ATHABASCA UNIVERSITY

FACTORS AFFECTING USERS' DECISIONS TO MIGRATE FROM INITIAL USE OF INFORMATION TECHNOLOGY TO CONTINUING USE

BY

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A thesis submitted to the

Athabasca University Governing Council in partial fulfillment

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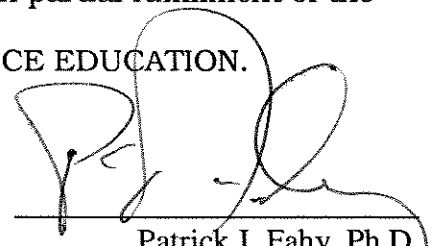
The undersigned certify that they have read and recommended to the Athabasca University Governing Council for acceptance a thesis "Factors Affecting Users' Decisions to Migrate from Initial Use of Information Technology to Continuing Use" submitted by Thomas M. Kane in partial fulfillment of the requirements for the degree of MASTER OF DISTANCE EDUCATION.



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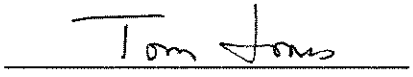

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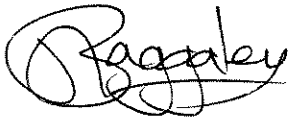

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DEDICATION

This work is dedicated to my late parents, who encouraged me to believe that I could and should engage myself in learning, and that I could reach the goals I set for myself. B'shalom.

ABSTRACT

Community college teachers completed survey and interview questions designed to elicit data on reasons for continuing use of web-based educational technology. The data were analyzed in relationship to two models of innovative technology evaluation.

The research sample was small. Nonetheless, the data demonstrated a good relationship with the Technology Acceptance Model (TAM). Responses concerning "usefulness" and "ease of use" rated high among the identified influences. The data did not relate as well with the innovation attributes identified by the "Diffusion of Innovations" model.

The results point to the value of continuing research. Two limitations in this study point to the necessity of conducting such research. One of these was the small sample; the other was the concentration on continuing users rather than the inclusion of subjects who stopped using the system after their first trial.

ACKNOWLEDGEMENTS

This study exists only because many people encouraged and supported the work required for its completion. I owe and express my deepest gratitude to each of them.

To: Dr. Pat Fahy, whose encouragement, guidance, and patient and knowledgable support made me increasingly aware of the need for clear, concise writing and the importance of thorough research as its foundation..

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To: my daughters, who, like my late parents, have always encouraged me and believed in my ability to reach the goals I set for myself.

To: my supportive and patient friends who wait through prolonged absences and then simply continue our friendships

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CHAPTER I

INTRODUCTION

BACKGROUND

The field of education has been viewed as fertile ground for innovation in policy, philosophy, methodology, and technology. Creators and sellers of products from early Edison recordings to Internet conferencing technology have showered administrators, elected officials, and teachers with words of the wonders of their wares (Cuban, 1986). As one small but recent example, over 180 vendors were willing to invest resources to show their products at the 2004 Educause Annual Conference (Educause, 2004).

Educators have felt the "helping hand [that] strikes again" (Fullan, 2001, p.23) all too often, and Cuban (1986) described the phenomenon of many of these tools ending their days in closets and storerooms.

However, the presence of TVs, VCRs, desktop computers, and the Internet in the classroom show that many things are not locked away and forgotten. The ongoing existence of distance education institutions bears witness to this.

Two branches of research may provide the means for studying how and why some innovations become routine ideas, practices, or tools of the trade for teachers: "Diffusion of Innovations" (Rogers, 1995), and the Technology Acceptance Model (Davis, 1989). The two branches appear to vary considerably in answering questions of how and why innovations succeed or fail in organizations. However, both of them

study relationships among characteristics of the individuals, the innovation, and the social system (e.g., the workplace), and share characteristics. Establishing one or the other as proven model can provide a base for consistent analysis of how appropriate a technology might be in a particular environment.

Rogers (1995) identified several sets of attributes describing the individuals in the subject social system and characteristics of the actual innovation as well as the social system.

The Technology Acceptance Model (Davis, 1989) identifies a much more parsimonious set of criteria consisting of the perceived usefulness of the technology and its perceived ease of use.

This document describes one study that attempted to link models with a specific case as a means of testing the applicability of one or both models to academic environments. The case was the apparently successful diffusion (or "acceptance") of Course Management Systems (CMSs) in community colleges in the Canadian province of Ontario. The relationship of the elements of the two theories to the actual study questions is described below in the discussion of the study's purpose. That discussion is preceded by a description of the circumstances that led to this study.

In October of 2001 Centennial College (located in the city of Toronto, Canada) implemented a new technology --- the Blackboard™ "learning system." System use spread rapidly, to the extent that over 25% of the college's faculty members currently use it. This occurred without any mandate from management; in fact, the college still has not issued any statement concerning the system's place in the institution. Why is this growth happening? Why has use of this new technology

spread as widely as it has? The history (mostly unrecorded) of technological innovation at the college does not provide answers. That history does not even point to consistent acceptance of technological innovation in the college.

The system was introduced in response to the convergence of a number of issues in the fall semester of 2001. The most pressing of these was the dependence of one academic programme on a similar system that was to be taken off the market at the end of December 2001. The second was the existence of a report by a presidential task force --- a report that called for a college-wide implementation group and system. The report became the justification for purchasing the initial license for a course management system (CMS) --- Blackboard --- to replace the soon-to-end system (Evans & Kane, 2003).

The college's experience with an institutionally-supported educationally-oriented technology was limited to a few systems: an Application Service Provider (ASP) supporting one distance education programme, and the now-discontinued CMS mentioned above. The programme on the ASP now is supported by the college's CMS server. Beyond these efforts, online access to course material was provided through faculty members' personal web sites; that is, by those who had the technical competence and confidence to produce their own web pages. Finally, there are no known reports on the use of any of these systems.

One department in the college used Internet technology to mount a single course in online mode (no classroom time except for exams), in 1996. After three terms, each with one class section, the trial was discontinued after use by three faculty members. A report by two of them (Kogitz & Scragg, 1997) points to high student

satisfaction. However, the high workload and unrealized cost savings brought a halt to further development (S. Kogitz, personal email, March, 2005). Kogitz also reported that all of the development work (e.g., composing the course web pages) was done by the two faculty members who taught the course, with the assistance of a third. The researcher carried the project forward one semester with similar results and experience.

The college provides other information technology (IT) services for faculty. These include Lotus Notes (mostly for email and calendar functions), and a mainframe application that faculty members can use for access to timetable and classlist data. A college portal system supplies limited functionality for class activities --- mostly email lists. However, there are no known studies on the degree of use of these services by faculty members.

In summary, this study appears to be the first one concerning a widely adopted complex technology within the college.

Blackboard is a "course management system" (CMS), although their web site does not identify the product as such. While the corporation calls its product a "Learning System," they described its function as "course management" (Blackboard.com, 2004). WebCT, a similar system, was identified as a Course Management System on a company web site, although they failed to define the term (WebCT.com, 2003). The relevant point is that these systems use complex computer-based, Internet-related technology to package, deliver, and manage course content and activity via web access.

In the period between the initial implementation of the system at Centennial College (October, 2001) and the time at which this study was prepared (March, 2005), the number of faculty users increased from 16 to 265, while the number of courses being supported by the system rose from 29 to over 480. There were more than 7,800 students in classes supported with this technology in the fall 2004 semester. That accounts for approximately 33% of the college's total enrollment that semester.

At Centennial College, 163 of those who used this technology once are using it for at least the second time at the time of writing. This represents the transition from initial use --- "implementation" --- to continued use --- "routinization" (Rogers, 1995; Saga & Zmud, 1994). The system has become part of faculty members' everyday toolset, and has lost its characteristic of being new or out of the ordinary (Saga & Zmud), at least for these faculty members. In summary, adoption, implementation, and ongoing use have increased significantly over three-and-a-half years.

However, the 140 previous users who are not making use of the system's facilities are equally important. It is a limitation of this study that they were not included in the sample. Further research could provide a better understanding of factors affecting the decision to continue use of a technology. In the case of educational technologies, such an inquiry will provide insight into the pedagogical and organizational factors that affect consideration and adoption of such innovations.

STATEMENT OF PURPOSE

The purpose of this study is to investigate the factors that influenced users' incorporation of technology into their regular practice --- to examine why an innovation diffused through a population past the adoption decision and even beyond implementation to routine use (Rogers, 1995), or, why this technology was "accepted" (Davis, 1989). Specifically, the study focused on faculty members in post-secondary education --- a number of community colleges in the Canadian province of Ontario --- and their decisions to continue use of information technology after initial trials. For this study the technology in question was the course management system. This provided the researcher with a population potentially involved with similar workplace and technology experiences, reducing two areas of variability.

The community college system in Ontario, Canada, consists of 25 institutions serving populations in over 25 municipalities. All of the colleges studied are "multi-branch" organizations, with at least one of these serving seven centres over a span of 600km. Two other colleges operate four campuses each in the Greater Toronto Area, while one in eastern Ontario serves three municipalities.

Organizational size, too, is significant for each college. A manager of education technology at one of the colleges reports approximately 12,000 students and 800 faculty members active on the system that forms the basis for this study's data. Another college is reported to have 1,965 faculty accounts and 31,000 full-time student accounts on their system, although this may include graduates. A third reports 2,241 active users and 112,924 pages hits per day.

Course management systems present at least two major issues of interest in the study of technological innovation; they are complex and they are highly visible.

Technologically, they combine database systems and web technology (including complex scripting). User authentication for access to a system and to specific sets of content and activity is part of the system's function. CMSs produce "tailor-made" web pages for users in specific contexts, i.e., individual students in classes. Most such systems also provide discussion boards, chat facilities, and online quizzes and tests along with the requisite record-keeping ("gradebooks").

These systems provide this service on the Web to large numbers of users simultaneously. Any service interruption is immediately and significantly visible. Stopping a server in midday can interfere with an exam, and bring quick responses from the faculty members involved, as the researcher experienced during the original drafting of this study.

In summary, this study concerns organizations making use of a complex technological innovation.

As stated above, two approaches attempt to describe the use of new technologies in organizations. Diffusion of innovations research (Rogers, 1995) and the Technology Acceptance Model (Davis, 1989) consider the relationships among personal attributes of the users, the attributes of the innovation, and those of the organization as important to the success of the eventual institutionalization of that innovation (Rogers; Davis). A discussion of these elements is presented in chapter two; however, a brief discussion here will provide the foundation for the specific questions posed in this study.

Rogers (1995) described user attributes in relation to a timeline --- the line describing how early in the adoption process a user makes use of the innovation. The attributes are identified in more detail below but they include such characteristics as intelligence, education, and social sophistication.

Davis (1989) described the relationship of users' beliefs and attitudes to the acceptance of technology. Davis identified perceived ease of use as an antecedent to perceived usefulness. The latter is described as a major belief contributing to a positive attitude towards the technology. This, in turn leads to the behavioural intention, and probably actual acceptance of the technology..

Innovations can be described through a set of attributes. Rogers (1995) identified the following as important: relative advantage ("will the new practice, policy, or instrument improve my work?"), compatibility with current practice, observability ("Will others see the change?"), complexity, and trialability ("Can I try it out before committing myself?").

Rogers (1995) also discussed communication channels --- the means by which knowledge of an innovation is diffused through a social system. These would include other users as well as their clients, "change agents" or "champions." These channels would be elements of the workplace environment.

Moore and Benbasat (1991) and Agarwal and Prasad (1997) suggested that voluntariness also might affect innovation decisions.

For study purposes the research focused on a particular population using a specific technology, so as to reduce the effects of seriously varying experiences. With respect to attributes studied the larger proportion of the topics related to

innovation and workplace attributes, as questions on such matters were more likely to be answered than deeply personal ones. The researcher also had to be mindful of questions of trust and knowledge of personal interviewing with respect to questions of personal attributes. The following questions were developed with consideration of the research issues, the availability of research subjects, and the matters raised immediately above.

1. Was each respondent's choice to adopt and implement the technology a voluntary one, and what effect, if any, did this have on the decision to continue using it?
2. To what extent was each respondent's decision concerning use of technology affected by a sense of personal technical competence; i.e., were complexity or perceived ease of use factors in the users' decisions?
3. Was institutional support, whether formal or otherwise, a factor in each respondent's willingness to adopt and use new technology? The suggestion here is that such support would reduce complexity or improve ease of use.
4. What relationship existed between a user's experience (i.e., growing familiarity) with a technology and ongoing use of it?
5. What relationship existed between the respondent's sense of students' response to the use of technology and the decision to continue its use? The relationship sought here was that between student use and perceived usefulness (Davis, 1989) or relative advantage (Rogers, 1995).

