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Proceedings of the 20th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE)

Adelaide, Australia
7–10 December 2003

Editors
Geoffrey Crisp, Di Thiele, Ingrid Scholten, Sandra Barker, Judi Baron

ascilite
**Australasian Society For Computers
In Learning In Tertiary Education**

A SWITCH TO ONLINE TAKES TIME: ACADEMICS' EXPERIENCES OF ICT INNOVATION

Jane Burdett
School of Accounting and Information Systems
University of South Australia, AUSTRALIA
jane.burdett@unisa.edu.au

Abstract

Universities introduce information and communications technology to support flexible teaching and learning and bring about improved performance for the organization, staff and students. Despite anticipated benefits, indications to date suggest that ICT is not embraced enthusiastically nor completely by all academics, resulting in limited uptake. The successful integration of ICT with higher education requires more than mandating its use and hoping academics will respond positively.

This paper explores the experiences of academic 'early adopters' and 'late adopters' using ICT in course design and delivery. Highlighted are sources of discontent, and strategies to address these issues are discussed. While advantages are acknowledged, this paper focuses on the perceived barriers to and problematic aspects of ICT use in higher education that have the potential to deter users and stifle innovation. It is essential that these barriers are identified, understood and action taken to overcome them. Findings indicate that universities will need to address academics' concerns through improved technology performance, workload allowances and appropriate professional development, if widespread and ongoing innovation is to be achieved.

Background and rationale

For many universities systematic integration of IT is essential to their future and not a matter of choice, but a requirement for effective operation and survival (Alexander, 2001; Taylor, 2001). In recent times, there has been 'a great rush' (Harmon & Jones, 2001, online) by universities to introduce communications technology to support teaching and learning (Bell et al., 2002; Alexander, 2001; Moe, 2000). The adoption of such technology is forcing universities to rethink their existing models of education (Salmon, 2000; Harasim et al., 1995), but this is taking place in a context of uncertainty (Bradley, 2001).

In spite of the nearly universal introduction of ICT in the tertiary sector, many academics continue to resist or reject its use (Anderson et al., 1998). As a result, ICT has not been uniformly adopted beyond the first level of a supplementary technology (Bell et al., 2002); and the development of web-based teaching and learning initiatives has not been systematic, but is often the result of the activities of risk takers in the institution who have an interest in the technology (Taylor, 2001). Results are unpredictable and rarely disseminated or replicated in other areas of the university.

In the light of this uneven and uneasy adopting of information communications technology in universities, this paper reports the findings from a larger study that examined academics' use of ICT in course design and delivery at a large Australian university. The research was conducted in a university that is establishing a flexible, technologically mediated learning environment in support of its goal to be innovative and globally competitive. To this end, the university has developed a complex intranet linked

to the Internet, and since 1999 has been encouraging staff to not only use the administrative functions available online, but to use online facilities for the delivery of courses.

To this end, an automatically generated 'home page' for every course offered by the university is stored on a web server. The pages supply information about course content, timetabling, learning support and staff and are freely accessible on the Internet. Web authoring software enables academics to create and develop online teaching and learning resources for their courses, which are also stored on the web server. However, the extent to which academics choose to adopt ICT as part of their course design and delivery is optional. Adoption is influenced by their own attitudes to ICT, their levels of expertise and their interpretation of its benefits. As in many other Australian universities (Taylor, 2001), despite its ICT initiatives, university management regards the use of ICT for teaching and learning to be not as widespread, popular or as systematic as hoped, although the use of ICT for administrative tasks is pervasive.

This study attempts to understand sources of resistance to the use of ICT for teaching and learning, and may prove helpful in identifying issues to be addressed. If changes inspired by the introduction of information and communications technology are to be widely accepted and institutional goals achieved, universities will need to more clearly understand the experiences of academics and their responses when confronted by new technology that is usually accompanied with suggestions of altering their teaching and learning strategies.

