Beyond Critical Mass: A Case Study Investigating the Use of WebCT for Course Delivery by Faculty in a Campus Based UK University

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Abstract

This case study investigates the use of WebCT for course delivery by faculty in a campus based UK university. Whilst numerous studies have been carried out which explore the use of online learning technology using indicators of critical mass of adoption, minimal research exists which analyses the use of content management systems (CMS) such as WebCT for course delivery by faculty examining both pace and level of use. The research findings highlight that using traditional models of critical mass in isolation is potentially a misleading indicator of the successful diffusion of a complex innovation. This paper presents the findings of case research study drawn from 60 semi-structured interviews with faculty. The paper builds on the diffusion of innovations literature by applying a conceptual model incorporating indicators of both pace and level of use of WebCT by faculty for course delivery to provide a structure to the findings. The analysis provided a more detailed understanding of the acceptance of WebCT, and from this analysis a series of practical recommendations for achieving more widespread and effective use of CMS for course delivery within higher education have been developed.

Keywords: Adoption, content management systems, WebCT, higher education, online learning, faculty.

Introduction: The Role of Online Learning in UK Higher Education

According to Ramsden (2007) in the 10-year period from 1996-2006 higher education institutions in the UK have seen an increase in student enrollment by 33 percent. The drive to implement online learning technology can be partly understood in terms of the need to satisfy this growing demand for higher education. Other catalysts for change in the higher education sector include pressure to introduce cost savings, the potential to improve flexibility of teaching and learning through use of new technologies, increased demand for 'lifelong learning', and the need to widen access to an increasingly diverse student body including those with disabilities or individuals living in remote locations (Littlejohn and Higgison, 2003). Advocates of online learning suggest the technology has the potential to address these dynamic changes, whilst facilitating the process by which teaching and learning is delivered (Shimabukaro, 2005). Online learning technology offers significant potential to reduce costs through economies of scale, since after an initial investment, the cost of use per student gradually decreases because course content can be delivered with consistency. This allows material to be widely disseminated with provision for real time updates and 24/7 access to information.

Since 1997, the UK government has played an integral role in supporting a number of initiatives to promote the use of online learning technologies in the UK higher education sector. It can be argued this catalyst for change emerged as a direct response to the Dearing Report (1997) which declared that

developments in information technology (IT) would drive improvements in UK higher education. A key vision of the report centred on the emergence of increasingly active partnerships between academia and industry and expansion in global markets. Souleles (2004) suggested that one outcome of the Dearing Report was the proliferation of online learning with numerous higher education institutions implementing some form of online learning technology including content management systems (CMS) such as WebCT and Blackboard. Akin to this vision, in 2005 the UK government allocated over £41 million in capital funds to HEFCE for the development of a national online learning strategy. This was in direct response to the failure of the UK e-Universities project (UKeU).

The UKeU, launched in 2000, was comprised of a consortium of 20 UK universities and private sector organisations offering online degrees. The project was backed by £62 million of UK government funding, but was withdrawn in February 2004 after failing to meet recruitment targets with only 900 enrolled students against a target of 5,600 (Garrett, 2004). The poor enrolment numbers point towards the continued value placed on traditional methods of course delivery by students despite significant investment in the provision of online degrees by UKeU. The Open University provides further evidence of the continued importance placed on traditional methods of course delivery in the UK.

Whilst the Open University is a pioneer in online learning it continues to operate from an extensive campus in Milton Keynes and makes considerable use of neighbouring universities resources for its summer schools. This example further highlights how the campus continues to play a dominant role in UK University education despite advocates of online learning suggesting otherwise. In practice, online learning has been slow to catch on in the UK higher education sector. To date it remains largely unchanged in terms of the nature of teaching provided, although many universities have 'bolted on' an online learning aspect to their traditional courses. Yet in stark contrast, Allen and Seaman (2007) note that since 2002 online enrolments have exceeded overall higher education enrolments in the USA. Their study highlights that in 2006, 3.5 million students were taking online courses, a 10 percent increase from 2005. At the time of writing this paper, the UK has yet to report on higher education online enrolment figures.

