Teaching English with Technology – Special Issue on LAMS and Learning Design, 11 (1), 81-97.

FACTORS INFLUENCING LECTURER UPTAKE OF E-LEARNING[1]

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Abstract

This paper reports on two research projects, one completed and a partial follow-up study in the early stages of investigation. The first study investigated a range of factors that directly affect the quality of web-supported learning opportunities. The outcome of that study is a taxonomy of critical success factors for quality web-supported learning based on six categories: institutional factors, technical factors, pedagogical factors, instructional design factors, lecturer factors and student factors.

The new study takes as starting point one of the categories of the taxonomy, namely lecturer factors. Using appropriate media effectively should be seen as part of the development of personal and teaching proficiencies. However the literature reveals that there remain various barriers to academics adopting learning technologies as a matter of course in their practice and that the uptake of institutional e-learning systems remains in the hands of enthusiasts. Academics need to be supported in investigating the use of appropriate technology to enhance and expand their teaching practices. A research study is underway at Oxford University (UK) to determine the level of uptake of the virtual learning environment, as well as the barriers and limitations that academic staff encounter in moving forward along the technology adoption curve (Moore, 1999).

1. Introduction

> "Unless a state of institutional sustainability is achieved, it is likely that e-learning activity will in the long term be limited to enthusiasts" (Nichols, 2008, p. 598)
>
> "… the doubters most often become the most enthusiastic converts." (Vallone, 2000).

The term e-learning embraces a variety of electronic delivery media, for example web-based distance education, multimedia, interactive television, virtual classrooms, video conferencing, and virtual learning environments (VLEs). This paper focuses on web-supported learning (WSL), which is taken to be synonymous with blended learning. The term web-supported learning is preferred over web-based learning (WBL) and e-learning, since the learning model under consideration is a blended one in a traditional face-to-face university, including a major component of contact time supported by a VLE. The term VLE is taken to be synonymous with learning management system (LMS).

This paper reports on two research projects, one completed at the University of Pretoria, South Africa (Fresen, 2005; Fresen, 2007), and a partial follow-up study in the early stages of investigation at Oxford University, United Kingdom. The first study (Study 1) investigated a range of factors that directly affect the quality of web-supported learning opportunities. The outcome of that study is a taxonomy of critical success factors for quality web-supported learning based on six categories: institutional factors, technical factors, pedagogical factors, instructional design factors, lecturer factors and student factors. The new study (Study 2) takes as starting point one of the categories of the taxonomy, namely lecturer factors, and plans to investigate where lecturers perceive themselves in terms of technology adoption, and what 'facilitative conditions' might be pursued in order to support them more effectively (Surry & Ely, 2002).

2. Study 1

2.1. Methodology

The research question for the first study was:

What factors[2] promote quality web-supported learning?

The primary research method was a literature review which identified and analysed studies of two types: those which present classic benchmarks, indicators and principles for quality web-supported learning (Institute for Higher Education Policy (IHEP), 2000; Barker, 1999; Chickering & Ehrmann, 1996; the Sloan Consortium (Lorenzo & Moore, 2002)), and those that identify criteria for exemplary or promising courses (Graf & Caines, 2001; Confrey, Sabelli & Sheingold, 2002). Twigg (2001) confirms that the IHEP study is particularly meaningful and useful. Collis and Moonen (2001) identify institution, implementation, pedagogy and technology as the key components for developing online learning materials.

Details of the studies mentioned above and the comparative analysis are given by Fresen (2005). An initial taxonomy of factors which contribute to the quality of web-supported learning, based on six categories emerged from Study 1: (1) institutional, (2) technology, (3) lecturer, (4) student, (5) instructional design and (6) pedagogical factors. Critical colleagues within the case study at the University of Pretoria reflected on and refined the draft taxonomy for purposes of triangulation and verification. The final taxonomy is given in Tables 1 and 2, and Figure 1.