Critical research
Critical to the success of the online activities in the university being reported, is a greater understanding of academics' responses to ICT initiatives and their perceptions of positive and negative impacts. Despite an interest in the use of ICT in education (Chin, 1999; Harmon & Jones, 2001; Glick & Kupiec, 2001), research into ICT use by academics has not progressed at the same rate as the appearance of 'various courses of varying worth on the Internet' (Siragusa, 2000, online). McShane (2000) agrees, saying 'there is a paucity of research into academics' experiences of teaching, identity, role and practices in online learning environments' and 'there is a need for inquiry into the experiences of teachers who use technology' (p.2). Without such insights, imposition of technology innovations is likely to be resisted and innovative and successful change will be limited.

The innovative actions or otherwise and experiences of individual academics and their level of ICT usage are the main foci of this paper, particularly barriers and negative perceptions.

Point of reference: Rogers' model of innovation diffusion
Rogers' (1995) Diffusion of Innovations Model states that people adopt technology at different rates: *innovators* and *early adopters* are leaders who take up technologies relatively quickly after their introduction into the community; while *early majority* and *late majority adopters* follow later, and *laggards* may avoid the challenge entirely. Anderson et al. (1998) combine adopters into two main groups: *leaders* and *followers* and have found the sizeable innovation rate gap between them to be 'worthy of further investigation' (Anderson et al., 1998, p.74). In this research, early adopters (EAs) are those academic leaders who are among the first to use ICT in the development and teaching of their courses. Late adopters (LAs) or followers, adopt ICT later than other academic colleagues, if at all.

Questions to be answered
The questions to be answered by the research were:
1. How do academics use ICT applications in course design and delivery?
2. What do early and late adopters describe as the advantages and disadvantages of ICT usage?
3. What are academics plans for further ICT innovation?

Method

Data was gathered from semi-structured one-hour interviews with ten purposefully selected academics responsible for course design and delivery. Interviewees were both course designers and course deliverers; that is, they made decisions about the extent to which they would use ICT during the development of a course, and how ICT would be used in course delivery (refer to Table 1). Thus they had a perspective of the impact of ICT on teaching and learning processes. Selection of the participants (five early adopters, five late adopters) was based on information gleaned from discussions with the university's Teaching and Learning Support Staff, Online Advisers and by accessing web pages for which the participants were responsible.

Interviewees were required to reflect on and describe their use of ICT in course design and delivery, articulate their experiences both positive and negative, and discuss their attitudes towards further ICT innovation. Structured questions asked the age of interviewee, length of experience, teaching responsibilities, ICT applications used and self-perception of their 'adoption rate'. Semi-structured questions focused on how ICT was being used (if at all), particularly to what extent the course web/home page was being used. Other questions sought insight into participants' motivation for their use or non-use of the ICT, as well as descriptions of experiences and perceptions, advantages and disadvantages of ICT use, and plans or otherwise for further innovation in ICT.

Research interviews were audio-taped, transcribed by an administrative assistant; and interviewees were given the opportunity to check their transcripts. Coding and analysis of transcripts revealed issues of interest, recurring patterns and relevant themes.

	early adopters	late adopters
Course delivery modes	internal and external	internal and external
Courses designed and delivered	2 average	2 average
Years of university teaching	9 years average	13 years average*
Age	3 in 30-40 years range 2 in 50-60 years range	3 in 40-50 years range* 2 in 50-60 years range
Adoption rate compared to academic colleagues	first to use ICT in course*	late to use ICT in course

Interviewer profile indicated*

Table 1 Interviewee profile

Findings and discussion: Patterns of innovation diffusion

Levels of ICT usage
Complementary to Rogers' model of innovation diffusion, Harmon and Jones (2000, p.28) identify five levels of use of ICT common in education and training contexts as:
• informational (course documents available online)
• supplemental (provides some course content via a web)
• essential (a web must be used to succeed)
• communal (both face-to-face and online)
• immersive (fully online).