Literature Survey: Diffusion of Online Learning Systems

Rogers (1995) framework provides a basis for analysing the rate of technological adoption. He defined an 'innovation' as an idea, practice, or object that is perceived as new by an individual, 'diffusion' as the process by which an innovation makes its way through a social system, and 'adoption' as the series of stages by which an innovation is selected or accepted. He conceptualised the adoption-decision process as a sequence of five steps (knowledge, persuasion, decision, implementation and confirmation) in which the individual is persuaded to decrease his or her uncertainty regarding the advantages and disadvantages of an innovation.

Rogers (1995) suggested that individuals adopt technologies at different rates and can be classified into distinct categories with the 'innovators' and 'laggards' at bottom ends of the curve and the early adopters, and the 'early/late majorities' representing the middle part of the curve. The diffusion curve starts to even out when approximately half of the individuals in a social system have adopted the innovation, defined as a 'critical mass'. This is because every new adopter finds it increasingly difficult to convey the idea to a peer that has yet to adopt, as individuals that are unaware of the innovation become increasingly scarce. Critical mass is achieved when enough individuals have adopted the innovation so that it becomes self-sustaining. Geoghegan (1994) explained the concept of critical mass as the transition between the early adopters and mainstream users of a technology. It typically occurs when between 10 - 20 percent of users have adopted the innovation.

Currently one of the most evident displays of technological progression is the ability of a single technical device such as WebCT (an online content management system (CMS) used to support the teaching and learning process) to simultaneously perform more than one function such as the delivery of course notes, send and receive email, provide an environment for online chat and discussion boards, links to RSS feeds, online tests and assignment submission. It is fairly evident that the requirements of the course and faculty will determine the degree to which the tools of the CMS are used and not all users will adopt the functions in the same way. Yet the indicators used to determine the successful diffusion of online learning systems fail to take into account the multi-functionality that these systems afford. For instance, earlier

research exploring the diffusion of online learning technologies in higher education acknowledge that the implementation of the technology is a complex process as individuals adopt technology at varying rates determined by social and organisational barriers. (Green, 2003; Geoghegan, 1994; Jacobsen, 2000; Quinsee and Hurst, 2005; Abrahams 2004).

Green's (2003) findings outlined for critical mass to be achieved in the use of a new online learning platform, user support and training are necessary in facilitating adoption of the new system. Geoghegan's (1994) research on faculty participation and involvement with new instructional technology (this was before the Internet became widely used) indicated that critical mass alone was insufficient to sustain the diffusion of technology to the mainstream group of users. Jacobsen (2000) argued that individual effort and initiatives alone are inadequate to fully develop online learning for teaching and learning purposes. Early adopters may be keen to develop online learning technology, but incentives, training, support, reward structures and commitment from senior management are crucial in achieving a critical mass of users. Geoghegan (1994) also maintained that the success of early adopters would not be diffused into the mainstream without extensive institutional support. It would be a mistake for senior management to assume that once faculty have access to the technology they will readily, instinctively and rapidly modify their teaching methods and course materials to take full advantage of online learning technology. It is clear from this that the mainstream user requires direction.

It is widely accepted within the diffusion of innovations literature that individuals often resist the adoption of a new technology. Ferneley and Sobreperez (2006) view resistance as a two-phase process. The first phase includes internal individual/group cognitive or emotional processes, an outcome of which is the decision to resist. The second phase is the 'resultant work-around behaviour' an example of this is when the use of a system is viewed as time-consuming, onerous or difficult. Jacobsen (2000); Quinsee and Hurst (2005) and Abrahams (2004) suggest that a barrier to technological adoption can be comprised of any factor that affects the adoption and or implementation of computing technology for teaching and learning purposes. For instance, the issues adding to a faculty member's pessimistic view about using online learning technology may be the outcome of their view that there is 'a lack of technological support' which adversely reinforces the barrier 'resistance to change' (Abrahams, 2004). Quinsee and Hurst (2005) outline that the flexibility afforded by online learning systems can turn into negative experiences for faculty unless adequate support strategies are in place. At a more intrinsic level, barriers can act as guards to prohibit the adverse effects that may upset the social systems core traditions and values. As such, they are within the control of the faculty member. Furthermore, Rogers (2000) adds that the adoption of online learning technology by faculty is prone to failure when there is a mismatch in the faculty member's level of technological adoption and potential internal and external barriers.