6. What was the relationship between the respondent's knowledge of pedagogy or teaching methodology and the decision to continue use of technology for teaching? Here, too, the combination of compatibility ("Do I have to change what I do?") and complexity/ease of use were of interest.
7. What relationship existed between the ease of use of technology and each user's decision to continue using it?
8. Was each user's decision to continue use of technology affected by degrees or types of control the user had over the technology's output, user interface or actions?
9. What criteria did each respondent identify for determining the decisions to continue using a specific technology?

The following discussion describes the circumstances that led to these questions.

Centennial College, the place of origin for this study, has no real strategy concerning education technology. Yet, use of a CMS has increased quite rapidly, as was stated earlier. An unpublished survey at the College garnered responses from 35 of the 148 college faculty members who were using Blackboard during the winter (January through May) semester in 2003. Twenty-five (70%) indicated that they used the system out of "personal interest," providing a strong indication of voluntariness (Stein, 1967). The continued growth in use hints at a possible relationship between voluntariness and implementation, and even routinization. The review of research literature in the field of innovations diffusion as well as management studies found

work in which researchers extended Rogers' list of characteristics to include voluntariness (Agarwal & Prasad, 1997; Moore & Benbasat, 1991).

Blackboard is used by a large number of faculty members in many areas of the college, suggesting the possibility that lack of confidence in technical ability is not an inhibiting factor in the choice to use technology. The low level of inquiry to the support person reinforces this inference. In the terminology of innovation diffusion research this would be identified as low complexity (Rogers, 1995), or "ease of use," in the terminology of the Technical Acceptance Model (Davis, 1989). This low level of communication with a central support person raises the question whether peer support may be a factor as well.

In the previously mentioned faculty survey at Centennial College, 18 of the 35 survey respondents indicated that use of technology helped their students "a great deal." Ten others indicated that the system "helped them a bit without hindering their studies." Did these perceptions of benefit to the student contribute to the respondents' satisfaction? A survey of faculty teaching through the State University of New York (SUNY) Learning Network found such a link (Fredericksen, Pickett, & Shea, 2000), although Kashy, Thoennessen, Albertelli, and Tsai (2000) did not mention student performance in their study of faculty satisfaction. A study from the University of Central Florida included "Interaction Quality" in its survey, and found that 75% of the responding teachers in media-enhanced classes believed interaction in their classes had improved (Hartman, Dziuban, & Moskal, 2000). Davis (1989) proposed that "usefulness" is an attribute that can increase acceptance of technologies. It is

suggested here that a positive contribution to student learning could be considered "useful" in an educator's view.

At the Distance Education Technology Seminar (2003) the particular technology (CMS) was criticized for the lack of control the teacher has over such matters as the design of user interfaces, the organization of content, and organization of the paths the student would follow in progressing through a course (Evans & Kane, 2003). Unfortunately, no record exists of that particular reference, but the issue was not taken lightly by the researcher. Those matters are considered in this study.

Currently, nothing is known of faculty members' knowledge of the pedagogy they employ, or of their knowledge and use of instructional design (ID) concepts that might be appropriate for distributed learning. It is possible that it seemed easy to adopt this new teaching tool when it appeared that nothing more was required than learning how to use it in a (more or less) mechanical sense. Within the framework of the diffusion of innovations model this could be categorized as "compatibility;" Davis' (1989) TAM would include this as "ease of use." Thus, questions relating to the influence of pedagogy at the beginning and later may be appropriate (Morgan, 2003).

In essence, this study was designed to examine why use of new technology spreads through organizations, and to consider the relationships between the findings and existing models. The models describe the relationships among innovations' attributes, characteristics of those who are introduced to the innovation, the work environment, and the actual diffusion of the innovation through a social system. The

preliminary results demonstrated in this study should guide further research on these relationships.

TERMINOLOGY

Acceptance is the formation and following of the intent to use the technology that forms the base of the innovation (Davis, 1989, 1993).

Adoption is "a decision to make full use of an innovation as the best course of action available …". The decision does not include actually using the innovation (Rogers, 1995).

Course Management Systems (CMS) are computer-based, Internet-related technologies used to package, deliver, and manage course content and activity via web access.

Diffusion is "both the planned and the spontaneous spread of new ideas" (Rogers, 1995).

Innovation refers to "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 1995).

Perceived ease of use "refers to the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989).

Perceived usefulness "is defined … as the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989).

Voluntariness is defined as the state of acting from one's own accord

DELIMITERS

The primary delimiter was the study's target population --- faculty members using course management systems in Ontario community colleges. The population is a diverse one contained within a definable system, providing the potential for reduction of variability in factors affecting the results obtained.

As stated above (pp 10-11), this should not reduce the more general applicability of the results, given the size and complexity of some of the colleges and the provincial college system as a whole.

The second delimiter is the specific technology under study. While the focus is narrow the system is significantly complex in design and function as well as innovative in terms of its application to the work of the persons in the system so as to be representative of large-scale technological change.

LIMITATIONS

Several issues may have limited data acquisition for this study.

1. The major limitation was the availability and willingness of the potential respondents to take part in the study. Scheduling the proposed survey was affected by the vagaries of semester activities such as start-up, exams, and off-campus activities such as work placements, so there were potential respondents who simply did not have time to answer a somewhat lengthy survey. Respondents were advised that completing the survey might require approximately 30 to 45 minutes.

2. The second and equally serious limitation was the exclusion of one-time users. This is, of course, a direct result of the first delimiter. Effects of this limit will be discussed at various points throughout this study.
3. The survey instrument may have created a limitation, in that it was online --- a web-based form. The potential respondent needed access to the World Wide Web. This should have been a trivial matter, as the target population is teaching with use of a web-based tool, but it is possible that some had access to the Internet only while at work, with limitations on their access while at work.
4. The study included a voluntary follow-up interview. This imposed a further limitation in that respondents were asked to participate in two separate activities. Respondents were advised that the interview might take 30 to 45 minutes. In fact, each took approximately 20 minutes.

ETHICS

The proposed study is based on personal responses to a survey and, in some cases, interviews. Protection of personal privacy is the major ethical issue. To that end application was made to the Athabasca University Research Ethics Board. Approval was granted on August 13, 2003.

CHAPTER II

REVIEW OF THE LITERATURE

There are several perspectives from which one can view the subject of technological innovation in education. For example, there are the serious skeptics; Neil Postman was one such critic (Postman, 1993, 1999). His perspective was one of caution, perhaps even opposition, and included positive commentary on Luddism.

Another cautionary view is that expressed by such authors as Goodman, Griffith, and Fenner, (1990), and Brown and Duguid (2000). This perspective is one of support for use of technology with an awareness of the need for social considerations.

A third area of research concerns technology in education, and studies regarding computer-mediated education (CAL, CML, CMT), e.g., work by Cuban (1986, 2001), or publications such as the *Journal of Asynchronous Learning Networks*, or the *Journal for Computer Assisted Learning*.

The fourth area of research concerns how (and whether) new ideas ("innovations") spread or "diffuse" through a social system (Rogers, 1995; Agarwal & Prasad, 1999).

Finally, there is the field of study concerning the acceptance of technology in the area of information systems. Specifically, this study considers the Technology Acceptance Model (Davis, 1989, 1993), or "TAM."

POSTMAN AND OTHER "CAUTIONARIES"

Postman argued that technology had become a driving force rather than an aid to human cultural development, bringing unexpected (and possibly unwelcome) changes. For example, Postman wrote that

> the uncontrolled growth of technology destroys the vital sources of our humanity. It creates a culture without a moral foundation. It undermines certain mental processes and social relations that make human life worth living. Technology, in sum, is both a friend and enemy. (Postman, 1993, p.xii)

In the volume identified above and in others (e.g., Postman, 1999) he noted that the Luddites were not simply blind, ideological, naïve reactionaries but people who took rational steps to protect the employment that provided them with livelihood (Postman, 1993).

This is a very negative beginning to developing a perspective on technological innovation, representing, perhaps, one extreme in the pro-and-con debate on technology in society. It provides a starting point for considering resistance or reluctance, but also acceptance.

Postman was not alone in expressing concerns. Others, e.g., Goodman, Griffith, and Fenner, (1990), Brown and Duguid (2000), Rogers (1995), Maki-Komsi and Repo (2000), and Bates (2003) describe a number of concerns such as the need for understanding the cultural impacts of technological innovations. However, these writers support use of new technologies, and their works are presentations of issues requiring careful consideration when an organization introduces technology to its members.

The introduction of a new technology into an organization involves a three-way relationship among the technology, the institution as an organization, and each individual in that organization. The effects are not one-way. Technology and the organization mutually affect each other and both affect the individuals within the organization. The technology affects the ways in which work and communication occur within the organization. The organization's choices concerning how and why it uses the technology will, in turn, affect the technology as it is viewed by the individuals within the organization, i.e., the "social meaning" of that technology. The technology thus has both physical and social components, and the social meaning can affect how (and the degree to which) each individual will use the innovation (Goodman, Griffith, & Fenner, 2000).

> No innovation comes without strings attached. The more technologically advanced an innovation is, the more likely its introduction is to produce many consequences --- some of them anticipated, but others unintended and hidden. A system is like a bowl of marbles: Move any one of its elements and the positions of all the others are inevitably changed also. (Rogers, 1995, p.419)

Brown and Duguid (2000) argued that technology changes culture in often unexpected ways, illustrating their point with the historic example of the effect that telegraph and telephone communication had on British businesses with overseas offices. The new form of communication radically changed the relationship between the central offices and those overseas offices. Conversations replaced long-delayed ship-borne messages as the means for exchanging information and giving orders. This allowed central management to strengthen its control over their overseas operations,

with a resulting loss of independence of overseas managers. A second example cited by Brown and Duguid described the reluctance of US Navy commanders in the nineteenth century to accept use of radio aboard ship. These commanders (like the overseas business managers) understood the loss of independence and control inherent in this new system.

The authors drew on Brown's experience working at the Xerox Palo Alto Research Center (PARC). PARC is famous (or infamous) for losing a significant innovation --- the Graphical User Interface (GUI) for microcomputer systems --- to Apple through the Xerox' inability to utilize and exploit the innovation. PARC was unable to adjust its corporate culture (as also described by Rogers, 1983,1995). Brown and Duguid (2000) also described how the Xerox machine itself almost did not reach actual existence, as large corporations could not see a value in document duplication because carbon paper was so cheap. The impact of the copier, however, was felt beyond mere single-copy duplication; it transformed the ways in which documents are processed, often on devices that function as document duplicators, networked printers and FAX machines.

Technological innovation can have a cultural impact, and potential users will see this coming. While some will embrace such change others will resist, or simply sit back and watch.

STUDIES ON TECHNOLOGICAL INNOVATION IN EDUCATION

"Technology is indeed a threat to traditional forms of teaching …" (Bates, 2003, p.18). This, along with perceived threats to power, authority, and even jobs, inhibits the use of technological advances in teaching (Bates, 2003). A Finnish study

(Maki-Komsi & Repo, 2000) echoes this in reporting survey results from educators – responses noting (not always favourably) the change in the balance of roles and control between teachers and students.

From a broader perspective (i.e., beyond the teacher-student power balance), Kerres (1995) raised the question of harmonizing the learning environment and the technology innovation under consideration. His point was the importance of considering social context as an element of design, the importance of the social context ("culture-specific determinants") in forming attitudes towards a potential innovation. Like authors previously discussed (e.g., Goodman, Griffith, & Fenner, 2000), Kerres argued for regard for the social concerns of technological innovation. He was concerned with "the situational or social embeddedness of all learning activities" (p. 79).

In an educational setting (and the current study is rooted there), Kerres wrote that due regard must be given to this social context of learning in design and implementation decisions. In fact, somewhat in contradiction to other writers, Kerres was concerned that the separation of implementation from development had become built in to the system design phase. Kerres quotes Reigeluth's (1983) "seminal definition of ID [instructional design]" (p. 80), as follows.

> Implementation should usually have the greatest impact on instructional design. Design must take into account implementation needs whenever possible because innovative programs of instruction are usually very poorly implemented in existing environments. (Reigeluth, 1983, p.10)

The suggestion here is instructional design (ID) affects and is affected by the use of educational or instructional technology, thus requiring similar implementation considerations.