Later Selim (2007) distilled four e-learning categories of critical success factors (CSFs) from the literature (instructor characteristics, student characteristics, technology, and university support) which are directly aligned with four of the categories distilled in this study. Selim (2007) conducted a confirmatory factor modelling analysis after testing the categories and their various indicators, by surveying 538 university students. His results led him to propose eight categories for e-learning CSFs: (1) instructor's attitude towards and control of the technology, (2) instructor's teaching style, (3) student motivation and technical competency, (4) student interactive collaboration, (5) e-learning course content and structure, (6) ease of on-campus internet access, (7) effectiveness of information technology infrastructure, and (8) university support of e-learning activities. I suggest that these eight items are not broad categories, but they do noticeably overlap with many of the factors in the refined taxonomy developed in Study 1 (see Tables 1 and 2). In particular, Selim's (2007) first factor (instructor's attitude towards and control of the technology) – an explication of 'lecturer factors' – forms the basis of Study 2 in this paper.

2.2. Results of study 1

The refined taxonomy, which answers the research question, is given in Tables 1 and 2 and Figure 1. Figure 1 provides a visual synthesis and interpretation of the taxonomy, which was mapped onto Ingwersen's (1996) cognitive model of information retrieval.

In synthesizing such a taxonomy, it is impossible to list *all* critical success factors for quality web-supported learning. It is inevitable that other researchers will suggest additional factors. In attempting to be as comprehensive yet as succinct as possible, earlier research listed separately two types of basic factors (Fresen & Boyd, 2003):

- underlying *assumptions* which must be in place before quality web-supported learning can even be contemplated;
- *exogenous* (external) factors, which are important for quality web-supported learning, yet are beyond the control of e-learning practitioners.

The critical colleagues agreed with listing underlying assumptions and exogenous factors separately. These factors are listed in Table 1, reflecting the suggestions and consensus of the critical colleagues. The resulting refined taxonomy of critical success factors for quality web-supported learning is presented in Table 2.

Table 1. Underlying assumptions and exogenous factors forming the foundation of the taxonomy.

Underlying assumptions	**Exogenous factors**
• ICT infrastructure; • information literacy of clients[3]; • basic computer literacy of clients; • positive attitude of lecturers; • commitment and motivation of clients; • sound advice, support and consultation to lecturers with respect to instructional design and educational practice; • sound instructional design practice; • sound teaching and learning practice; • commitment to continuous improvement.	• quality of the institutional learning management system; • stability of national telecommunications infrastructure; • class size; • work load of clients; • recognition and incentives for lecturers.

The refined taxonomy presented in Table 2 should be read with the understanding that the underlying assumptions listed above are taken as given and that the exogenous factors are acknowledged.

Table 2. Resulting taxonomy of factors to promote quality web-supported learning.

Institutional factors	**Technology factors**
Technology plan	Appropriate use of technology
Student selection and entry into courses	Reliability
Student consultation	Availability 24/7
Institutional programme evaluation	Accessibility (Inclusivity)
Change management	System training for clients
Standardisation of information design	IT support for clients
and dissemination	Appropriate bandwidth and download demands
	Management of student data
Lecturer factors	**Student factors**
Interaction / facilitation	Communication
Frequent feedback	Time management
Academic background	Self directed learning
Evaluation of teaching competence	Critical thinking
Community and empathy	Problem solving
Instructional design factors	**Pedagogical factors**
Usability:	Learning outcomes, goals, expectations
• Modular chunks	Flexible learning package
• Use of media	Assessment strategies
• Use of images, graphics, animation	Learning styles
• Layout and presentation	Learner-centered learning environment
• Standards	Content and learning resources: relevance,
• Accessibility	accuracy, currency
Learning principles:	Adaptable, sustainable, scaleable, reusable
• Collaborative learning	Self reflection
• Interactivity	
• Engagement	
• High expectations	
• Higher cognitive levels	

Various factors were suggested by the critical colleagues, for example the importance of standardised dissemination of information, on an institution-wide basis. This factor refers to the importance of standardising the *information design* of all applications that influence web-supported learning, for example the user interface of campus portals, access to library reference pages etc. Another suggestion was to subdivide the instructional design factors into two subsections, *usability* and *learning principles*.