In the context of the take-up of online learning technology for course delivery by faculty across higher education, the literature suggests that levels of IT skills, senior management support, incentives and rewards structures influence technological adoption. Although existing studies provide an insight into the nature of the barriers to the use of online learning technology, these studies explore the diffusion of these technologies using indicators of only critical mass. As such, there is a gap in the literature which fails to address the use of online learning technology using indicators of both the pace and level of use, which such multi-functional technologies afford. Furthermore, the majority of these studies have been carried out in North America. The findings from this case study research, which is presented shortly builds on the diffusion of innovations literature by applying a conceptual model incorporating indicators of both pace and level of use of WebCT for course delivery by faculty to provide a structure for the case study findings. From this analysis a series of practical recommendations for achieving more widespread and effective use of CMS within higher education have been developed. Before the research findings are presented, the research design and case study are introduced.

Methods: Research Design

This study has focused on a single case design. According to Yin (2003) and Feagin, Orum and Sjoberg (1991) the case study is an ideal methodology to adopt when a holistic in-depth investigation is needed. This study draws on qualitative data obtained from a traditional campus based university within the UK higher education sector. The material was gathered from an investigation of written documents, semi-structured interviews with 60 members of faculty, emails, steering group meetings, and the observation of organisational settings and context. The interview stage took place over a period of eight months,

which allowed key comments to be cross referenced against earlier interview material.

The data were analysed using a grounded theory approach (Glasser and Strauss, 1967). This data analysis process places importance on developing theory that will be pertinent to the research being undertaken. In order for the grounded theory approach to be most effective, it was necessary for the qualitative data to be systematically categorised into a clear framework as key themes emerged. The computer software package QSR NUD*IST 5 facilitated this process by enabling the data to be coded under specific headings. The predominant concepts that arose from the analysis of the case study data built the foundation of the grounded theory approach. After the analysis of the interview data, the steering group meeting data, and emails, a data pattern became visible. This enabled further data that were gathered to become predictable. Glaser and Strauss (1967) label the point where the data pattern becomes predictable as 'saturation' and it indicates that at this stage enough data have been collected.

Case Study

The case study university is a traditional campus based institution located in the South of the UK with a student population of 14,000 including 3,000 post-graduate students and 1,700 faculty members. The university experienced a significant increase in staff and student numbers over the last decade and, as a result, trebled in size. It can be argued that these changes, akin to other UK universities led the case study institution towards adopting private sector practices, in a drive to attain excellence in research and teaching in order to secure funding through grants. At the same time the case study university understood that significant income can be generated through the intake of fee-paying students including home, EU and international students. Therefore, the university faced pressure to compete with other institutions at both a national and an international level. Recruiting and retaining students became one of the case study university's key strategic objectives, particularly fee paying international students. For instance, the numbers of international students at the university are predicted to rise from 12 to 20 percent by 2010 and implementation of WebCT was viewed as a way of managing increasing student numbers through scalability whilst fostering innovative teaching and learning practices afforded by WebCT.

WebCT was implemented campus wide across the university in 2002 and at this stage four different types of computing systems were being used simultaneously, but all on a voluntary basis. WebCT became the dominant CMS from the 2004/5 academic year, replacing the Intranet and other online learning systems being used. Whilst the case study university experienced changes across the board, the most notable change was an increase in the numbers of students attracted at both the undergraduate and postgraduate levels. This increase in student numbers placed extreme strain on the university. Significant logistical difficulties were anticipated for the academic year 2006/7 due to this increase in student numbers. Indeed, this large increase required greater levels of support for faculty who were juggling a number of different responsibilities in an already pressurised environment. As such, there was an air of uncertainty and low morale within the university. For instance, significant numbers of non-research active teaching staff applied for voluntary redundancy. These staff members traditionally carried the burden of teaching large groups of students.