This "situational or social embeddedness of all learning activities" raises an important question. Is the educational setting significantly different from other organizational environments to the extent that innovation studies in this field must be significantly different as well? Functionally, schools, colleges, and universities differ in some ways from businesses, government services and other large organizations. The former build and maintain regular, often daily contact with their clients --- students. Many of the applications employed in the education area are used by the students as well as by the faculty; the technologies are shared, and also may be a means of communication between those two groups. Communication, here, is meant as a broader term than simply discussion or conversation; it includes conveyance of information (e.g., study material).

While this could be true for many types of organizations, it may be the case that this is a more basic part of the employee-client relationship in education than it is in other types of organizations.

"… the way in which change is put into practice determines to a large extent how well it fares" (Fullan, 2001, p.10). Fullan found that one of the factors affecting adoption and use of changes in education is the manner in which the change is presented to the user community, as did researchers previously cited. In the introductory chapter of *The New Meaning of Educational Change,* Fullan wrote that the change process, as distinct from the actual innovation, is a matter of highest

priority. In fact, Fullan noted that even small details *in the process* [emphasis supplied] can spell the difference between dismal failure and energized teachers and inspired success.

Equally important is Fullan's point that the interaction between the "what" and "how" of educational change is vital, as well as a moving target in a social setting.

Fullan cited House (1974) as follows:

> The personal costs of trying new innovations are often high … and seldom is there any indication that innovations are worth the investment. Innovations are acts of faith. They require that one believe that they will ultimately bear fruit and be worth the personal investment, often without the hope of immediate return. Costs are also high. The amount of energy and time required to learn the new skills or roles associated with the new innovation is a useful index to the magnitude of resistance. (p.36)

In effect, the innovations could appear as threats as much as benefits, affecting teachers' consideration (let alone use) of new ideas, methods, and tools.

Fullan continued by arguing that change occurs along three dimensions, which he defined as follows.

1. possible use of new or revised materials (including technologies)
2. possible use of new teaching *methods* [emphasis supplied]
3. possible alteration of beliefs (one can relate this to the Theory of Reasoned Action and the Technical Acceptance Model described later in this paper).

Further discussion of Fullan's work will occur in the discussion of innovation research, below.

Given these expressions of concern it might not be surprising to encounter resistance or reluctance or wariness with respect to introduction of computer-based technology as a means of delivering and managing institutionalized education.

In reviewing literature on the use of technology in education one finds that conclusions are difficult to draw. For example, in 1987 one finds high faculty satisfaction in one study, although it draws on the experience of two professors (Graff, 1987), while Fahy and McDonald (1987) describe resistance to technological changes to teaching, including the comment that the "not invented by me" syndrome seemed to block instructors' use of new tools, a view also reported in a study of the use of music training software (Bresler & Walker, 1990).

Indeed, teachers have long been accused of obstructing innovation and change in the classroom (Cuban, 1986). Cuban studied adoption of technology in the classroom, and found reluctance, or slow acceptance, rather than resistance, (Cuban, 1986, 2001). A photograph in the earlier book illustrates his point; the photo depicts a class of young children in an airplane, all sitting in the traditional classroom formation with a teacher at the front using a pointer and a globe. In the accompanying text Cuban described how the teacher retained familiar methods even when enclosed in the new technology. In the epilogue to the earlier text Cuban argued that teachers, through their slow acceptance of change, have provided stability amidst change (Cuban, 1986). It is significant that Cuban used the term "acceptance," not "rejection," or "resistance."

In their "Editors' Introduction" to a series of essays on information and communications technology (ICT) and innovation, Loveless and Ellis (2001) state the following.

> The mere presence of technology will not be a catalyst for radical change in our education systems. It is more likely that it will be used in unexpected ways after a period of trying to make it fit into the old systems. (p.1)

Rogers (1995) referred to this phenomenon, naming it "reinvention" and identifying it as a positive phenomenon. Technologies such as the one studied here provide for this possibility. One can use them simply as document repositories, or make use of a variety of other features such as testing (and grading), asynchronous discussions, and "chats." Even use as document repositories carries the choice of sole-source vs simple backup for the students.

This statement does not argue high or low quality; it merely considers how technology might work its way into a social system (an education system, in this case), and this is the object of this study.

If faculty members are not willing to adopt new instructional concepts, methods or tools the students will not see the benefits of potential reforms. The willingness of individuals --- faculty members, in the proposed study --- to participate is important (Wejnert, 2000; Almeda & Rose, 2000; Fredericksen, Pickett & Shea, 2000; Dillon & Walsh, 1992; Murphrey, Pesl, and Dooley, 2000). While this study concerns ongoing use ("routinization"), it is important to remember that there is no

ongoing use without implementation --- described by Rogers (1995, p.172) as when "an individual … puts an innovation into use."

Planned implementation that takes the members of an organization into account is an important element in a successful diffusion of the change within that organization. The history of technological innovation in education includes lost opportunities --- lost as a result of top-down imposition of "great ideas" that were introduced with little thought of how they might fit into the particular culture of the institution (Kerres, 1995; Reigieluth, 1999; Cuban, 1986). Goodman, Griffith, and Fenner (1990, p.53) identify two important characteristics of an implementation process: that it is distinct from the actual technology, and that it tries to "create a specific socially constructed image of the technology," a concept echoed by Fullan (2001).

Studies on educators and technology innovations are not new, of course. A number of related studies appeared in the *Journal of Asynchronous Learning Networks* in the year 2000. These studies concern faculty satisfaction rather than the more specific one of innovation adoption or acceptance. However, while the "satisfaction" and "routinization" are not the same (and one is not a precondition for the other!) there *may* be a greater likelihood of continued use by satisfied users than there would be by un- or dis-satisfied users. The hesitation expressed here is recognition of the possible effects of executive or management decisions, student demand, or peer pressure. Nonetheless, reviews of the SUNY Learning Network ("SLN") and other studies can provide indications of influences towards continued use.

The State Universities of New York (SUNY) Learning Network academic programmes are fully online. At the time of the SUNY study (2000) more than 10,000 students were enrolled in the network's online courses. The faculty selection process is not clear, nor, apparently, consistent across the SUNY system. "The choice of faculty, including adjunct faculty, is purely a campus-based decision" (Fredericksen, Pickett, & Shea, 2000, p.247). The SLN provides significant support to the faculty participants, "include[ing] instructional design assistance, technical support, training, collaborative experiences, and printed and web-based faculty manuals" (p.247). In fact, support is a major component of the Learning Network; this support is provided down to the course template detail level.

The results of the SUNY study are summarized in a single sentence, although supporting data analysis also is supplied. "The factors that significantly contribute to faculty satisfaction in the teaching of their courses are student performance, level of student interaction in the course, reason for choosing to teach on-line, satisfaction with the SLN, a positive perception of the effects of the technology, low levels of technical difficulties, and how well the faculty got to know their students" (Fredericksen, Pickett, & Shea, 2000, p. 258).

On the question of student performance, nearly 45% reported better results in online courses than in classroom settings, while 44% reported no difference (Fredericksen, Pickett, & Shea, 2000).

At the University of Central Florida (UCF), online technology was used in several modes ranging from simple support for traditional classroom-based courses to fully online instruction. The university's emphasis was on "M" (media-supported)

courses, as this served the needs of their (the university's) 32,000 students while relieving pressure on classroom space (Hartman, Dziuban, & Moskal, 2000).

UCF's approach was to standardize and then heavily support a specific set of tools. The purpose was to increase the possibility of consistency and to make it easier to establish a faculty development programme. This enabled UCF to formalize processes of faculty selection (selection for teaching with online tools) and development, as well as provide student support for use of the online tools. With selection processes and supports in place one might expect to see high levels of satisfaction, and this is what they reported. "Generally, our instructors rate their experience as satisfactory *with the large majority wishing to continue in the new modality*" [emphasis supplied] (p.173). Through surveys, interviews, and focus groups, UCF found the following as contributors to faculty satisfaction:

- enhanced student and teacher interaction (when compared to classroom-only classes)
- a more flexible teaching and learning environment (when compared to classroom-only classes)
- the change from teacher to facilitator
- the shift in the students' role to greater activity and responsibility
- the greater depth of a course resulting from expanded resources
- the potential for improved use of classroom time
- the potential for inclusion of instructional resources created by others
- the recognition and use of instructional design and learning theory
- the need to be less ambiguous and more organized.

On the other hand, the UCF study found negative influences on satisfaction. There are listed here:

- severe time loads
- technology problems
- a decrease in actual face-to-face student contact
- loss of control
- an excessive and, perhaps, overwhelming amount of information that is available to the student
- testing (assessment of student work)
- reduced ratings of faculty members by students
- the place of online modes of instruction in a university culture
- the degree of department support experienced (or felt).

The reader should remember that the UCF study concerned faculty satisfaction, not the individual instructor's decision to continue use of an online instructional system, although there was the reference to faculty members' desire "to continue in the new modality" (Hartman, Dziuban, & Moskal, 2000).

The University of California Extensions (UC-E) area reviewed the use of online tools in its writing curriculum (Almeda & Rose, 2000). UC-E, like the University of Central Florida, developed selection criteria for courses and faculty participants. The two sets of criteria were the following.

For courses, selection considerations included

- appropriateness for on-line delivery (no details provided in the study)
- good classroom enrollments

- involvement of an existing campus course or professor
- inclusion of the course in a sequence of certificate
- availability of funds for development
- public (student) interest.

Instructors were "chosen based on their expertise in the content area, their teaching experience, their interest in developing and teaching via ALN (asynchronous learning networks), and their technology background" (Almeda & Rose, 2000, p.182). In addition, "practicing professionals" often were selected rather than "ladder-rank UC [University of California] faculty" to teach certain courses, as the former "are often more available for ALN and, in some instances, may be more appropriately prepared to teach a particular course" (Almeda & Rose, 2000, p.182). This appears to be a qualification on one of the course selection criteria - involvement of an existing campus course or university professor.

Stated simply, careful choices may have affected the results when UC-E studied faculty satisfaction. And, again, the reader is reminded that the UC-E study, like so many others, concerns satisfaction, not an educator's decision to use technology, and that satisfaction may influence an instructor's decision to continue using the online technology, but may not be the deciding factor.

The UC-E study states the following:

> [I]nstructors reported being generally satisfied with the experience [of teaching through use of Asynchronous Learning Networks --- ALN]. Six gave strong yes responses while three others expressed mixed reactions, identifying concerns related to lack of student motivation (and, thus, dropouts or nonstarts), difficulties adjusting to asynchronous course delivery and compensation. (Almeda & Rose, 2000, p.189)

The UC-E study identified other factors in the matter of "advantages and drawbacks of using technology in instruction." Flexibility, especially in the anywhere-any time area, was important to the professors. The number and variety of students were seen as positive aspects, too. This is the only one of the three studies (SUNY, UCF, UC-E) to include this issue.

Negative factors included time commitments required for communication with students, "fitting in their on-line teaching with their other commitments, and the lack of group interaction" (Almeda & Rose, 2000, p.189). In fact, the UC-E study reported this last point as the major obstacle to adoption. This possibly is a contradiction with the University of Central Florida study described above. However, it useful to note that the UCF use of ALN's includes mixed-mode (classroom and online) classes. The community college model under study here generally is in the mixed-mode, wherein the online system supports the classroom experience.

A study that is closely related to the current one, at least as far as the specific technology is concerned, was conducted in the University of Wisconsin (UW) system (Morgan, 2003). That study dealt with four major questions:

- What was the extent of faculty use of course management systems?
- What factors drove faculty to start using a course management system (CMS), and, once they started, what factors determined whether faculty increase or decrease their use?
- For what purposes were course management systems used?
- What pedagogical gains did using a CMS bring?

In the UW study, 140 faculty members were interviewed, and 740 faculty and instructional staff members completed a survey. The researchers also reviewed server logs.

At the time of the UW study, most CMS use in the university was for "enhanc[ing] regularly scheduled face-to-face classes" (p.4). This is quite similar to use of the technology in the colleges with which the current study is concerned. Just over 80% of the faculty in the UW System used these systems in this manner.

Initial adoption of this technology was largely influenced by the systems' tools for class management, although interviewees oftimes related that they were drawn to the systems by pedagogical challenges.

Peer influence also loomed large, as did administrative pressure or persuasion. The UW study author expressed surprise that student pressure actually had little effect. "Only three percent of the faculty surveyed cited student pressure as the primary reason for starting to use a CMS" (Morgan, 2003, p.2).