Each level represents the relative amount of online-related course content and the level of reliance on ICT. Data from the interviews indicated differences between interviewees in the extent and level of the innovative use of ICT to support their course design and delivery. Early adopters were making advanced use of the university's web at essential and communal levels, but none was delivering fully online (immersive) courses. Late adopters generally found email adequate for most of their needs. Where staff were persuaded to use the course home page to distribute information (informational), paper based methods of distribution were also retained. It is not difficult to understand and use technology to

disseminate information; and therefore the likelihood of adoption increases. Furthermore, using ICT to distribute information is compatible; that is, consistent with academics' existing needs and values and does not require significant pedagogical change (Rogers, 1995).

Use of key online features

It should be recalled that an automatically generated home page for every course offered by the university is stored on a web server and is freely accessible on the Internet. Thus, every course has its own web. Using web authoring tools, university staff are able to create additional web pages, discussions and quizzes to place on the course web, with links to these additional pages appearing on the course home page.

The course home page

Early and late adopters indicated the frequency with which they used the features available as part of the course home page. As might be expected, usage varied, with the early adopters using the course home page for a variety of reasons other than supplying information, including the provision of online assessment tasks such as quizzes, online discussion groups and online access to course documents such as information books and study guides. While the late adopters made similar use of course home pages for the distribution of information and the provision of lecture notes, additional use was limited. None created quizzes and only two used online discussions to a limited degree. Early adopters made more use of other applications, such as FAQ (frequently asked questions) features, compared with late adopters, none of whom did so. Two late adopters did not use the home page at all, finding email to be adequate for their information and communication needs.

Using course home pages for efficient dissemination of information to students was the major advantage for interviewees, but early adopters spoke of more advantages than late adopters. One late adopter commented: *I'm using it [course home page] as my main form of communication. I don't get stuff printed out; I don't hand out notices; the students are expected to use the web site;* but three LAs expressed preference for email: *I can message them [students] quickly using the email distribution lists; email is a quick and easy way for me to communicate with my students; email is more personal and I want to capture as many students as possible. If I thought that 100% students were able to have access to the home page then I would utilize it more...but I don't think that we can assume that at this stage.*

Early adopters saw other opportunities in using the course home page, such as adding value, moving to a paperless environment, getting access to resources, such as libraries and databases, easily; and ICT enabled improved contact between external students: *Technology can put the external students in the same position as the internal students with group work and I would probably argue that without this I wouldn't run external classes.*

In addition, an EA commented on the use of the home page to provide learning support: *The timetable...comes up automatically. You have got all the support links, so it is quite an efficient way of doing that across the many thousands of courses the university teaches.*

Interactive, online discussion sites

Concerns about interactive, asynchronous bulletin boards or discussion sites and real time chat rooms were raised due the potential for students to share ignorance and use technology: *just to communicate with whomever and not being a positive means of increasing knowledge* through shared communication and problem solving. *What's the point of just having a bulletin board? Where's that connection of the minds required in an educational institution?* said one LA. Large student numbers compounded problems.

Student reluctance to participate in chat or group discussions stemmed from ideas of being exposed and a lack of anonymity. According to one EA: *They don't want to commit their ideas in print, expose themselves and they may regret this later.* He added that he couldn't run real time chat sessions because he had too many students.

Other comments raised questions about conflicting goals of collaboration versus competition: *There are a lot of students around who are saying why should I share my information with others. They are very*

competitive and that is why I think that unless you actually reward for them for doing it, they are not going to participate [in online discussion] on a wide basis.

Similar sentiments were expressed by an EA: *I do have a discussion board, yes, but what I found is that unless you build that into assessment it just doesn't get used very much.* Communication with individual students was preferred by an LA who observed: *They can set up a chat group and it is not necessarily going to work. You are better off replying to individual emails.*

An LA recalled the advice of a colleague who said discussion facilities only become useful when there was assessment associated with them, which led the LA to conclude: *Then of course the whole methodology falls apart everywhere because the lecturers are saying I don't think they are using it well enough so I'm going to give them assessment to force them to use it. They [students] play the game to get the assessment. What does this achieve I wonder?*

Online interaction

All interviewees were experienced in constructing learning experiences to support off-campus students; and recognised group interaction to be an effective learning strategy when it provided opportunities for students to negotiate meaning, share ideas with others, reflect on their learning and solve complex problems (Fraser & Deane, 1997; Trist, 1983). It seemed a logical extension of the more traditional forms of distance education to move to an ICT-supported approach that allowed collaboration among geographically distant students. Early adopters, more so than late adopters, attempted to use web pages for interactive purposes to facilitate the sharing and building of knowledge collaboratively. They regarded online interaction as essential to improved learning processes and, importantly for two early adopters, to the enabling of collaborative group work often denied to external students.