Further modifications agreed upon were that the term *inclusivity* should be re-worded as *accessibility* and moved to *technology* factors. The current connotation of the word *accessibility* includes access to technology for persons with learning and/or physical disabilities (Brown, 2004). Similarly *diversity* was reworded as *learning styles*, which is intended to include equity issues as well as social, cultural and gender sensitivity. The term *organisational change* was replaced with *change management*, a term more widely used in the field of education innovation.

2.3. Graphic interpretation of the taxonomy

The taxonomy was mapped onto Ingwersen's (1996) cognitive model of information retrieval (IR) interaction (Fresen, 2005). Such a mapping provides a practical interpretation and overview of the complex issues involved in synthesizing factors to promote quality web-supported learning. The mapping of the categories in the taxonomy (Table 2) onto Ingwersen's model is given in Figure 1, in which the categories of the taxonomy are indicated in italic text. *Institutional factors* appear twice, since they appear to map naturally onto both the *institutional infrastructure* and onto the *organisational environment*.

In Figure 1, the interface for the interaction is the computer (1) that is required by lecturers and students to prepare or access electronic learning materials and media (this maps onto *technology factors* in the taxonomy). The individual user (2) is the lecturer or student participating in designing or using the virtual learning environment (this maps onto the *lecturer* and *student factors*). The information objects or products (3) are the electronic learning opportunities that the student is engaging with, including content, resources, learning activities etc. These learning objects should take into consideration sound *instructional design* and *pedagogical factors* to promote learning. The *institutional infrastructure* (4) enables such learning to take place using the institutional virtual learning environment. The social or organizational environment (5) includes institutional and exogenous factors, as well as the underlying assumptions that are required for quality web-supported learning. For example, underlying assumptions such as positive attitudes, motivation, class size and incentives for lecturers are part of the social and organisational environment.

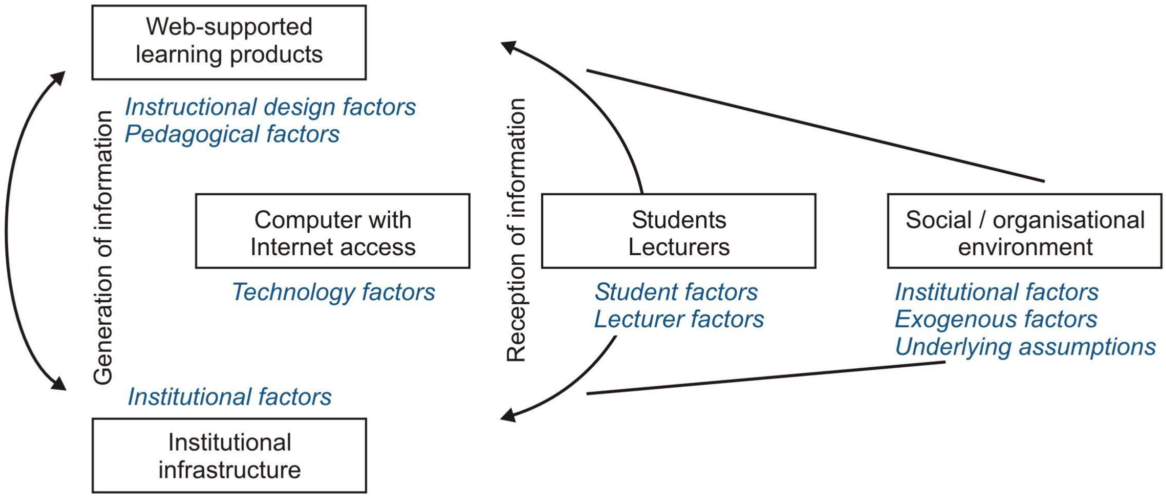

Figure 1 Graphic interpretation of the taxonomy for quality web-supported learning, mapped onto Ingwersen's (1996) cognitive model of information retrieval.