More germane to this study were the findings related to increased or reduced use of CMS technology. The most significant reason given for continuing use was that the faculty members and instructional staff saw new ways to use the systems. "Many faculty spoke of how using the CMS allowed them to see new ways that they could use it in their classes or ways they might use it in different classes" (p.2). Often, the new ideas came from colleagues who also were using these systems. The reader may recall the earlier references to "reinvention" (Rogers, 1995; Loveless & Ellis, 2001).

On the other hand, there were "faculty [members] whose use decreased over time (just 5 percent of those surveyed)" (Morgan, 2003, p.3). The major reasons were time consumed (mostly for content loading and reloading), perceived system inflexibility, and difficulty in using the technology.

The issue of rigidity was reflected in two ways --- the overly-structured format, and the near impossibility of using proper mathematics or science notation. (At the time of the UW study, Blackboard, for example, had not evolved to its current stage. The current version of this product includes the ability to include such symbols in content and assessments.)

Ten percent of those surveyed found the course management system "too difficult to use" (p.4), and "a greater number (16%) limited their use of these systems because of problems students reported." In fact, Morgan reported that this was a major issue; all of the respondents in the UW study felt that their use of the system would increase if faculty and student training were more available. This point also was raised in Surendra's (2001) research, cited below.

Other issues were reported under such topics as "How faculty use course management systems," but they pointed to potential influences. Among these were the ability to use supplemental material to "address diverse learning styles," and "increasing transparency and feedback." This last was the result of using the CMS gradebook, despite the difficulties and shortcomings of this feature in the CMS in use at UW at the time of the study. Parenthetically, it is noted here that this reflects comments often made by faculty members to the researcher in one of the colleges involved in this current study.

In addition, UW "[f]aculty were especially impressed by the way course management systems allowed them to increase communication with their students" (Morgan, 2003, p.4). However, the "flip side" of this is the issue raised in the UC-E study described above. That issue is the heavy email load faced by faculty members. It is appropriate, perhaps, to point out that communication becomes largely one-to-one in the online environment, perhaps much more so than in the classroom.

Reporting on two additional studies requires discussion of the research base for this study – Diffusion of Innovations, and the Technology Acceptance Model.

DIFFUSION OF INNOVATION

The adoption and continued use of innovative ideas, concepts, methods and technologies is the subject of study in at least two fields: basic social sciences, and business and Information Systems. In the former, Rogers' "diffusion of innovations" studies (Rogers, 1995) have been the foundation for a branch of continued research.

One of Rogers'(1983, 1995) early fieldwork studies considered the course of adoption of hybrid seed corn among farmers in one U.S. state. Rogers began to classify adopters and innovation characteristics, as well as time lines that related groups of adopters to time of adoption or rejection, and the communication channels through which information concerning an innovation was transmitted. Rogers identified five innovation characteristics.

1. ***Relative advantage*** is a measure of the improvement an adopter would see in her or his quality of work, efficiency, or ease of doing a task.
2. ***Compatibility*** is a measure of how consistent the innovation appears to be with an adopter's beliefs or means of working.

3. ***Observability*** is a measure of how visible the innovation or its results are to an adopter's peers. This has been confused with "observability" of the innovator, and Moore and Benbasat (1991) distinguished between "observability" and "image".
4. ***Complexity*** concerns how difficult use or acceptance of the innovation is perceived to be.
5. ***Trialability*** refers to the possibility that the new user can try out the innovation without commitment.

With respect to the current study an individual may find several forms of "relative advantage," including the possibility that her or his students' performance will improve over that previously observed in solely classroom-based courses. As well, the individual may view the ease of class management as a "relative advantage" over some of the manual record-keeping that usually is required, or may see simplified document distribution as a benefit. Another potential benefit is the students' ability to check their grades, thus reducing a great deal of "administrivia" for the faculty member.

In one of the colleges in this study an example of "observability" was the phenomenon of students requesting use of a CMS in a course after experience in another one.

Rogers also classified the stages of adoption.

1. ***Knowledge*** is the stage at which a person becomes aware of the new concept, process or tool.

2. ***Persuasion*** identifies the time during which an individual forms a positive or negative attitude towards the innovation.
3. ***Decision*** is the point in time when the person chooses (initially) to adopt or reject the innovation.
4. ***Implementation*** refers to actually putting the new concept or process or tool in use or practice.
5. ***Confirmation*** or ***routinization*** is the stage at which the person chooses to continue to use the innovation, or to finally reject it. At this stage the user can reverse a previous adoption/rejection decision, of course. This study concerns itself with this last stage --- for the case in which the user confirms the decision to continue using the innovation.

As a matter of terminology, the first three of these stages comprise "adoption" --- the stages leading to making initial adoption/rejection decision.

To a great extent, Rogers (1995) was concerned with the questions of how (or whether) an innovation spreads through a social system. Rogers' emphasis on individual choice extended to Rogers developing terms to describe when, relative to others in the social system, a person adopts an innovation. So, for example, "innovators" are among the first (more or less) 2.5% of the members of the social system being exposed to the innovation, while "laggards" (Rogers' term) form the last 16% who might adopt it (or even reject it). Rogers divided the groups quite simply on the number (one or two) of standard deviations (SD) from the average time to adoption. The innovators, for example, are those who adoption is at least two S.D.'s away from the average adoption time for an innovation.

"One of the major limitations of classical diffusion is the implicit assumption that individuals are adopting innovations for their own independent use, rather than being part of a larger community of interdependent users" (Fichman, 1992, p.5). In a similar vein, Agarwal and Prasad (1997), and Moore and Benbasat (1991) added voluntariness to Rogers' attributes. This decision arose from an interpretation of Rogers' work – an interpretation that held that Rogers' work was based on free individual choice, and not inclusive of the potential adopters within organizations. The relevance for this study is that the respondents were in varied circumstances in this regard.

Rogers (1983) appears to acknowledge the question of voluntarism, but without naming it. Chapter 10 in the third edition (Rogers, 1995) is concerned with innovation adoption in organizations and refers to several forms of innovation decisions, including "authoritative" and "contingent." Rogers describes the example of a doctor's being able to adopt a new diagnostic device only after the hospital (the organization) has adopted it. This does imply a voluntary choice for the doctor, but Rogers does not state this and does not examine the question of adoption by the doctors and their peers within the organization.

Moore and Benbasat (1991) added "image" as a distinct attribute, writing that the meaning of "observability" (Rogers, 1995) was unclear. They interpreted "observability" as referring to the results of the innovation, as distinct from the potentially new visibility of the adopter, as in the example cited above (student demand).

Diffusion of Innovations, as enunciated by Rogers (1995), includes communication channels as one of its variables. The issue is how news and information concerning the innovation is spread through the social system in question. Rogers described two fundamental communication channels: interpersonal and mass-media. The choice of channel could affect the success (or failure) of the attempt to diffuse the innovation through the social system. Each channel has its appropriate use, according to Rogers. "Mass media" would be most appropriate at the information stage, while various forms of interpersonal communication ---peer-to-peer, client-to-institution, use of change agents or "champions" --- would be more productive at later stages in each potential adopter's stage in the consideration of the innovation.

Rogers (1995) describes the "champion" or the "change agent" as an individual who carries the message of the innovation to her or his peers or (if the change agent is external to the social system) brings the innovation to that social system. The role can be constructive if it is carried out properly, with consideration of the social system's culture.

Fullan (2001) similarly described phases in the innovation process. He identified the first as "initiation" --- the process that leads up to and includes a decision to adopt or proceed with a change. He also included the terms "mobilization" and "adoption" as labels for this phase. The reader will note that the parallel with Rogers' first three phases.

Fullan (2001), as did Rogers (1995), identified initial use as "implementation."

Finally, Fullan (again, like Rogers) identified the final phase as ongoing or continuing or "institutionalized" use.

Fullan argued that the process is far from linear, despite the labels, effectively describing innovation as a process of cycles that incorporates lessons from "later" phases in reiterations of "earlier" ones. This is reflective of Rogers' (1983, 1995) argument that the decision stage after implementation may include a reversal of the initial decision to adopt or to reject.

In the context of Rogers' work this study is concerned with "institutionalization" of an innovation, and a consideration of characteristics of innovations and users' experiences that affect the transition to that phase from implementation.

TECHNOLOGY ACCEPTANCE MODEL

The Technology Acceptance Model --- TAM (Davis, 1989, 1993) --- provides a more parsimonious perspective. The model is limited in its scope, as its name implies, and describes a more limited set of characteristics: perceived usefulness and, indirectly (through usefulness), perceived ease of use.

While Rogers (1995) studied the more general field of innovation, Davis concentrated on (as the model name suggests) acceptance of technology. Even more narrowly, Davis' concentration was on acceptance in the workplace. Davis (1989) developed the TAM from social psychology studies --- specifically, the work of Fishbein and Ajzen (1975) to "explain computer usage behavior" (Davis, Bagozzi, & Warshaw, 1989). In positing their Theory of Reasoned Action, Fishbein and Ajzen (1975, 1980) hypothesized a chain from belief to attitude to behavioural intention.

They identified "belief" as the information the individual has concerning the proposed behaviour, including the potential outcomes of that behaviour (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980). They defined "attitude" as follows: "[q]uite simply, an attitude is an index of the degree to which a person likes or dislikes an object" (Ajzen & Fishbein, 1980). Ajzen (1988) continued the research, resulting in an extension --- a Theory of Planned Behavior. Ajzen's concern with non-volitional (or less than fully volitional) choices led that author to separate "social norms" from individual beliefs as influencing factors. In fact, Ajzen argued that such norms could have a direct influence on the intention rather than simply the indirect effect through attitude.

According to the TAM, a subject's belief in the object technology's usefulness will lead to an attitude towards that technology, and, thence, to the behavourial intention to use or reject that technology. Davis (1989) originally considered perceived ease of use (PEOU) as a parallel belief that would lead to the subject's attitude, but later determined that PEOU in fact is a determinant of perceived usefulness, rather than a determinant of the eventual attitude.

Together with Venkatesh, Davis further explored perceived ease of use. Their 1996 study pointed to the subject's belief in her or his self-efficacy with respect to general computer use as the main determinant of PEOU (Venkatesh & Davis, 1996).

The importance of perceived ease of use was further examined by Venkatesh (2000) in a study that examined "the determinants of this important driver of technology acceptance and use" (Venkatesh, 2000, p.2). Venkatesh described the relationship between perceived ease of use and perceived usefulness by noting that

"…TAM posits that perceived usefulness will be influenced by perceived ease of use because, other things being equal, the easier a technology is to use the more useful it can be" (p.3). Venkatesh differentiated between "anchors" --- the preliminary opinions and perspectives held by the potential adopter prior to actual experience with the technology --- and "adjustment" --- the revised opinions and perspectives held by the adopter after her or his experience with the technology in question.

Venkatesh (2000) proposed several attributes of perceived ease of use: control (internal and external, the former including computer self-efficacy), intrinsic motivation (identified as "computer playfulness"), and emotion (operationalized in the study as computer anxiety). These were identified as "anchors." Venkatesh regarded "objective usability, perceptions of external control as it related to the specific environment, and perceived enjoyment from system use" as "adjustments" that came into play after the user's initial use.

This study concerns itself with users who have made an initial adoption and who have proceeded beyond this stage. This implies that they have reached the stage of "adjustment."

A meta-analysis of TAM studies (Ma & Liu, 2004) supports the basic belief-attitude-behavioural intention chain proposed by Davis (1989), including the *specific chain from perceived ease of use to usefulness to self-reported use and intention to continue use* [emphasis supplied]. It is important, though, to note their (Ma and Liu) caution concerning the relationship between perceived ease of use and technology acceptance. Their caution was based on the possibility that one additional study showing "null effects" could have changed the results. This latter relationship (ease of

use to behavioural intention) is in line with Davis' original conception of perceived ease of use having a direct effect on the behavioural intention (Davis, 1989). The analysis considered twenty-six empirical studies that fulfilled four requirements:

1. testing of TAM directly or indirectly
2. reporting of sample size
3. reporting of correlation coefficients between the constructs of TAM of other values that can be converted to correlations, and
4. publication or dating after 1989, the year the TAM was first published.

Although these two models appear to be divergent there is some common ground. As Moore and Benbasat (1991) note, perceived usefulness is parallel to Rogers' (1983, 1995) "relative advantage," while perceived ease of use maps to Rogers' characteristic of "complexity," although, of course, higher PEOU produces the opposite effect to that of higher complexity.