Results

The most significant findings to emerge from analysis of the case study data was that faculty used WebCT not only at different rates, but also at many different stages as illustrated in Figure 1 below:

Stage 7: represents fully integrated use of WebCT for administrative, pedagogical and organisational functions. This would include for example other departments across the university such as registry, the library and the centralised marks department.

Stage 6: represents faculty who have pedagogically integrated WebCT so that students can interact with them in real time across the full range of tools.

Stage 5: an advanced Stage of use where faculty experimented with the interactive assessment tools such as multiple-choice quizzes and online assignment submission.

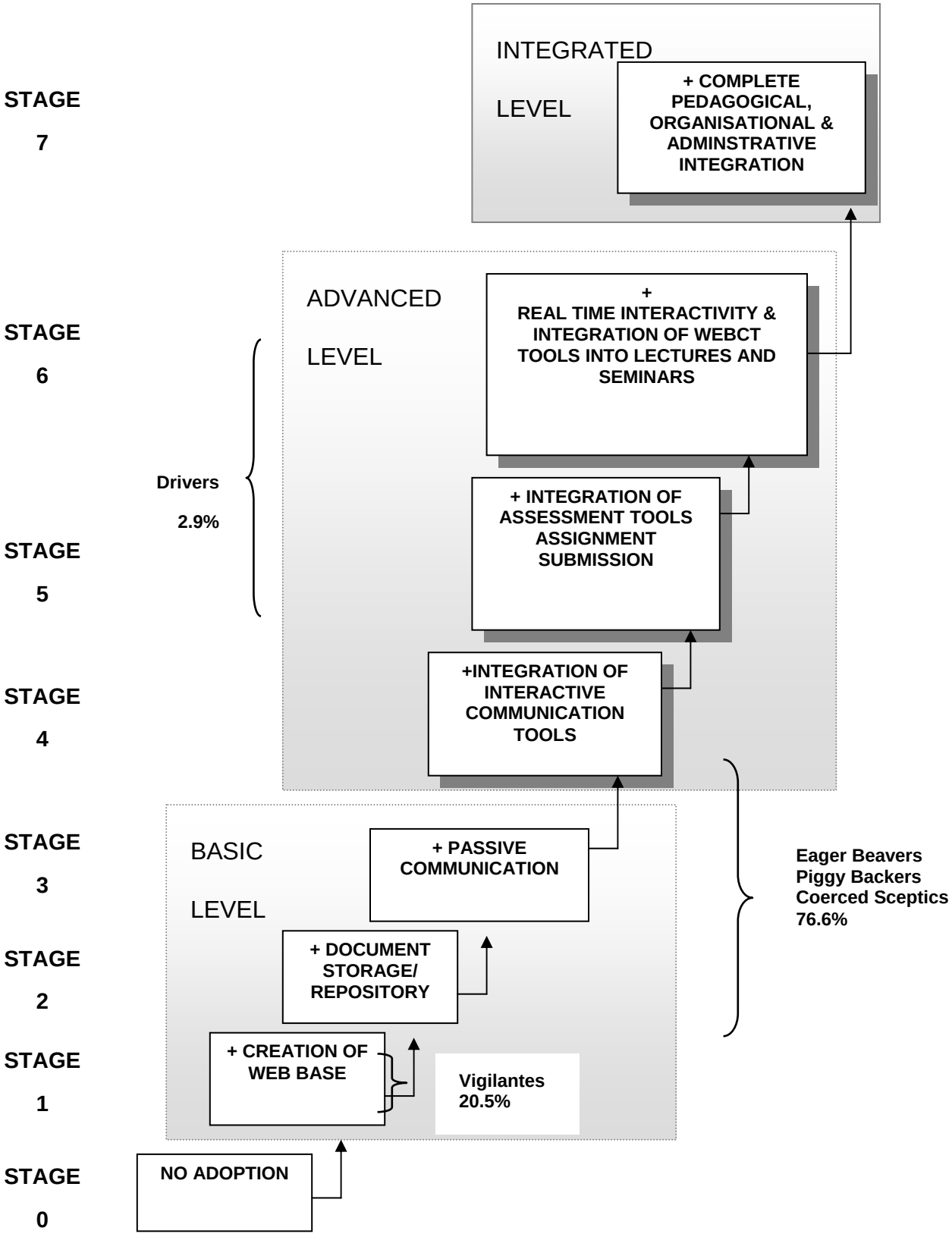

Figure 1. Faculty Use of WebCT for Course Delivery.