This more sophisticated use of ICT, going beyond information distribution to collaborative or interactive student activities through discussion forums, was not seen by late adopters as advantageous and was not part of their plans, however. Greater levels of ICT-supported interactivity require advanced competencies and restructured pedagogical approaches and can be resisted because of additional time and resource requirements. Interactivity also provides logistical and pedagogical challenges when large numbers of students are to be managed.

Interview responses indicated that attempts to create collaborative interactions were not always successful as students and academics struggled to cope with the flow of comments and responses and the demands of frequent interactions. Even early adopter experiences revealed that students were reluctant to use online discussions fully or in ways that enhanced learning. Furthermore, misunderstanding by students of shared information was noted on occasion.

None of the interviewees, EAs or LAs, favoured the use of web-based ICT to replace traditional face-to-face methods for teaching students on campus. Some late adopters were concerned that the move to the online delivery of courses that would normally be delivered face-to-face to students on campus would ultimately have a negative impact on the student cohort, resulting in greater attrition, a decline in student learning and further isolation of students. These concerns about the impact of ICT on teaching and learning brought into focus important, but sometimes ignored, issues about processes and outcomes.

A matter of time

Overwhelmingly, individuals raised the issue of time consumption as a negative consequence of using ICT and a deterrent to further innovation. Despite agreement by interviewees that ICT assisted with efficient communication and dissemination of information, one aspect seemed to concern all the academics, be they early or late adopter, and that was the time commitment required to plan, develop, learn, maintain and increase the use of ICT in course design and delivery.

Not surprisingly, late adopters commented: *You spend so much of your time just running it [course home page] and maintaining it; as you get into more technology, you have to look at the chat room every day and your email and answer that...This is like a chain around your neck; it is more work [for academics].*

The experience of other LAs reflected concerns about assistance: *But it became a time factor and exactly how I wanted to run it. I was told that I couldn't run it the way I wanted to because of the sheer volume of the students.* And another commented that: *I would certainly utilize it better for students if I had time to set it up properly or if someone came along and said I will put all these things on to start with and all you have to do is keep them upgraded, I would do that and be happy to continue doing that.*

One early adopter expressed concern about how much time was needed for ongoing monitoring and maintenance of his web pages: *It's saving nothing in time at all. In fact it could actually be costing more than running a face-to-face format.* Other EAs felt that: *Setting it up is horrendously time consuming;* and that: *Developing the online stuff...takes hours to come up with a very simple thing.* Another EA commented that: *It's not cost effective with your time.* The view that: *We have so many responsibilities and at times I feel overwhelmed was also expressed.* Workload increased because: *It supplements, not replaces, what we do.*

All interviewees in this study indicated that the time consuming aspect of ICT is a considerable disincentive for ICT use and innovation. While ICT has been lauded as the means of saving time and increasing productivity, the opposite can be the case (Alexander, 2001; Moe, 2000; Keogh, 2001). Time spent setting up web sites and maintaining them, as well as dealing with technical and logistical problems, were all perceived as increasing pressure on academics. Incorporating ICT in teaching and learning design seemed to add another responsibility without replacing existing activities.

Resolving technical 'bugs' impacted negatively on academic time and attitudes towards ICT. Case et al. warn that web-based instruction creates 'opportunities for off-task behaviour, resulting in longer engagement times than those resulting from on-task behavior and traditional instruction' (2001, online). Increasing time demands place stresses on academics (Chalmers, 1998; Alexander, 2001); and as Coaldrake and Stedman (1999) observe:

> Academic work is becoming more demanding and there are growing pressures on time and workload....Academic work has stretched rather than adapted to meet the challenges posed by transformation of the higher education sector. (p.9)

The shifting of many administrative tasks, such as word processing, document and materials preparation, from support staff to academics is placing greater time pressures on already burdened staff. Rather than easing the burden, web-based ICT systems require additional competencies of academics and impact on the nature of their work (McShane, 2000).