Thus the answer to the research question in Study 1 is provided by the *taxonomy of factors for quality web-supported learning*, which has three components:

- underlying assumptions and exogenous factors (Table 1);
- refined taxonomy of factors, in six categories (Table 2);
- graphic interpretation providing a cognitive summary (Figure 2).

3. Study 2

The new study takes as starting point one of the categories of the taxonomy, namely lecturer factors. Academics are specialists in their own particular discipline and do not necessarily embrace upcoming technologies to enhance and expand their teaching practice. They tend to view technology with scepticism, particularly in the light of various waves of technology initiatives which may have failed to deliver on their potential. Bower (2001, n.p.) concludes that "Faculty are not recalcitrant Luddites. Many have simply been disillusioned by previous technologies touted as innovations that would alter the course of education. Faculty are exhibiting healthy skepticism when they resist the call to jump on the latest educational bandwagon before assessing how this new technology will help students learn".

3.1. Research questions

The research questions for the follow-up study (Study 2) are:

1. What barriers and limitations are encountered by academic staff in attempting to use an institutional VLE?

2. What is the level of uptake of the VLE at Oxford University (UK) amongst academic staff?
3. What facilitative conditions can be pursued to optimize the uptake of the VLE?

3.2. Background

The literature on rates of adoption, the decision innovation process and barriers to technology adoption is extensive. There is even an online board game called the *Diffusion Simulation Game* (Indiana University, 2009), in which you play the role of a change agent making use of various strategies to persuade teachers to adopt a particular educational innovation. The theory of the diffusion of innovations was developed in the United States by Rogers (1962) whose work became legendary in modeling innovation diffusion in the fields of agriculture, education, medicine and marketing (Wikipedia, n.d.).

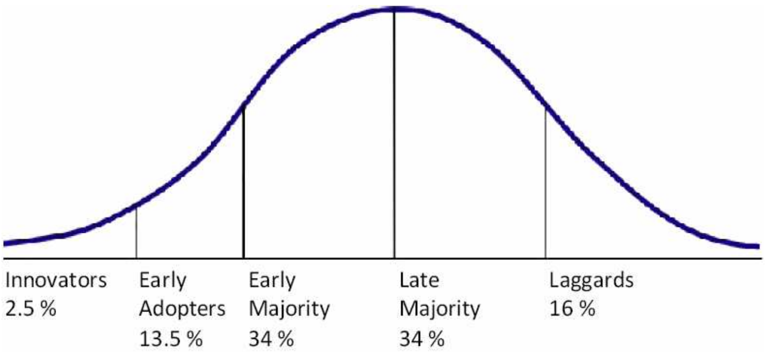

Figure 2 The diffusion of innovations according to Rogers (1962, adapted from Wikipedia http://en.wikipedia.org/wiki/Everett_Rogers).

Moore (1999) drew from Rogers' work in describing the technology adoption lifecycle, in particular the gap or "chasm" between the first two adopter groups (innovators/early adopters), and the early majority. Various descriptive synonyms for Rogers' original category names are also in use, namely 'technology enthusiasts', 'visionaries', 'pragmatists', 'conservatives' and 'sceptics'.