Stage 4: a more advanced Stage of adoption incorporating an interactive communication functions such as email, discussion board and chat rooms.

Stage 3: WebCT used as a passive form of communication, rather like a notice board where students could be informed of any changes to the course, or for cancelling lectures at short notice. Some faculty used the calendar to inform students of important deadlines.

Stage 2: the site has been developed and has registered student users. At this basic level, faculty are utilising WebCT as a document repository for uploading and storing course material such as module outlines, reading lists, lecture notes, seminar material and links to other sites.

Stage 1: represents faculty who have made the decision to adopt the technology but had not yet done so in practice. They had discussed the technology with colleagues, read literature around the area, attended presentations on WebCT and taken part in training sessions.

Stage 0: represents faculty who did not adopt the technology

Another method of data analysis undertaken was to compare and contrast the adopter characteristics of the findings against Roger's (1995) categorisation of adopters as illustrated in the Figure 2 below, based on 5 distinct user groups.

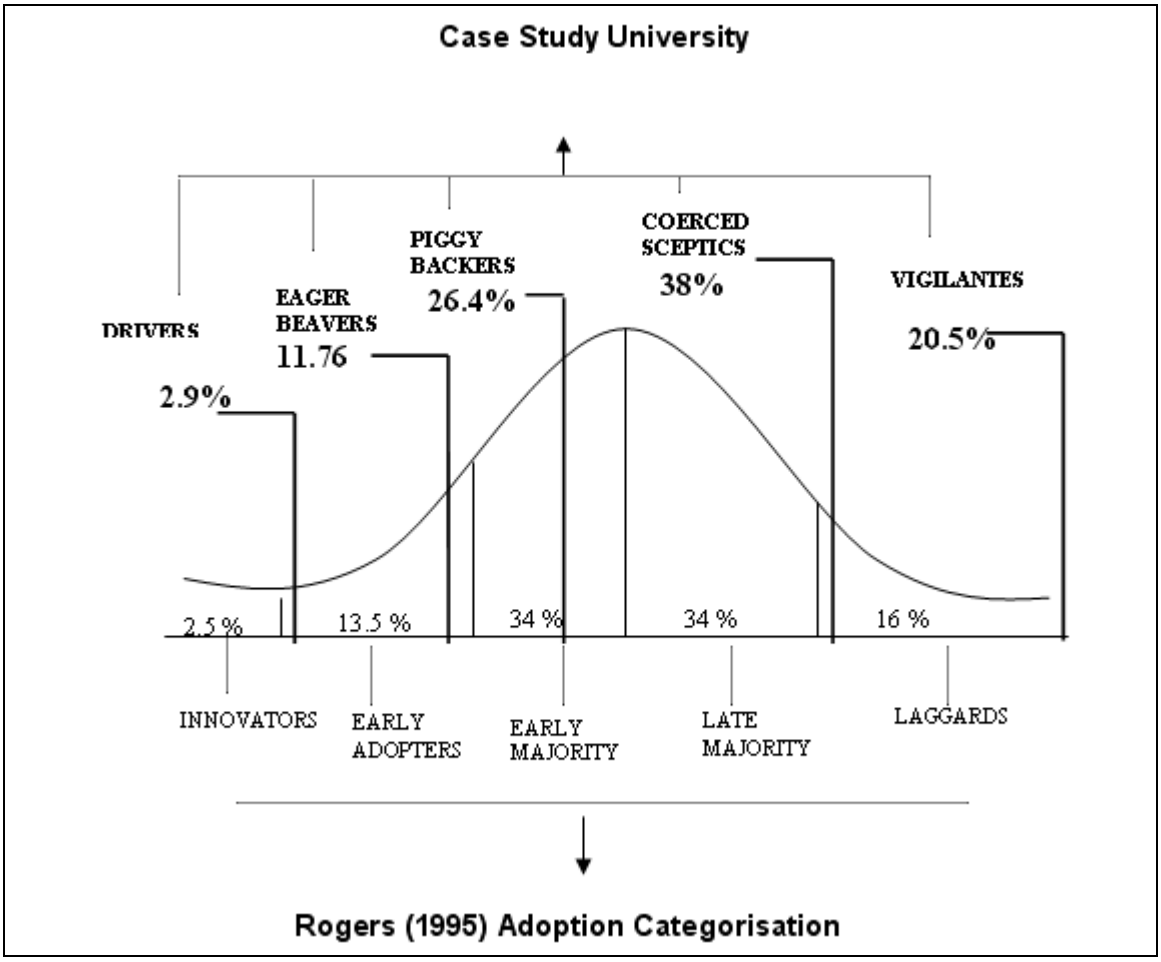

Figure 2: Comparison of WebCT user categories with Rogers (1995) adoption model

User Segment 1 - Drivers
The drivers of WebCT were enthusiastic about the technical capabilities of the system, possessed advanced technical knowledge and had research backgrounds within the area of online learning. They adopted the technology during the pilot stage of the implementation of WebCT. Drivers play a fundamental role in the subsequent take-up of WebCT by other faculty. As such, they play a pivotal role in making the attributes of the technology transparent to others.

User Segment 2 - Eager Beavers
The eager beaver group was willing to take the time to explore the capabilities of the technology and to experiment with the various tools and features. The outcome of this experimentation determined the level of their subsequent use of WebCT. A striking feature of the eager beaver group was their research background and area of expertise were not IT related, but they were nevertheless interested in exploring the potential of the technology. The group explored the diverse capabilities of the technology, experimenting with the assignment submission tool, multiple choice question tools and communication tools (discussion boards, chat rooms and email).

User Segment 3 - Piggy Backers
The piggy backers were reluctant to experiment with the advanced tools and mainly used WebCT as a document repository and notice board after encouragement from their peers who had adopted the technology earlier. However, a number of faculty members commented that although they were willing to explore the potential of WebCT, they decided not to adopt because they were sharing a module with a colleague that was unwilling to contribute.

User Segment 4 - Coerced Sceptics