STUDIES BASED ON DIFFUSION OF INNOVATIONS AND TAM

A New Zealand study of adoption of web-based education technology considered both models (Tetiwat & Huff, 2002), with the addition of an extension of the base for the Technology Acceptance Model, the extension being the Theory of Planned Behavior (Ajzen, 1991).

Ajzen (1991) extended the Theory of Reasoned Action (TRA) with the concept of subjective norms. These were described as an individual's perceptions of social pressures and external behavioural controls. A management directive would be an example of the latter.

Tetiwat and Huff's (2002) research model is shown in Figure 1. "WBET" is "web-based education technology."

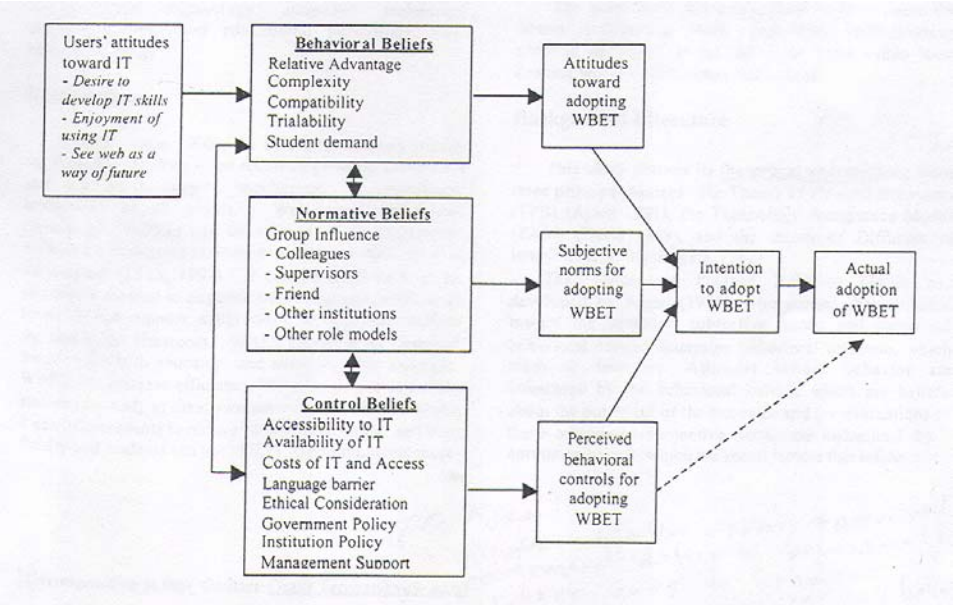

Figure 1: Tetiwat & Huff Integrated Research Model

Tetiwat and Huff interviewed 32 informants from the country's tertiary-level education institutions; twenty-two of these informants were educators while the other ten were management and administrative personnel.

The researchers categorized the influences as control beliefs and behavioural beliefs, as well as normative beliefs, as illustrated in Figure 1.

The five strongest influences were the following:

1. access to technology (convenient to use)
2. compatibility (suitability to subject, teaching style, and work, as well as suitable to students' learning)

3. availability of technology (infrastructure, all required functions, quality of the equipment)
4. relative advantage (enhancing of image, output quality, result demonstrability)
5. student demand.

Confirming the influence of attitudes towards IT, the sixth-strongest influence was the users' attitudes towards IT.

Items two and four above clearly relate to Rogers' Diffusion of Innovations model. The relationships to TAM (Technology Acceptance Model) are less clear, at first reading, but may be the following.

As noted earlier, "perceived usefulness" has been cited (Moore & Benbasat, 1995) as analogous to Rogers' (1983, 1995) "relative advantage." "Perceived ease of use" appears to have a good relationship with items one and three in the list above. Among these five factors, student demand may be difficult to place with respect to the models.

This current study considered these two characteristics --- perceived usefulness and perceived ease of use --- as possible influences in the users' decisions to continue use of a specific computer technology. The simplicity of the Technology Acceptance Model --- its parsimonious nature --- could provide a usable tool for studying potential technology tools in educational (as well as other) settings.

A study that relates closely to the current one was published in 2001. Surendra conducted research concerning adoption of Web-based education technology at one Ontario community college (Surendra, 2001). Surendra examined the adoption of

web-based technology in education with respect to innovation diffusion factors to determine, if possible, the predictive quality of any of the factors involved.

He drew on three sources for possible innovation-related factors: Rogers (1995), Fullan (1991), and Clinton (1971). Rogers' (1995) were described above.

Surendra (2001) listed the following factors identified by Fullan.

1. existence and quality of the technology to support the innovation
2. access to information concerning the innovation
3. advocacy from central administration
4. teacher pressure/support
5. presence of change agents and consultants
6. community pressure/support/apathy/opposition
7. funding
8. legislation or government policy
9. bureaucratic incentives

From Clinton Surendra (2001) cited the following factors.

1. clarity of results
2. initial cost
3. repercussions --- loss due to non-introduction, according to Surendra, (2001) although he also states that Clinton described this as the stresses and dislocations for society and the user that occur if the innovation is accepted
4. association with teaching, possibly overlapping with Rogers' listing of compatibility, according to Surendra (2001)

5. novelty
6. pleasure
7. efficiency
8. continuing cost
9. penalty – fear of excessive personal expenditure of time and energy

Surendra (2001) categorized the factors as "primary," which he described as the intrinsic attributes of the innovation, and "secondary," which he described as "benefit-related attributes"; i.e., variable with the potential adopter rather than fixed with the character of the innovation. He later noted that the classification (primary vs. secondary) was mainly based on "the criticality of the factors in facilitating the diffusion process" (S. Surendra, personal communication, January 9, 2005).

The study sample consisted of 109 persons --- faculty members and administrators --- approximately 20% of the population. The conclusions fell into two groups.

The first group consisted of the following general conclusions.

- The more positive the perception of diffusion factors the higher was the acceptance or adoption of innovations. Surendra defined "adoption" as "the acceptance and use of the innovation," and "acceptance" as the "favourable reception of an innovation, but not its utilization."
- Surendra found no relationship between years of service at the college and user acceptance or user perception of diffusion factors.

- Surendra also found no relationship between years of computer usage and user acceptance of innovation or user perception of diffusion factors.
- There was no relationship between age and acceptance of technology.
- The study did find a relationship between the computer knowledge of the adopter and the acceptance of innovation.

With respect to the diffusion factors Surendra determined the following as crucial.

There were four very important "primary" (intrinsic) attributes:

1. access to information (mainly training)
2. efficiency
3. trialability
4. community pressure/support/apathy/opposition

Of the possible "secondary" (benefit-related) attributes the following three were prominent.

1. association with teaching
2. relative advantage
3. complexity/ease of use

Surendra emphasized that the primary diffusion factors identified as important "accounted for 48 percent of the variance in acceptance or adoption variables. The multiple correlation between acceptance and the combined value of the above four attribute variables was .69". Surdendra reported that access to information ---

especially training --- was a very strong primary attribute (S. Surendra, personal communication, January 9, 2005). The reader is referred also to the findings at the University of Wisconsin (Morgan, 2003) cited above.

Below, subsequent to the presentation of the data analysis, the results will be considered in the perspectives of "Diffusion of innovations" studies and the TAM.

SUMMARY

The literature described above views technological innovation from a number of perspectives. The first, represented at the extreme by Postman (1993, 1999), is a series of warnings or cautions concerning introduction of technology into a social system such as a place of employment, or an education setting. While Postman tends to decry a perceived dominance of technology in contemporary society, more positive authors such as Brown and Duiguid (2000), and Goodman, Griffith, and Fenner (1990), as well as Bates (2003), support the use of technology, while also urging thorough consideration, planning, and care in the process of introducing innovative methods, techniques, and ideas into any social setting including educational institutions.

The literature revealed studies related to faculty satisfaction with use of technology as a means of course delivery and management, but little was uncovered that was based on the technology acceptance or innovation diffusion models. Two exceptions were the Tetiwat and Huff (2002), and Surendra (2001) studies.

The literature also revealed two major streams of study in technology innovation: the "diffusion of innovations" work of Rogers (1995), and the Technology Acceptance Model (Davis, 1989, 1993). The former is more generally

concerned with innovations in a social system while the latter is concerned with (as the name implies) the acceptance of technology, in a workplace environment.

The current research attempted to relate continuing use of technology in an education environment with these two models.

CHAPTER III

METHODOLOGY

SAMPLE

This study sought data concerning influences on users' decisions to continue use of educational technology; the specific case concerned course management systems. Faculty members at five Ontario (Canada) community colleges participated in a survey late in May and June of 2004. Late that same year and early in 2005 twenty of the respondents were interviewed. Two of the colleges are in the Toronto area. One is in eastern Ontario, one in the north-west area of the province, and one in the southwest. Users of two CMSs were included in the study. At each of the five colleges a contact person sought out potential respondents and together reached a total of approximately 50 faculty members who were using a Course Management System at the time of the study. Thirty of them completed the survey.

This choice was based first on the widespread effect of these complex technologies, and second on the control of variability available through choice of a particular work environment and technology.

Managers and education technology specialists at five community colleges were asked to seek potential respondents. Four qualifications were specified.

1. The potential subjects had to be repeat users of a CMS.
2. Each college's sample should include users with varying numbers of semesters of use.
3. The potential subjects' opinions of CMS should vary within each college.

4. Eight to ten potential respondents should receive initial requests from the college contacts.

To limit the effect of product influence on the outcome, the sample included users of two different systems: Blackboard and WebCT. The two systems provide the same functions and many of the same features. Both support the delivery of course content. Both systems provide course management tools such as online assessments and gradebooks, and control of participation (classlists). Both provide for course participation on the World Wide Web, and neither requires a high level of technical sophistication on the part of the teacher.

The study utilized a web-based survey with data entered into an online database, eliminating the need for manual data-entry. This direct data-entry by the respondents eliminated a major source of error. Further, this manner of recording the data added a layer of privacy, as there were no additional data handlers. The elimination of data-entry reduced expenses and one stage of manual data-entry, along with its potential for injecting errors into the data-collection.

The choice of a closed-questions survey was based largely on the geographically-dispersed nature of the population (Alreck & Settle, 1995). The questions posed arose from a number of sources:

- studies by Fredericksen, et al (2000), Almeda and Rose (2000), Kashy, et al. (2000), Morgan (2003), Moore and Benbasat (1991).
- the researcher's ongoing communication with faculty members during the preceding three years as the project leader for Centennial College's implementation of Blackboard.

- accumulated experience of teaching computer applications in a community college and providing support to computer system users in industry and government.

The survey included a request for follow-up interviews. These interviews were used to explore the question of the degree of use of the system by the faculty member. The interview also was used to fill in blanks revealed by survey analysis. Nearly all of the interviews were conducted by telephone. The script is attached to this document as Appendix C. The greater proportion of the script consists of multiple-choice or yes/no questions so that the responses can be clearly recorded, and to reduce the possibility of misinterpreting a respondent's answers to the queries (Albeck & Settle, 1995). This script was part of the submission to the Athabasca University Research Ethics Board.

INSTRUMENT

The study is largely quantitative in nature. The survey instrument is attached (Appendix A). This instrument uses several forms of questions: multiple choice, Likert-scale multiple choice, a small number of binary ("yes/no") items, and two open-ended questions.

The first several questions sought responses on basic matters such as the CMS in use, the types of classes supported (e.g., full classroom or hybrid), the number of semesters of CMS use, and the number of classes taught with CMS support at the time of the survey.

The main data --- the influences affecting user decisions --- were acquired through 11 questions (grouped as Question 24, see Appendix A); each used 5-point

Likert scale responses. The text common to all of these questions was, “For each of the items identified below please indicate how the item influenced your decision to continue using the Course Management System (CMS). In each case where a degree or level of an item is discussed use your personal experience, not a theoretically positive experience.”

The 11 influence factors, and their relationships to the research questions (“RQ”) were as follows.