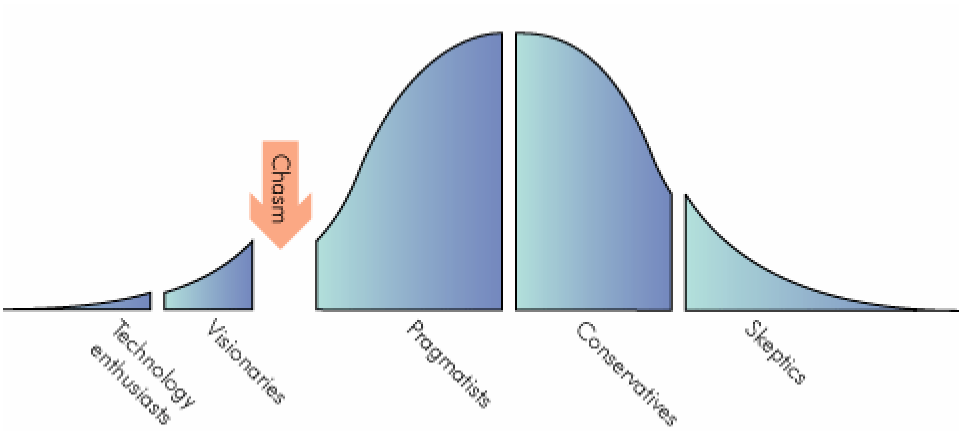

Figure 3. The Technology Adoption Curve (Slinn, 2010, after Wikipedia).

In recent years the use of the term 'adoption curve' has permeated into higher education circles, and Morgan (2008) even claims that it "has become so overused it is meaningless, and hence annoying. People use a genuflection toward the faculty adoption curves with early adopters, early majority etc. as a way to ignore the complexity of how technology use varies within the faculty."

Moore (1999) summarises the logic of the technology adoption lifecycle: "technology is absorbed into any given community in stages corresponding to the psychological and social profiles of various segments within that community" (p. 12). Since it becomes increasingly difficult to engage the groups of people further along the curve, not only must the technology be made increasingly easier to adopt (Moore, 1999), but I suggest that the support and guidance provided must become more extensive, varied and easily accessible. For example, in the case of an institutional VLE in a higher education institution, the innovators and early adopters will be willing and able to experiment for themselves, but the early and late majority will require the support of user group meetings, step-by-step guides, drop-in consultation sessions and video screen demonstrations.

Despite its name, the technology life cycle is all about the people and where they are in the process of adoption. Rogers' early work was in the field of rural sociology, inspired by farmers who were slow to adopt various biological-chemical farming innovations. Surry and Ely (2002) give an overview of the adoption and diffusion process, with particular emphasis on educational technology and suggest 'facilitative conditions' in an effort to adopt a more positive approach, rather than focusing on resistance.

Another useful way of representing the maturity and life cycle of technological innovations is the Gartner Hype Cycle (Slinn, 2010). The Gartner group (www.gartner.com) conducts regular research to investigate where various technologies lie on their hype cycles.

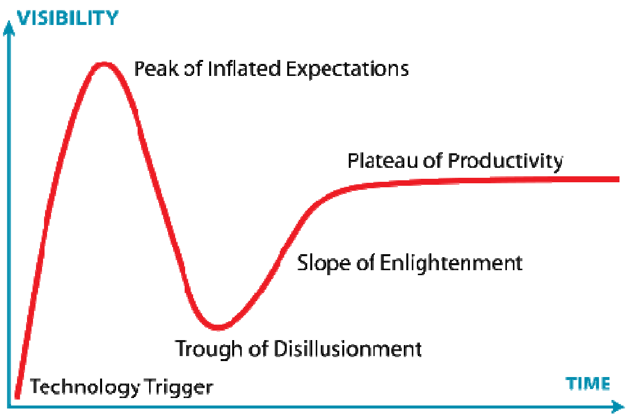

Figure 4. The generic Gartner Hype Cycle (Wikimedia Commons; Gartner_Hype_Cycle.svg, attribution: Jeremy Kemp).

When it first appears, a new technology may generate a lot of 'hype', in particular raising a 'peak of inflated expectations'. With hindsight, this is what happened with innovations in the 1950s and 1960s in terms of the use of radio, television and personal computers, which were expected to revolutionise the world of education and put teachers out of work. As early claims dissipate without being realised, the item of technology may fall into the 'trough of disillusionment', before it gradually climbs the 'slope of enlightenment' with more and more adopters understanding its benefits and seeing its potential, and then it eventually emerges on the sunny 'plateau of productivity'. Where do institutional VLEs lie on the Gartner hype cycle for emerging technologies?