This group adopted the technology when all existing online learning systems became obsolete and hence they were effectively forced to do so. They approached innovation with a certain level of trepidation, and peer pressure was often a key factor in driving adoption. The coerced sceptics were reluctant to experiment with the advanced tools and mainly used WebCT as a document repository and notice board. They lacked confidence and questioned their technical ability to use the advanced tools of WebCT. The coerced sceptics were reluctant to continuously ask for support because they feared being labeled incompetent.

User Segment 5 - Vigilantes
As with Roger's (1995) categorisation of laggards, the vigilantes were sceptical of the underlying motivations and wider social implications of using WebCT. This was because they believed the technology had the potential to change the culture of academia. In particular, they felt that online learning represented the antithesis of the culture and values of a UK university as the following quote illustrates:

> *"I'm not a technophobe but I will still not use WebCT because the technology goes against what we as lecturers are here to facilitate."* (Lecturer)

This interesting finding highlights the importance of communication and deliberation between all stakeholder groups about the wider impact of online learning technology across higher education. The vigilantes were not resistant to innovation per se, but peer and institutional pressure was insufficient to alleviate their broader concerns about the role of online learning. Further, the findings also indicate that reaching a point of mainstream acceptance of the technology still did not influence the vigilantes to adopt.

DISCUSSION

The findings show that the majority of faculty (76.6 percent) adopted WebCT, indicating that a 'critical mass' of users has been achieved. Nevertheless, most of this use is occurring at a very basic level, between stages 1 and 3 which hardly constitutes a radical change in user practices. Only 2.9 percent of faculty used WebCT at an advanced level (stages 4 – 6), despite a large number being highly IT literate and/or with a research interest in online learning technology. (At the time of carrying out the empirical investigation, there was no use of WebCT at a fully integrated level (stage 7) because the system had yet to be fully integrated with other functions and departments across the University) The results therefore indicate that critical mass alone can be a misleading indicator of the sustainability of a new technology as it fails to identify and deal with the varied degrees of technological use observed in practice. An

innovation cannot be regarded as self-sustaining simply because it has attained a critical number of users. This finding is consistent with the earlier work carried out by Geoghegan (1994) who argued that critical mass alone is insufficient to sustain the diffusion of technology to a mainstream group of users. It should be noted that faculty load and resistance issues may have contributed towards the level at which WebCT was used. However, it was beyond the scope of this study to explore these variables. This is something that will be explored in future studies.