A matter of trust

Both early and late adopters were critical of the reliability of online technology and in some cases felt that the inadequacies would inhibit further innovation choices. The early adopters, however, clearly demonstrated a self-confessed interest in information technology itself, and an enthusiasm for new and exciting ways of managing the teaching and learning process. This resulted in a strong motivational drive to explore the potential of the technology and to innovate regardless of perceived difficulties or setbacks. Early adopters can, therefore, been seen as pioneers experimenting with new systems and they often had 'a tough time' at the new frontier 'experimenting with various forms of distance, open and flexible learning'. (Salmon, 2000, p.vi &.8). Nevertheless, they remained enthusiasts, 'able to cope with uncertainty and exhibit risk taking behaviour' (Rogers, 1995, p.264) and 'willing to accept the occasional setback' (Jacobsen, 1997, p.6).

Online technology, on the whole, then, was not trusted to be robust and reliable by either early or late adopters and a lack of reliability and the underperformance of technology were a concern for both groups. Caution was expressed by one early adopter who would not move to any new web authoring tools created in house until they were all finished, although the Head of School was encouraging the staff to use one that had recently been introduced in the university. She observed: *Bugs are not ironed out....There [aren't] enough people who [understand] the system. Getting it wrong is costly for everyone.*

One late adopter believed that the technology could handle the basics well, but about putting it to more sophisticated use he said: *I don't think the technology is reliable enough. You have to be able to rely on*

the technology 100% to offer a course online and I don't think the technology is there yet.

One EA raised concerns about systems compatibility and student access saying: *You don't know that everybody's computers are going to be able to support the technology. [Our university]web applications don't work with all browsers; then you are already at a disadvantage.*

Two early adopters had been thinking about further developments such as video delivery and other multimedia applications but thought that: *Technology is a problem* and *...A lot of things I want to do with it, it can't do. For example, voice and lecture delivery for externals.* Both EAs mentioned this as one of their concerns and a reason for: *...holding off until bugs in the system are discovered and ironed out.*

It is common for 'technologists [to] think that advantageous innovations will sell themselves, but this is seldom the case' (Rogers, 1995, p.7). Venezky and Davis (2002) agree with Rogers, stating that it is technology's ease of use and reliability that are the important factors in determining ICT acceptance. From the outset, therefore, the technology should be reliable, user friendly and not require excessive cognitive loads to manage. Failure to address these issues can undermine any attempts at developing positive attitudes to technology, higher level competencies and more extensive use, particularly for late adopters who are sceptical and less likely to tolerate system failure (Jacobsen, 1997). It is imperative therefore that any organisation provide the resources to ensure the reliability and usability of the technology. Failure to do so can create barriers to any innovative change initiatives and interfere with successful outcomes.

A matter of effective learning
Research is divided on whether ICT improves learning outcomes (Kozma & Johnson, 1991; Keogh, 2001; Russell, 1999). One of the major difficulties with ICT in course development is that educators are not convinced that online learning can provide a worthwhile alternative to traditional teaching methods (Bell et al., 2002; DEST, 2002). Interviewees in this study expressed similar concerns and uncertainty.