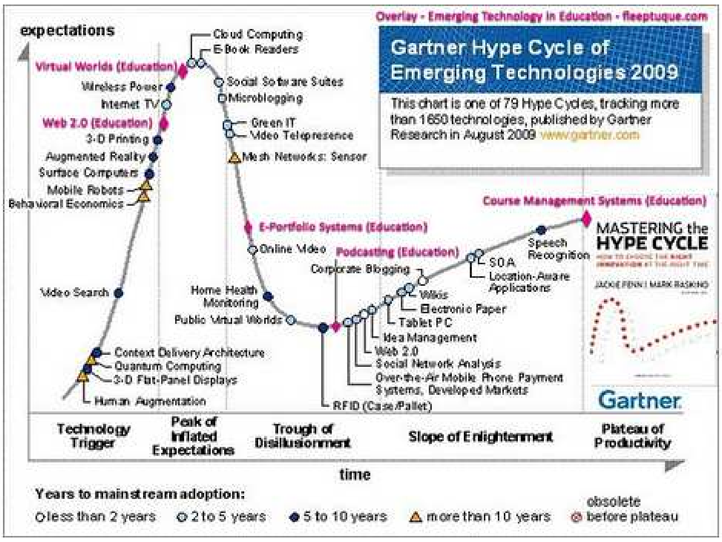

Figure 5. The Gartner hype cycle for Emerging Technologies, with overlay of particular Educational technologies (Collins, 2009).

According to Collins (2009), Course Management Systems (at the beginning of the plateau in 2009) should no longer be classified as an emerging technology as from 2010, since most educational institutions have implemented such systems (also called Learning Management Systems – in the USA, and Virtual Learning Environments – in the UK). However, even if the technology can be considered as being mainstream, this does not necessarily imply that academic staff have become part of the late majority.

McKeown (2010) reflects on why every teacher isn't using their computer and the internet connections productively, and presents the idea of the pencil metaphor, which includes the 'lead-ers (pronounced 'led'), the 'sharp ones', the 'wood' (those who 'would' use the technology if some 'sharp ones' gave them the training and support), and the 'dead wood' (the last part of the pencil that cannot be sharpened no matter how hard you try). In this metaphor, there are even the 'erasers' who undo much of the work done by the 'lead-ers'.

3.3. Literature review

Schifter (2000) carried out a study in the United States to measure the extent of motivators and inhibitors for faculty participation in distance education. She found that determining what factors deter faculty from participating in distance education appears to be easier than determining what motivates them. I suggest that the same comment would apply to academic staff in a blended learning environment.

A survey undertaken in a considerable number of higher education institutions in the USA (Higher Education Research Institute, 1999) indicated that faculty members are slow adopters of computer technology for teaching purposes. They generally feel out of touch with the newest computer technology trends. The stress of keeping up with information technology has surpassed the well-known pressure to 'publish or perish'.

Although the majority of faculty make use of information technology in order to communicate via e-mail, to conduct research and to conduct scholarly writing, a minority of them actively make use of online learning in their teaching - 36% of faculty members place or collect assignments on the Internet and 22% use computers in undergraduate course instruction (Higher Education Research Institute, 1999). In the same study, 67% of the faculty members reported that keeping up with information technology has proved to be stressful for them. Despite technology's role as a stress-producer, the vast majority of faculty members (87%) believe that computers are educationally beneficial.

Newton (2003) conducted an extensive literature review, as well as a survey and interviews across a range of institutions within the UK to investigate the issues perceived by academic staff to be important barriers in using technology in teaching and learning. The overall finding was that "developments are often led by the enthusiasm of individuals with little extrinsic reward structure to encourage these innovations" (p. 412).

The following list of major inhibiting factors compiled by the Microsoft Scholars project (1997) is cited by Newton (2003, p. 413) as a starting point:

Table 1. Major factors which inhibit the accelerated adoption of technology in higher education.