The research findings also revealed that the majority of faculty believed they did not receive adequate information about WebCT. A number of faculty members mentioned that their first exposure to WebCT was at a departmental seminar presented by the authors of this article. This highlights an issue with the way that information about the new system was communicated to faculty, whilst alerting us to the importance of how the technology is marketed, something which has not been identified in earlier research and requires further investigation.

A recurring theme from the interviews was faculty felt the earlier Intranet system made obsolete by WebCT was adequate for their purposes, namely a repository for lecture notes and an electronic environment where notices could be passively communicated to students. The majority of faculty questioned the benefits of using WebCT, believing it to be more complex to use than the basic Intranet system it had replaced. One interviewee suggested:

> *"I'd found it [WebCT] hard to learn and it's very complex. It's very involved putting files up. You need something like 20 keystrokes in order to put any file up, and that must be about 19 keystrokes more than you need to do on the Intranet. It does take longer to put things on."* (Lecturer)

WebCT training opportunities were made available but the take-up was low. Faculty members believed they had no reason to at that stage and were perfectly content using the existing basic Intranet system, but once the Intranet became obsolete, users had to switch to WebCT. This indicates that the decision of the majority of faculty to implement WebCT was postponed until the last possible moment, i.e. when it was actually enforced because the earlier system was withdrawn. This key finding suggests that although training is an important component to facilitate the adoption of technology as also identified by Green (2003) and Jacobsen (2000), providing training does not necessarily guarantee that these opportunities will be embraced and that perhaps a more tailored type of training and support based on individual needs is more appropriate. This will be discussed further in the recommendations.

Interpersonal networks constituted the most influential medium through which faculty communicated their opinions of WebCT to one another. This was despite other more formal channels such as email and flyers, regularly informing faculty members of the WebCT opportunities available to them. Many faculty members commented that they had heard 'on the grapevine' that WebCT was too difficult and time-consuming to use and hence decided not to use it for those reasons. Furthermore, a number of faculty members suggested that when they had adopted WebCT, they learned how to use the system from their colleagues. One faculty member provided a useful illustration of the positive influence of interpersonal networks:

> *"I learnt from another member of staff. I was sharing the module with them and they were using WebCT, and they showed me how to use it."*

However, another faculty member highlighted that influence of such networks could be negative:

> *"I know someone that did become very keen and very excited after attending the WebCT training course, but at the end of the day they said it was such hard work because they ended up creating so much more work for themselves."* (Lecturer)

It is also important to note that during any of the stages, the decision to use WebCT at that particular level can cease. If the faculty member progresses to a higher level of adoption, their experiences of using WebCT at that level, together with shared experiences of best practice with their peers can influence them to make the transition back to a lower stage of adoption. The research findings show that this occurred with the 'eager beaver' group of adopters. They initially experimented with various advanced

functions within WebCT, but their negative experiences with the technology led them to using the technology at a more basic level.

By identifying the different levels at which faculty are using WebCT for course delivery appropriate strategies can be put into place to encourage progression to more advanced levels of use which more fully utilise the potential of the technology. This process requires understanding of the barriers that influenced the decision of faculty members to adopt and use the technology, namely:

- lack of extensive deliberation between key stakeholders of the university
- lack of explicit guidelines for best practice of WebCT
- lack of a 'needs analysis' of faculty
- inadequate training and support
- conflicting priorities for faculty

Therefore, a number of practical recommendations for other universities implementing CMS such as WebCT to arise from the case study research as follows:

Recommendation 1: Encourage extensive and open communication with key stakeholders of the university.