1. level of student learning	Student response (RQ #5), also "usefulness"
2. degree of voluntary choice in the decision to use the CMS	Voluntarism (RQ #1)
3. degree of ease in using the CMS for document distribution	Ease of use (RQ #7)
4. the CMS tools for fostering discussion	Usefulness (not original research question)
5. the level of technical competence required (or not required, as the case may be)	Perception of personal technical competence (RQ #2)
6. the level of pedagogical or instructional design knowledge the respondent needed (or did not need)	Relation to respondent's knowledge of pedagogy or instructional design (RQ #6)
7. the level of the respondent's college's CMS administrative procedures and support	Importance of institutional support (RQ #3)
8. the level of formal or informal support the respondent received from colleagues and the college support personnel	Importance of institutional support (RQ #3)

9. the degree of control the respondent had over visual design of the course presentation	Importance of control over technology's output, interface, or actions (RQ # 8)
10. the degree of control the respondent had over organization of the areas or units of the course	Importance of control over technology's output, interface, or actions (RQ # 8)
11. the degree of control the respondent had over navigation through the course pages	Importance of control over technology's output, interface, or actions (RQ # 8)

The available responses were

1. Strong counter-influence
2. Moderate counter-influence
3. No influence
4. Moderate positive influence
5. Strong positive influence

Additional questions sought data related to the influences. For example, if the influence of voluntarism was to have any meaning the level of voluntarism would be important. Thus, question 9 (first item) asked the respondents about their "level of agreement" with the statement, "My decision to use the CMS was completely voluntary." Similarly, the influence of institutional support might be affected by how the respondents rated that support. Question 10 asks for these ratings.

The issue of usefulness (relevant to the TAM) was explored through questions concerned with system features (e.g., class discussions, gradebooks, or online assessments). Questions 18 through 22 are in this group.

A detailed list of survey questions and their relationships to specific research questions is presented in Appendix B.

PROCEDURE

As described above, the survey was available to invited respondents on a web site. The responses were recorded in an MSAccess database on the web server. The downloaded data were exported to an EXCEL workbook in which data were extracted into logically grouped tables for study and analysis as well presentation. In addition, EXCEL worksheets lend themselves to easy export to SPSS. This latter application was used to calculate means and standard deviations as well as frequencies and correlations.

Data analysis occurred in two stages. Initial analysis of the statistical data from the survey was largely quantitative, and preceded the interview stage, with the analysis providing guidance for the interview. As a result of this initial analysis, two questions were added to the interview script. The following two questions were added.

1. How strongly did student response to the CMS affect the respondent's decision concerning continued use of the CMS?
2. What was the strongest influence on the respondent's decision to continue use of the CMS?

However, as a number of interviews had been conducted prior to inclusion of these questions, email messages were sent to those who were not queried on these two issues.

As noted above, many of the proposed interview questions required simple response (multiple choice or "yes/no.") to simplify recording responses. The script also contains a small number of items that allow for less restrictive responses, to provide more descriptive data to provide even more depth.

CHAPTER IV

RESULTS

FINDINGS

Blackboard was the most commonly reported CMS, but that is the result of the availability of contact persons, not an indicator of Blackboard dominance in the Ontario community college system. Four of the five selected colleges (and 26 of the respondents) use Blackboard; the fifth college (four respondents) uses WebCT. While differences between responses from users of Blackboard and users of WebCT appeared in a few instances no pattern was evident. All WebCT users were from the same institution. Thus, no conclusion could be drawn concerning the impact of the specific CMS.

Eighteen (60%) of the thirty respondents were using a CMS for at least the fifth time; the mean number of semesters of use was 4.0 (median = 5, mode = 5). Eight (27%) of the respondents reported supporting five courses with a CMS, again the highest selection provided on the survey. The mean number of courses reported was 3.2 (median = 3; mode = 3).

Twenty-one (70%) used the technology to support full-time classroom teaching for some portion of their work, while 13 (43%) used it for hybrid (reduced-classroom hours) courses; eight of these respondents also used the system for full-time classes. Nine (30%) of the respondents used a CMS for distance education classes; seven of these also supported classroom teaching with the system.

In summary, the respondents collectively represent continuing users who supported a significant number of their courses with a CMS. Most used the systems to support classroom teaching.

Table 1 summarizes the distribution of responses by college and CMS.

Table 1

Distribution of responses by college and by CMS

College	Number of Respondents	Percentage of Respondents	CMS in use	
			Blackboard	WebCT
1	4	13.3	Y	
2	8	26.7	Y	
3	9	30.0	Y	
4	5	16.7	Y	
5	4	13.3		Y
Totals	30	100.0		
		# using each CMS	26.0	4.0
		% of users for each CMS	86.7	13.3

A second round of survey invitations was issued in October, 2004, but these invitations did not attract additional respondents.

The operational questions guiding this research were the following.

1. Was each respondent's choice to adopt and implement the technology a voluntary one, and what effect, if any, did this have on the decision to continue using it?
2. To what extent was the respondents' decision concerning use of technology affected by a sense of personal technical competence?
3. Was institutional support, whether formal or otherwise, a factor in the respondent's willingness to adopt and use new technology?
4. What relationship existed between a user's experience (i.e., growing familiarity) with a technology and ongoing use of it?
5. What relationship existed between the respondent's sense of students' response to the use of technology and the decision to continue its use?
6. What was the relationship between the respondent's knowledge of pedagogy or teaching methodology and the decision to continue use of technology for teaching?
7. What criteria did the respondent identify for determining her or his decision to continue using any specific technology?
8. What relationship existed between the ease of use of technology and the user's decision to continue using it?

9. Was the user's decision to continue use of technology affected by degrees or types of control the user has over the technology's features or uses?

Primary data was sought through "influence" questions, as described in chapter 3. Appendix "C" reports the full survey influence data by college. Summarized statistics are presented in Table 2.

Table 2
Summary of Influence Factor Responses

Influence Factor	Mean	Median	Mode	Std Deviation	Minimum	Maximum
Ease of use for Document Distribution	4.30	5.0	5.0	0.88	2.0	5.0
Student Learning (*n* = 29)	4.28	4.0	4.0	0.70	3.0	5.0
Control of Course Organization	4.23	4.0	5.0	0.77	3.0	5.0
Control of Visual Design	3.93	4.0	4.0	0.90	1.0	5.0
Voluntary Use *(n* = 29*)*	3.90	4.0	4.0	0.77	3.0	5.0
Overall Institutional Support *(n* = 29*)*	3.83	4.0	4.0	0.89	1.0	5.0
Control of Course Site Navigation *(n* = 29*)*	3.79	4.0	4.0	0.94	1.0	5.0
Own Technical Competence	3.73	4.0	4.0	0.74	2.0	5.0
Fostering Discussion (*n* = 29)	3.72	4.0	4.0	0.65	3.0	5.0
Administrative Support & Procedures	3.63	4.0	4.0	0.96	1.0	5.0
Knowledge of Pedagogy & Instruction Design	3.37	3.0	3.0	0.89	2.0	5.0

n = 30*;* Scale:1 = Strong Counter-Influence to continuing use of CMS; 5 = Strong Positive Influence to continue use of CMS

Voluntariness

This study's first question asked if voluntary use influenced the faculty member's decision to continue use of the system, and this influence ranked fifth (mean value of 3.9, where 4.0 indicates moderate positive influence). Thus, the results do not point to a strong influence on the users' decision or to a strong relationship between voluntary use and continued use, at least relative to other influences studied. However, no one indicated that their own level of "voluntariness" was even a mild counter-influence, not even the seven whose use was not voluntary.

The survey sought data on whether or not the respondents' use of the technology was voluntary. The first item in Question 9 asked for level of agreement with the statement, "My decision to use the CMS was completely voluntary." The mean value returned was 3.83 (*SD*=1.5), on a five-point Likert scale. More telling, perhaps, is the fact that the modal response was a "5" --- strong agreement (14 such responses; 47%). Another nine (30%) selected "agree" as their response. In contrast, there were five "strong disagreement" responses (16.7%) and two "moderate disagreement" responses (6.7%).

Email communication with management at four of the five colleges elicited the information that only one of those four has a mandate concerning use of the college's CMS; the requirement is that all course outlines for day school must be available through the college's CMS. The other three leave use of the CMS to the faculty member's discretion. The fifth college did not respond to a request for the relevant information. This was at the institutional level, not the school or department

level. Individual deans or department chairpersons may have had different approaches on this matter.

During follow-up interviews, the respondents were asked to assign a level to the degree of coercion they felt to try using the CMS. Of the twenty people interviewed, one reported a "tiny" degree of coercion; the respondent replied "0.5" to a "yes/no" question. One other reported "yes," indicating receiving a management directive. The remaining 18 responded "no," including others at the college where the "yes" response was reported.

Effect of peers on voluntariness

The interviewees also were asked to gauge the influence of peer pressure on the decision to try and then continue use of the technology. The responses demonstrate that this was hardly a factor for continuing use. The mean value for the effect of peer pressure to try out the CMS was 2.65 (*SD*=1.67), and the effect on the decision to continue use dropped to 1.40 (*SD*=1.09) on the five-point Likert scale (1= No influence). If peer pressure can be considered a counter to voluntary decision-making, this data further indicates a general atmosphere of voluntariness.

In summary, the data show that use was, indeed, largely voluntary, but also that voluntariness was not a dominant influence on the decision to continue use of the CMS.

Technical Competence

The study's second question asked about the respondent's own perception of her or his technical competence and the consequent influence on the decision to continue using the CMS; remember that these were users who already had experience

with the system in question. Thus, it is not entirely surprising that self-efficacy ranked eighth as a positive influence with a mean value of 3.73 (*SD*=0.74); "4" meant a "moderate positive influence".

The respondents reported their agreement with the statement, "I have the technical ability to use the CMS effectively with little or no assistance." The mean value was 4.13 (*SD*=1.01) on a scale from 1 to 5 ("strong disagreement" to "strong agreement"). Only three respondents indicated any degree of disagreement with the statement.

Thus, it appears that a significant proportion of the respondents believed themselves to be sufficiently technically competent to use the system, but, as with voluntariness, this was not one of the dominant influences.

Institutional support

Support issues, too, showed a moderate positive influence on faculty users' willingness to continue use of the systems, occupying fifth and tenth positions for "overall support" and for "administrative support," respectively.

The survey did not ask the respondents to rate overall support, but (rather) broke down areas of support: technical help, support for Instructional Design issues, and administrative support. A calculation combining the ratings responses for all three categories produced a mean value of 3.88 (4 = "Good"), but the means varied widely amongst the categories:

- Mean value for rating of technical support was 4.27 (*SD*=0.83)
- Mean value for rating of administrative support was 3.80 (*SD*=0.89)
- Mean value for rating of ISD support was 3.57 (*SD*=1.27)

Four of the 13 "counter-influence" responses on the survey were for support questions. However, there was some overlap.

- Three came from one college (same respondent for two of these).
- Three of these corresponded with "poor" ratings of support
    - Two correspond with "very poor" ratings for administrative support.
    - One corresponds with a "no opinion" rating for administrative support as well as a "very poor" rating for Instructional Design support.

It appears that a correspondence exists between the user's opinion of institutional support and the influence of support issues on the decision to continue use of technology. However, the fact remains that these respondents continued to use the technology, two (of the four) for their fifth term. The lower rank of the two support influences indicates that the effect of support matters was countered by the importance of other issues.

User's Experience with the CMS

The survey data do not demonstrate that the level of "satisfaction" with the CMS increases in relationship with increasing experience with such systems, although interviews revealed a positive change between the respondents' first use and later use.

- Twenty (67%) of the thirty respondents reported being "very satisfied" with the CMS, regardless of the number of semesters the respondent had used a CMS.

- Six (20%) reported being "somewhat satisfied."
- Three (10%) described themselves as being "somewhat dissatisfied."
- One respondent did not answer this question.

These "satisfaction" ratings did not correlate with the reported number of semesters of CMS use ($r = 0.089$).

Another indicator of the effect of continuing use is the "Ratings" data gathered during interviews with 20 of the respondents, as summarized in Table 3. The respondents were asked how they may have rated the CMS during their first semester of use and how they rate it now. Fourteen of the 20 questioned were in their fourth or fifth semester of CMS use. The remaining six also reported high (4 and above on the 5-point scale) "current" ratings; there were no ratings below level "4" for the (then) "current" semester.

Table 3

Rating the CMS in first trial and in current use

Rating	Mean	S.D.	Mode
Initial	3.3	0.80	3
Later	4.6	0.48	5

(*n*=18***);*** Scale: 1 = very low rating; 5 = very high rating

Although there is no direct correlation between number of semesters of use and satisfaction (or "rating") the data demonstrate increased satisfaction after the first term of use.

Accumulated experience does not mean that the user increased the number of courses she or he was supporting with the CMS. In fact, the largest number of courses appeared for those who were in their fourth semester with the system (mean of 5.5 courses per user). The mean number of courses dropped significantly among the fifth-term users (2.8 courses). This reduction points to another area requiring study, as will be discussed in chapter 5.