1.	Inadequate infrastructure for access, support and training for sustaining technology
2.	Lack of co-ordinated planning for technology at departmental, institutional and system levels
3.	Use of technology is not part of the prestige, recognition or promotion systems currently in place
4.	Academic staff have not been taught how to apply technology to teaching
5.	Technology is not a financial priority within schools or departments
6.	Uncertainty of intellectual property rights in an electronic environment
7.	Resistance to changing traditional teaching practices
8.	Lack of understanding of application of technology
9.	Lack of high level vision in administration about the role of technology
10.	Unrealistic expectations of what the technology can do
11.	Dismissive attitude because of early inadequate experience (real or perceived)
12.	Generational division between older and younger staff in responding to use of technology
13.	Resistance to external pressure to change
14.	Ideological resistance to technology
15.	Claims that technological solutions are pedagogically not appropriate

Sharpe, Beetham and McGill (2009) propose a pyramid model as one way of understanding how effective e-learners can be developed in terms of their digital literacy.

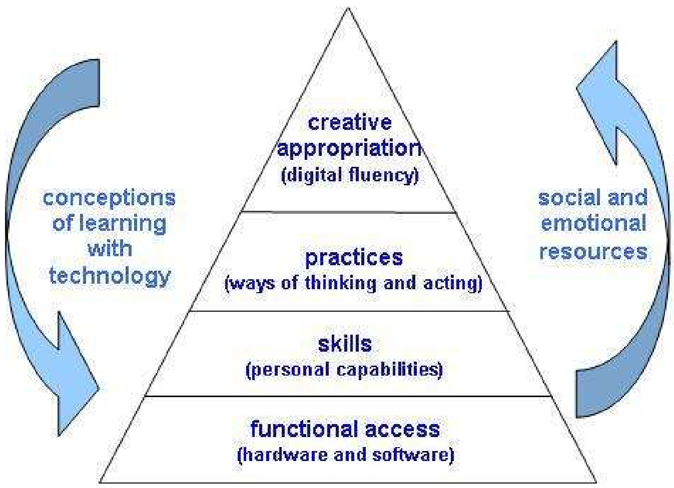

Figure 6. E-learner developmental model (adapted from Sharpe, Beetham & McGill, 2009).

In investigating how academic staff progress along the adoption curve in terms of the use of an institutional VLE, the above developmental model for student digital literacy could be adapted and applied to academic staff.

3.4. Methodology

Study 2 is currently still in the planning stages. What has been done as a starting point is to ask a small group of users of the institutional VLE where they would place themselves on the technology adoption curve. Not surprisingly, they classified themselves either as innovators or as part of the early majority. They then suggested that they should place their colleagues on the curve – again, not surprisingly, they placed their colleagues in the late majority category, with even a handful of laggards.

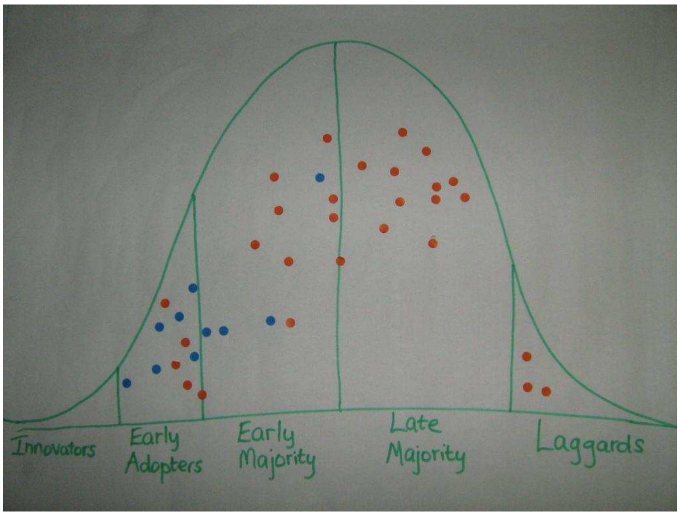

Figure 7 Exploration of user perceptions as to where they and their colleagues lie on the technology adoption curve.

The envisaged methodology for Study 2 is to conduct a mixed methods study amongst academic staff at Oxford University (UK), including a questionnaire and semi-structured interviews. The study has no funding, nor the resources to extend it to other higher education institutions; however, the methodology may be generalisable to other institutions.

