited grasp of e-learning and were willing to explore the benefits of e-learning further. Twelve percent of tutors identified themselves as having advanced knowledge of

e-learning and thorough expertise in LMS. They believed that they used e-learning to transform their teaching as much as possible (Mitchell et al, 2005).

In terms of tutor involvement in e-learning courses, the 2005 study indicated that over half (51%) of the 817 survey respondents were not involved in any e-learning course development. The study further found that, of the 49% staff that was involved, 20% are either developing or delivering only one online course (Mitchell et al, 2005).

This study made an attempt to include the e-learning development status of the New Zealand universities. Unfortunately, the researcher did not find any suitable literature to determine the overall status of e-learning development across the university sector in New Zealand.

It is noted that there has been no study done to date in the New Zealand tertiary sector to investigate e-learning system adoption factors within the context of information systems acceptance. Analysis of existing publications in this topic suggests that the current studies do not appear to be based on the frameworks incorporating the theories from information systems user acceptance. Thus, the empirical research in information systems user acceptance provide well founded theoretical models with valid elements that predict whether individuals will accept and voluntarily use information systems. This study addresses this need and therefore it is envisaged that the findings of this study would be useful for the wider communities in the tertiary sector in New Zealand.

1.7 Thesis structure

The research report is structured into six sections. Section two provides a detailed literature review on factors that would influence or inhibit the adoption of e-learning in teaching institutions. Section three presents the methodology that was used to conduct the research and section four presents the results of the research. Section five is the analysis and discussion of results and finally section six concludes the report with the summary of outcomes of the research with recommendations to address barriers to e-learning development in tertiary institutions.