The first stage in facilitating the successful integration of CMS in higher education institutions requires open and extensive deliberation to occur amongst all the stakeholders, for example, management, faculty, student representatives, administrative staff, other support staff and online learning steering group members (if a steering group exists). These stakeholders should be encouraged to attend informal meetings on an ongoing basis to discuss their experiences of engaging with online learning technology. Such meetings enable all stakeholders to become part of the process and facilitate the successful diffusion of the technology.

Recommendation 2: Identify individual training and support needs for faculty based upon their user profile

Faculty have diverse sets of IT skills and therefore require different levels of support. However, training provided for faculty tends to be generic and fails to take into account the individual IT skills levels and the various attitudes towards WebCT that faculty members hold. To encourage more efficient use of CMS systems, a comprehensive IT skills survey should be conducted with faculty to clarify these issues and customise the training accordingly as part of a formal process, leaving the option of participating in the IT and CMS training as voluntary on the part of the faculty member.

Recommendation 3: Involve 'e-fellows' as mentors and project champions

Utilise faculty members, final year undergraduate students or postgraduate students with a background and interest in computing related fields as 'e-fellows' to support less experienced faculty with the development of their web bases and online course delivery skills. Such a strategy would be beneficial at several levels:

1. It is cost effective as it would not require any additional staff to be employed, but makes use of existing resources.
2. Individualised support would ease the pressure on faculty and allow them to devote more time to their research and teaching related activities.
3. Personal support and tuition from an expert will encourage the use of WebCT at more advanced levels and help to optimise the full potential of the technology.
4. 'Champion' the benefits of the technology

Recommendation 4: Develop explicit guidelines for 'best-practice' use of CMS

It is crucial that transparent policies and procedures form the basis of the online learning strategy, so that both faculty and students are aware of what is required of them. These policies should specifically address faculty concerns over ownership of knowledge and copyright restrictions. Equally, the

development of explicit guidelines will make it clear to students what they can expect from faculty members so as to establish appropriate boundaries between the two. The information should also be clearly conveyed to administrative staff. Table 1 below outlines specific recommendations to facilitate this process.

Table 1. Specific recommendations to facilitate "best-practice use" of CMS.

USER PROFILE	RECOMMENDATIONS FOR ACTION BY E-FELLOWS
Drivers	• Encourage their key role as 'champions of online learning technology. • Reward drivers for dissemination of best practice through departmental seminars and informal networking.
Eager Beavers	• Provide specific training in advanced or new features of the technology, such as developing forms of online assessment or managing online seminars. • Encourage liaison with Drivers
Piggy Backers	• Focus training on the development of skills to use technology autonomously and at a more advanced level, such as managing discussion boards (see Figure 1) • Build confidence in use of the technology in order to convert user to an Eager Beaver over time
Coerced Sceptics	• Work with this group to develop skills to use the technology at a basic level, such as creating links and the uploading of course notes and reading lists (see Figure 1) • Demonstrate the benefits of using the system • Establish the reasons for resistance and work closely with the user to address their concerns
Vigilantes	• Drivers and Eager Beaver groups need to work together with the Vigilantes to promote the benefits of using the technology through informal networking • This group will need to be encouraged by peer pressure to move initially from 'no adoption' to using the technology at a 'basic level.' • Assist the Vigilantes in ongoing maintenance of the web-base to address the issue of time constraints, then gradually step back over the longer term to encourage more independent use • Ensure modules are jointly taught with Eager Beaver tutors paired with Vigilantes in order to lead by example

It is important to note that this strategy relies on the willingness of faculty and students to partake in such apprenticeship roles. E-fellows will focus on building the skills required to encourage faculty members to use WebCT at more advanced levels as identified through the initial skills audit conducted.

CONCLUSION

The findings from this case study research report on the use of WebCT for course delivery by faculty in a traditional campus-based UK university. The research findings have demonstrated that using traditional models of critical mass in isolation is a misleading indicator of the successful diffusion of CMS, such as WebCT, due to the multi-functionality that such CMS afford. The adopter categories identified provide evidence that individual characteristics displayed by faculty influence both the pace and degree to which these faculty members used WebCT and allowed the researchers to develop a series of both generic and targeted recommendations for effective diffusion and more efficient use of CMS for course delivery. The research as a whole highlights that a number of organisational and social issues compromised the use of WebCT by faculty.

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