One possibility is to use the snowball sampling technique. This sampling technique involves the researcher identifying a small number of individuals who have the required characteristics. These participants are then asked to identify other participants who qualify for inclusion (Cohen, Manion & Morrison, 2000). The existing VLE user group at Oxford

University can be approached for suggestions as to which academics to target in the initial round.

Masters students in the Education Faculty specialising in e-education could provide assistance with the project, since they are required to conduct research in the field to comply with their degree requirements.

3.5. Next steps

The next steps to follow in Study 2 are the following:

- Approach the coordinator of the Masters in Education (e-learning) to offer the project to student researchers.
- Conduct a review of more recent literature on the topic of faculty adoption of VLEs in blended scenarios.
- Refine the conceptual framework in terms of which technology adoption life cycle or developmental model to investigate, in conjunction with personal traits and preferences of academic staff.
- Devise and pilot a questionnaire for academic staff.
- Devise and pilot an interview protocol for semi-structured interviews with academic staff.

It is envisaged that the literature review will start in October 2010, with the data collection phase taking place in January 2011. The findings should be available by October 2011.

4. Conclusion

The web medium offers increased convenience and alternative methods of communication, interaction and assessment. There are changing roles for both lecturers and students in learning how to make optimum use of virtual learning environments in order to enhance the learning process. Issues such as change management, accessibility, learner-centered approaches, and technology access and reliability have an impact on the quality of web-supported learning opportunities.

Few studies appear to present a holistic approach to enhancing quality in web-supported learning, by applying standard quality assurance practice to products, process and client satisfaction measures (see Fresen, 2005). The first study discussed in this paper presents a taxonomy of critical success factors to enhance the quality of web-supported learning opportunities in a blended learning environment in higher education. The taxonomy of factors is organized in six categories: institutional, technology, lecturer, student, instructional design and pedagogical factors. One of the factors, *lecturer factors*, will be further investigated in a second proposed study, with particular emphasis on identifying not only inhibiting factors, but also facilitative conditions to enable academic staff to make optimal use of educational technology, where appropriate, to enhance teaching and learning experiences.

Newton (2003) concludes that "organisational barriers do not appear to have been significant in determining uptake decisions" (p. 423), but he stresses that effective strategies must be in place to support technology-based teaching and learning initiatives. These points link neatly back to the exogenous factors and the taxonomy of critical success factors in part 1 of this paper, in particular the importance of the quality of the institutional learning management system, system training and IT support for users.

The problems anticipated by staff with regard to embracing instructional technology are not new. Concerns about lack of resources, and resistance to educational innovation have been evident since the days of traditional mainframe computer-based training, and indeed even since the advent of radio and television. Newton (2003) found that despite uncertainly in adopting technological innovations, there is a willingness on the part academic staff that "appears to be almost entirely due to intrinsic values which academic staff place on teaching and learning" (p. 423).

A guiding principle is that good pedagogy remains good pedagogy, regardless of the tools, media or technology at our disposal. Particularly in a traditional face-to-face institution, a virtual learning environment can be viewed as yet another supplementary opportunity to optimise teaching and learning in an already immersive learning environment. The enthusiasts, champions and innovators among us find ways and means of overcoming barriers, but the question remains as to how to provide effective support to cross the chasms in the technology adoption curve (Moore, 1999), and move the adoption of an institutional VLE into the domain of the late majority.

Please cite as: Fresen, J.W. (2010). Factors influencing lecturer uptake of e-learning. In J. Dalziel, C. Alexander, J. Krajka & R. Kiely (Eds.), Special Edition on LAMS and Learning Design. *Teaching English with Technology*, *10*(3), 81-97.

Notes

1. This paper was presented at the European Distance and E-Learning Network (EDEN) Research Workshop, Budapest, 25-27 October 2010. Reprinted with permission.

2. The word 'factor' is used throughout in the ordinary everyday sense of the word, such as 'characteristic' or 'aspect'. No statistical *factor analysis* is implied or intended.
3. "Clients" include lecturers and students.

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