While the university promotes the benefits of ICT to enhance student learning, one LA believed that it was having a negative impact on student learning because it was: *...dumbing down students' ability to read, investigate and think and they have an expectation that information would be fed to them to compensate for their own reluctance to think.* EAs felt that availability of online material was encouraging students to miss classes: *We are spoon-feeding them a bit. They don't go to tutorials because the answers are there [on the Web] and they don't go to lectures because we put the notes on the web.*

Similarly, providing students with model answers and disseminating more information was not helping, according to an LA: *It doesn't matter how many examples you give them [on the course home page], they won't learn from them because they haven't done the work about the subject matter...but then you are doing more spoon-feeding; you are doing their work for them.* He was critical about the way in which course home pages were used, saying that he refused to: *...put something on [the course home page] without giving it serious consideration and examining how it would fit in and enrich the learning process.*

Inappropriate use of the Internet was criticized by another late adopter, saying: *The university is about knowledge and to my mind the Internet is only useful if it helps us advance knowledge and most of the time I suspect all it does is act as an additional repository for information rather than creating knowledge.*

The academics were influenced in their use of ICT by their beliefs about how learning is achieved, by what resources were available and best suited to achieving desired outcomes, and by previous experiences with ICT. Their decisions were not made in isolation nor based simply on their views about technology. Each of the academics was either favourably or unfavourably disposed toward ICT by their perceptions of the 'consistency of the innovation with existing values, experiences and their needs as potential adopters' (Rogers, 1995, p.15).

Several early adoptive interviewees felt that they had established connections between their ICT innovations and learning outcomes using qualitative assessment of the online group discussion content

and quantitative data, that is, exam mark performance that indicated improved learning. Late adopters generally did not believe they had evidence of enhanced learning outcomes that could be attributed to the use of ICT. Nor did they suggest that further innovation could result in such improvements beyond their current levels of use.

The opposing views of the early and late adopters confirm Rogers' (1995) observation that an innovation needs to be perceived as having a relative advantage; that is, being more worthwhile than the idea it supersedes if it is going to appeal significantly. Early adopters perceived advantages over established ways of providing education; late adopters generally did not. Any advantage late adopters perceived related to the distribution of information and the facilitation of communication. Ironically, both the LAs and the EAs recognised that this ease of communication was not without a downside, having the potential to lead to a decline in student learning and a dependence on easy access to web-based information sources that are accepted unquestioningly.

Narrowing the gap

This research reveals various views (some shared, others not) about ICT, its usefulness and academics' motivations to adopt and innovate. The perception of the suitability of ICT differs, given that teaching contexts and individual teachers are never identical: course content, academics and student cohorts vary. Anderson et al. (1998) argue that the chasm between the two groups needs to be closed, but it may be more realistic to attempt to narrow the gap instead and acknowledge the fact that some differences will always exist.

So how can the gap between early and late adopters be narrowed and common difficulties for both groups addressed? Three key issues need particular attention:

- Firstly, user friendly technology must be assured, particularly for late adopters who are sceptical and less likely to tolerate system failure (Jacobsen, 1997). Teachers and learners can ill afford to waste time sorting out technical problems and suffer frustrations and reduced confidence that detract from effective learning.
- Secondly, there should be adequate workload allowances for academics incorporating ICT in course design and delivery. Web-based teaching and learning is novel and still largely experimental. The adjustment of traditional pedagogies and the growth of technical expertise require time, time for preparation, evaluation, reflection and the acquisition of new skills. As Alexander (2001) points out: 'Sophisticated learning design will not help students to learn if ...faculty are overloaded' (p.246).
- Thirdly, professional development and support must be timely and individualized. If delivered in a one-size-fits-all strategy that fails to acknowledge differences between academics, then activities aimed at progressing ICT adoption will miss their mark and continue to be resisted.

Conclusion

In summary, early adopters, more so than late adopters, used a greater variety of the information and communications technologies available to them, and used them more interactively. Moreover, early adopters expressed more interest in the technologies, more willingness to experiment and greater satisfaction overall with their use. However, this did not mean that early adopters were totally accepting of technology. In many instances they shared, or at least approximated, the late adopters' dissatisfaction with unreliable technology, their observations about the amount of time demanded by the use of technology and their concern with educational outcomes.

Both groups raised issues that present challenges for universities. If innovative use of ICT continues to be regarded as important in education, then barriers to its adoption and consistent, successful use must be addressed and supportive practices introduced. If not, web-based teaching and learning initiatives will continue to be ad hoc, resulting in 'individual and organizational frustration and ultimately unrealised potential' (Green & Gilbert, 1995, p.9).

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