This study lacked a question concerning the influence of accumulated experience on the decision to continue use of the technology. Matters such as habit, comfort, increased usefulness and ease of use, and growing dependence (both for faculty member and students) were not considered in this study.

Finally, it is clear that those who continued using a CMS were "satisfied" with the technology, as all rated it rather high. This does not say that accumulated experience does, in fact, *influence* them to continue. In addition, the reduction in the number of CMS-supported courses reported by respondents with longer experience will be discussed in chapter 5 as a subject of further research.

Students' response to the CMS

The fifth research question asked if student response to the use of Course Management Systems affected the respondent's decision to continue use of the system. Two questions concerned the respondents' perspective on the effect of using technology on their students' ability to learn the course content or concepts:

- "How well has use of the CMS contributed to your students' learning the skills and concepts in your course?" (Question 20; see Appendix A)

- How did the level of student learning in their classes influence the decision to continue use of the CMS. (Question 24; see Appendix A)

With respect to the first of these two questions the response statistics are as follows:

- Mean value = 4.0 (*SD*= 0.75) ("somewhat helpful" - scale 1 to 5)
- Median and Mode = 4

The potential effect of (the perception) of student learning was not specifically one of the research questions, but it was the second strongest influence on the decision to continue use of the CMS; the mean value was 4.28 (*SD*=0.70), where 4 = "moderate positive influence" (median and mode = 4), and is one form of student response, although perhaps not as that term might usually be interpreted.

No one reported a negative effect of the technology on student learning. In fact, 23 (76%) of the 30 respondents reported that the technology at least contributed "somewhat [to] my students' ability to learn." Further, every correspondent save one (who did not answer the related question - #13) felt that the students "like" or "strongly like" the use of the CMS in the course.

The correlation between the reported perceived contribution to student learning and the influence of the effect on student learning was 0.53. The reviewer is cautioned, however, that the sample consists only of 30 respondents, and the responses for both values are highly positively skewed.

Student learning can be seen as the major goal of an educator. In other words, if a teacher perceives that the students' ability to learn is improved or aided through use of an innovation, that teacher would likely see the new tool or method as useful.

The fact that the teacher sees the effect and relates it to the desire to continue using the innovative technology speaks to the effect of the usefulness of the system. The relationship to the Technology Acceptance Model will be discussed in Chapter 5.

The interview script was modified later in the data gathering to include two additional questions, one of which asked the respondent to rate the influence of student response to use of the CMS. Of the twelve who were asked this question seven rated it at 5 (on the 5-point scale), while five rated it 4. One additional respondent volunteered in a "further comments" portion of the interview that student demand, progress, or appreciation mattered to the faculty member.

Knowledge of pedagogy and instructional design

This factor was the last in rank of the 11 influence factors specified in the survey. Several other data items may relate to this, as well as a connection (to be discussed in Chapter 5) with one of Rogers' innovation attributes --- compatibility (Rogers, 1995). There were five "counter-influence" responses to the question on the effect of knowledge of pedagogy and instructional design --- the largest number of such responses.

Survey data indicate that institutional support for instructional design and pedagogy issues was relatively the weakest of the three support categories (mean value of 3.6, compared to 3.8 for technical support, and 4.3 for administrative support). While this area of support is rated lower than others the value is in the "good" range.

When asked to indicate whether or not they had the requisite instructional design or background (question 9, Appendix A), the mean value of the responses was

3.77 (*SD*=1.04), where 4 = "Agree" and 3 signifies that the respondent "neither agree[s] nor disagree[s]" with the statement, "I have the instructional design background required to use the CMS effectively with little or no assistance."

Agreement with a "no change in teaching" question was lower. In fact, the mean value on the disagree-or-agree scale was 2.63 (*SD*=1.19), just into the "disagreement" range.

Of course, this does not mean that the combination of instructional design and pedagogy was without positive influence; it merely was out-ranked by the other factors.

In view of the responses concerning support for instructional design (ID), as well as those concerning the need to change teaching methods, the low ranking of pedagogy and ID can be seen as a logical outcome and, perhaps, reinforcement for the perception of a need to query first-time users who did not continue use of a CMS.

Ease of use for document distribution

The greatest reported positive influence was perceived ease of use for a common task – document distribution. The mean was 4.3 (*SD*=0.88), where 4 indicated "moderate positive influence" and 5 indicated a "strong positive influence." This factor's ranking is further reinforced by both the median and modal values (5) showing "strong positive influence."

Control of course design

This area of study was subdivided into three more specific topics: control of course site organization, control of the visual design, and control of web site navigation. The results indicate differing views on the three subtopics.

Control of site organization

Control of site organization was the third-ranked influence, somewhat to the surprise of the researcher. The following may explain that surprise.

Content Management Systems historically have defined course site organization, using rigid "content areas," such as "Documents," "Communication" (e.g., asynchronous discussions, or "chat rooms"), and "Assessments." Although system designers have introduced flexibility, allowing the user to include several types of content in an "area" and allowing for re-labeling of the links to the areas, the old definitions of "content areas" are the default cases.

The data did not capture the reasons for some influences, and this, unfortunately, is one of them. The mean value for responses to this question was 4.23 (SD=0.77), where 4 indicates a "moderate positive influence."

Control of site visual design

Similarly surprising is the fourth-place ranking of site visual design, as this also is largely under the control of the technology. It is true that limited visual control is facilitated through menu and link "buttons." One can surmise, as well, that the limited control actually provides a better sense of control as little design sense and little technical knowledge are required to develop a visual identity for one's course. The mean value for responses to this question was 3.93 (SD=0.90), just below the level of "moderate positive influence."

Control of site navigation

This item, however, was not seen as a strong positive influence to the population sample. The mean value of the responses was 3.79 (SD=0.94), somewhat (though not seriously) below the level of "moderate positive influence."

Identification of respondents' main criteria for choice

Interviews revealed further data on "What was the strongest influence on the respondent's decision to continue use of the CMS." No single factor dominated the responses. Twenty subjects were interviewed.

Student response (seven interviews) and ease of use and convenience (five interviews) were the most frequent answers given. The ability to "tailor the course more close [sic] to what happened in class" also was reported; the respondent reported being able to use the CMS site to adjust to advances or delays in classroom delivery or discussion by posting material "at the last minute," so as to make up for delays, avoid duplication of material covered in the classroom, or appropriately supplement the classroom presentation and discussion. Another reported that using technology forced tighter course and personal organization, a comment the researcher has heard in personal conversation, as well. In both cases this was seen as positive. There was one comment about the technology being a "wonderful support tool for supporting/supplementing student learning." Other responses mentioned student access to their grades.

Communication Tools

The survey explored possible influences from one other aspect of the technology under consideration. The survey question referred specifically to fostering

discussion, which may have led respondents to believe that the question referred strictly to a "discussion board." The influence ranked ninth, along with the effect of "administrative support" --- one place above the last influence factor. The mean value of the responses was 3.72 (SD=0.65), nearly on the same level of the influence of one's own technical competence.

SUMMARY

Survey response data show that all 11 of the items studied provided some degree of positive influence on users' decision to continue use of the technology in question, based on mean values of the responses. These means ranged from 3.37 to 4.30, with 3 indicating "no influence" and 5 indicating a "strong positive influence." The fact that there were only 13 "counter-influence" responses reinforces the notion of the generally positive influence of these factors.

When the influences were ranked by the calculated means three of them stood out:

1. ease of use of document distribution
2. perceived effect of using the CMS on student learning
3. user's control over site design.

The means for two of these three were quite close (4.30 and 4.28) and the mean for the third was 4.23; the standard deviations were 0.88, 1.25, and 0.77, respectively. These influences were the only ones with means indicating a degree of "positive influence."

Pedagogy and instructional design issues as well as institutional support were indicated as possible counter-influences, in that their rankings as positive influences

were low and they were given a significant proportion of the admittedly low number of "counter-influence" indications --- five of the thirteen. As well, related survey data point to correlations between users' experiences and the low rankings.

The potential significance of negative (or "counter") influences is illustrated by the following. In the winter (January through May), 2005, semester 163 of the 265 faculty users at one college were repeat users. However, 140 at the same college did not move past first-time use of the CMS. One of this study's major delimiters was the qualification that the respondents would be current CMS users. While this enabled the researcher to gather data concerning why users went beyond implementation, nothing was learned about why others discontinued using the systems and the relationships, if any, to the models that form the basis for the study. As noted previously, this is a matter for further research and will be discussed in chapter 5.

There were only 13 "counter influences" indications out of 330 possible responses for the influence factors (30 respondents, 11 questions).

- As was noted above, five of the 13 "counter-influence" responses concerned the influence of knowledge of pedagogy and ID.
- One person reported "[S]trong counter influence[s]" for "control of visual design" and "control of site navigation."
- There were four "[S]trong counter influence" responses for support issues, but there was some overlap because there were two support-related questions.
- There were five "no answer" responses and three of these came from the same party who reported "strong counter-influence" for site visual

design and site navigation. The three factors not reported by the respondent were “effect on student learning,” “use of communication tools,” and “effect of voluntarism.”

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

REVIEW OF STATEMENT OF PURPOSE

The primary purpose of this study was an analysis of the diffusion (or acceptance) of information technology, at the transition from implementation to "routinization" (Rogers, 1995; Saga & Zmud, 1994).

BASIC RESEARCH QUESTION

To achieve this purpose this study sought responses from post secondary education teachers concerning influences on their decisions to continue use of complex computer technology. The operational questions related to use of course management systems in the community college system of the Canadian province of Ontario.

RELATIONSHIP TO EXISTING RESEARCH

The research material located in the course of this study concerned the following matters:

- Satisfaction among faculty users (e.g., the SUNY and UW studies).
- Studies concerning technological innovation in education and the relationship between data and existing models describing innovation or technological change.
- Studies of changes in education practice, usually related to adoption decisions or implementation, and usually dealing with the broad

questions of the process of change rather than adoption or acceptance of specific practices, methods, or policies.

- Models describing innovation diffusion or acceptance of change, in general (i.e., not specifically in education).

The surveys of user satisfaction provide empirical data but the data were not related to theory or models in the studies reviewed. On occasion, the results from one study contradicted those of another (e.g., the role of student contact). Results were not fixed to a model that could be replicated.

Two findings in one of the "satisfaction" studies (Morgan, 2003) corresponded to those of the current one: control of the course site and difficulty. The Morgan study dealt with use of the Blackboard CMS. In addition, the Morgan study identified the need for training, as did Surendra's (2001).

Researchers such as Kerres (1995) and Fullan (2001) suggested that the process of change, not simply the content of a proposed innovation, is a matter of importance, though the former also cautioned against a complete separation of process from social context. Two streams of research provide research bases for such consideration: "Diffusion of innovations" (Rogers, 1971, 1983, 1995) and the Technology Acceptance Model (Davis, 1989).

Among the few theory or research model studies found on introducing technology change in education were those by Tetiwat and Huff (2002), Surendra (2001), and Murphrey, Pesl, and Dooley (2000). However, this last simply is a "Strengths, Weaknesses, Opportunities, Threats" (S.W.O.T.) study based loosely on a discussion of diffusion of innovations research.

There does not seem to be a large body of research relating theory or mdels to innovation diffusion or acceptance in education. However, a great deal of research related to diffusion of innovations and to the TAM includes empirical research in business organizations.

This study is in the family of those such as Tetiwat and Huff (2002) and Surendra (2001) --- relating innovation research models to educational settings.

Tetiwat and Huff (2002) and Surendra (2001) studied adoption, although they considered the term differently (decision to use vs actual initial use, or implementation).

Tetiwat and Huff (2002) found the following as major factors contributing to adoption.

1. access to technology (convenient to use)
2. compatibility (suitability to subject, teaching style, and work, as well as suitable to students' learning)
3. availability of technology (infrastructure, all required functions, quality of the equipment)
4. relative advantage (enhancing of image, output quality, result demonstrability)
5. student demand

The relationship of these to the results of the current study is not readily apparent, except for "relative advantage." In fact, the fifth finding is contradicted in the current data. None of this study's subjects indicated that student demand

influenced their decisions to adopt or continue use, although student response to use of the systems was positively reported.

Compatibility, too, was not a factor indicated in this study's data.

While Tetiwat and Huff's (2002) factors 1 and 3 might contribute to "ease of use," they do not correspond with this study's questions on that matter.

There are distinctions between the Tetiwat and Huff (2002) study and this one. Of their 32 respondents, 10 were management and administrative personnel, not teachers. In addition, their research was on the question of adoption. The current study focused on solely faculty users and their decisions to continue use of a technology system.

Nonetheless, the differences cited above relate, to some degree, to differences between the current study and innovation attributes identified by Rogers (1995), and bear further consideration. For example, this study's working definition of "ease of use" is quite limited, concerning, as it does, a single feature of a specific technology. The respondents, like the author, may have taken such factors as access and availability to technology for granted.

Similarly, the current study assumed a very narrow definition for "compatibility." This, too, may require adjustment for further research.

Surendra's study related more closely with this one. While the research also had administrators as subjects in addition to educators, the question dealt with actual use, although the term "adoption" was used. In addition, the population closely resembled the one in this study, although it was limited to one college; the technology

studied was not a CMS, but, rather, web technology in general. Major points in Surendra's findings were the following, quoted from chapter 2.

There were four very important "primary" (intrinsic) attributes:

1. access to information (mainly training)
2. efficiency
3. trialability
4. community pressure/support/apathy/opposition

Of the possible "secondary" (benefit-related) attributes the following three were prominent.

1. association with teaching
2. relative advantage
3. complexity/ease of use

While Surendra studied adoption (which includes implementation, in that research) this study relates to continued use. Yet, there are some identical findings. In fact, Surendra's "secondary" findings match those of this study quite closely, and (it is argued here) Surendra's first "primary" finding --- training --- is a contributor to ease of use, though, it is acknowledged, not as "ease of use" was queried in this study. In chapter 2 it was noted that Surendra emphasized the importance of training as a factor contributing to adoption (S. Surendra, personal communication, January 9, 2005).

The current study is concerned with a later phase in the diffusion or acceptance process --- continuing use. The study also brings another model (TAM) into consideration, in addition to the Diffusion of Innovations model.

The 140 teachers who did not make the transition from implementation to ongoing use indicate a need for studying this transition further, as will be discussed below.

However, the data for this study do demonstrate a relationship between continuing use and the two main characteristics of the Technology Acceptance Model (Davis, 1989) --- perceived usefulness and perceived ease of use. The data also demonstrate a relationship between continuing use and two of the innovation attributes described by Rogers (1995). Like the research by Tetiwat and Huff (2002) and Surendra (2001), this study demonstrates that research models provide means for relating user populations ---"social systems," in Rogers' (1995) terms --- to use of innovative technology in academic environments. Furthermore, use of these models appears to be appropriate to research at later stages of that diffusion or acceptance process. Finally, the more parsimonious model --- the TAM --- appears to be quite relevant to such research.

In a related line, Venkatesh (2000) identified three "adjustments" that would affect continuation of acceptance: objective usability, perceptions of external control, and enjoyment. The first of these corresponds with the results of this study. The second may be implied in the small influence of voluntariness found herein. The third, however, was not an issue in this study.

DISCUSSION OF RESULTS IN RELATION TO MODELS

The specific influences studied herein are particular to one technology, but the results provide guidance for the application and interpretation of research models related to technologies in education settings.

In that vein, the high rank of two factors in this study --- usefulness (contribution to learning) and perceived ease of use --- demonstrate a need for further consideration of the Technical Acceptance Model (TAM; Davis, 1989) for studying technology acceptance in education organizations, much as it has been studied in businesses. The simplicity of the model also is attractive, of course.

The application of the TAM requires defining "ease of use" and "usefulness" in each circumstance in which innovative technology is being considered.

In the present case, the subjects were asked specifically about "ease of use" for one feature of the technology. This leaves unanswered the question of generalized "ease of use" for the system as a whole, as was noted with respect to the Tetiwat and Huff (2002) results. In addition, the working environment may contribute to (or detract from) the ease with which an individual uses technology.

Intuitively, one might assume that an individual's own technical competence would affect the ease of use of a technology system. However, that perception was ranked eighth as an influence. It is possible that the users found the system was so easy to use that technical competence was a non-issue. It also is important to recall that these respondents were repeat users, not faculty members being asked to try a new system. Thus, self-efficacy with respect to computer technology might not have been relevant to them. Acquired familiarity with the system's requirements and

techniques might have overridden, or even negated, any personal sense of technical incompetence.

While these last two issues --- generalized IT systems use and the effects of the larger work environment --- remain unresolved, easy use of the system's features was clearly demonstrated.

This study equates "contributing to student learning" to "usefulness." The data demonstrate a strong positive influence by this "contribution" on users' decisions to continue use of the technology, providing a good indication that the Technology Acceptance Model is appropriate in the field of education as well as in business.

There are other possible perspectives on "usefulness," and the survey approached this issue by asking respondents to rate the "helpfulness" of a number of CMS features:

- document distribution
- calendar and announcements (i.e., communicating events and changes to students)
- online assessments
- online gradebook
- communication tools, i.e., chat, discussion boards, "whiteboard," email

The data are summarized in Table 4, and point to users finding at least some portions of the technology "helpful," if not explicitly "useful."

In each case the respondent was asked to indicate from a teaching perspective how the feature "…help[ed] you in this course." Overall, 118 (79%) of the 150 responses (30 people answering five questions) demonstrated that the listed features

were at least “somewhat helpful”; in fact, the mode for every category except online assessments was 5 --- “very helpful,” even when those who did not use some specific feature were included. The mean for all 30 respondents and all categories was 3.93 (SD=1.50).. The mean rose to 4.60 (SD=0.58) when the calculations only included actual users of the features.

One conclusion drawn here is that the technology provides “useful” features for the user’s primary purpose --- student learning; i.e., usefulness is, indeed, an aspect of the user’s experience and is quite important in determining whether or not a person will make use of a system beyond the trial period.

At least two questions are unanswered. The more obvious one is why some respondents chose not to use various features of the system. The less obvious one is what would the respondents have defined as “usefulness?” This study is based on the researcher’s interpretation --- usefulness defined as “contribution to student learning.”

Table 4

Helpfulness of commonly-used CMS features (actual users only)

Technology feature	Mean	Median	Mode	Standard Deviation	Minimum Value	Maximum Value
Gradebook (*n*=26)	4.85	5.0	5.0	0.37	4	5
Document Distribution (*n*=28)	4.64	5.0	5.0	0.56	3	5
Communication tools (*n*=27)	4.48	5.0	5.0	0.58	4	5
Calendar and announcements (*n*=24)	4.48	5.0	5.0	0.49	4	5
Student assessment tools online (*n*=17)	4.29	4.0	5	0.85	2	5

Scale: 2 = *"hindrance more than help*; 3 = *"Neither hindrance nor help"; 5 =* "*very helpful"*

The argument is made here that these data reinforce the "usefulness" findings presented by the explicit question on contribution to student learning. However, there are no data clearly demonstrating that the usefulness of these features influenced the respondents' decisions to continue use of the technology.

In summary, there are limited data pointing to the TAM (Davis, 1989) as a workable and appropriate model for consideration of technology innovation in an academic environment.

The "diffusion of innovations" model, too, is an issue in this study. Among other factors (user characteristics, communication, time; Rogers, 1995) identified five innovation attributes. These are repeated here to guide the discussion on relating the study data to the "diffusion of innovations" model.

1. "*Relative advantage*" is a measure of the improvement an adopter would see in her or his quality of work, efficiency, or ease of doing a task.
2. "*Compatibility*" is a measure of how consistent the innovation appears to be with an adopter's beliefs or means of working.
3. "*Observability*" is a measure of how visible the innovation or its results are to an adopter's peers. It should be noted, here, that this has been confused with "observability" of the innovator. Moore and Benbasat (1991) distinguished between "observability" and "image".
4. *Complexity* concerns how difficult use or acceptance of the innovation is perceived to be.

5. *Trialability* is an indication of the possibility that the new user can try out the innovation without commitment.

Moore and Benbasat (1991) equated "relative advantage" to usefulness. The data presented in Table 4 point to "relative advantage" as an attribute of importance in the education setting.

Additional data on "relative advantage" was obtained through use of the following three questions.

1. How has use of the CMS affected document distribution when compared with not using the CMS?
2. How well has use of the CMS contributed to your students' learning the skills and concepts in your course? (This item also was reported earlier.)
3. How has use of the CMS affected discussion in your course, both online and in the classroom?

For all three of these questions the respondents (collectively) reported some degree of improvement, or "relative advantages," in their classes ---the highest rating being given to document distribution (for which "ease of use" also was highly rated as an influence), supporting the applicability of "relative advantage" to the technology and environment. It is notable that there were no negative responses to these questions.

The responses are summarized in Table 5.

Table 5

Relative Advantage – "Contribution of CMS" to teacher's work

CMS Contribution to	Mean	Median	Mode	Standard Deviation	Minimum Value	Maximum Value
Document delivery (*n* = 27)	4.52	5	5	0.70	3	5
Student learning ***(n*=26*)***	4.00	4	4	0.75	3	5
Class discussion *(n*=28*)*	3.54	3	3	0.69	3	5

Scale: 1 = significant decline; 3 = no effect; 5 = significant improvement

"Compatibility" is described by Rogers (1995) as "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (p. 224). For this study, this was measured by the degree to which the respondent had to change how she or he teaches. The argument is that an educator's ways of teaching constitute a set of core values one brings to the work.

The response to the specific question --- ""In the beginning I used the CMS because I did not have to change the way I teach." --- was slightly to the side of "disagree," with a mean value of 2.63 (*SD*=1.19), where 1 represented "strong disagreement," 3 meant "neither agreement nor disagreement," and 5 meant "strong agreement." This study's sample did not consider compatibility important, at least as it is defined by the question.

These were continuing users; this may have been a factor in the reduced importance of compatibility as it is defined in this study. The users possibly were past the point of requiring that no change occur.

"Observability" (Rogers, 1995) refers to one's use of an innovation being seen by others. In this study, this attribute was studied "in reverse." Respondents were asked in follow-up interviews to score the influence of peer usage on the decision to try and then to continue use of a CMS; i.e., the effect of observing *others'* use of the innovation.

The mean value for peer usage influence on the decision to try using the CMS was 2.68 (*SD*=1.67), on a scale of 1 (no influence) to 5 (very strong influence). The mean value for peer usage influence on the decision to continue using the CMS was 2.30 (*SD*=1.65). Ten of the respondents changed their reported level of influence

between the trial and continuation stages. While the mean values are just above the mid-point on the scale, they suggest a small effect of peer observation.

Responses to another survey question discounts this "reverse" observability, as well. The respondents were asked to report their "*primary* [emphasis original] motivator to use the CMS" (Appendix A, question 8). Only 3 (10%) answered that their "students asked for it;" while one reported that a colleague's suggestion was the motivating force. The remainder responded that they followed their "own interest in course management systems or technological innovation" (25, or 83%) or a "management directive (1).

The relationship between continuing use and "observability" was not clearly demonstrated.

Another meaning may be drawn from the "primary motivator" responses; the greater proportion of these respondents may be early adopters, and some did so identify themselves in comments.

"Complexity" is the reverse of "ease of use," discussed above, and shown there to be a serious consideration for the study sample.

This study did not identify "trialability" as a matter of concern. Further, no one volunteered any information on this matter. Therefore, no conclusion is available on the matter. One fact that can be put forward is that nothing the user does in a CMS is visible to the user's students or peers until the user sets an "availability" parameter. Trialability is a component of the technology. However, there is no data on this topic. Further, these are continuing users, not those at the adoption decision stage; they already have tried and accepted the technology.

Was "trialability" a hidden factor? Some of those 140 teachers at one college who did not continue use "tried" the system and chose not to keep using it.

In summary, the results related to Rogers' innovation attributes are mixed, with "relative advantage," "complexity," showing relevance, while the data on compatibility are negative and data on trialabilty are lacking. The relationship of "observability" with continuing use is not clear.

This survey did not explicitly question the subjects on champions or communication channels. There is some hint at the latter of these, in the "peer usage" data, but more direct questioning on this matter is required.

The findings for voluntarism are in line with previous studies (Agarwal, & Prasad, 1997, Cooper & Battacherjee, 2001), although the two studies mentioned approached the question differently. The former study (Agarwal and Prasad) included voluntary adoption as a possible innovation characteristic, while Cooper and Battercherjee considered the effect of an organization mandate as spread by "incentives and control." Both studies found that voluntarism had little effect on initial and continuing adoption of innovations. This relates closely to Ajzen's (1988) discussion of "social norms" if the "social group" is the employment environment, and to Venatesh's (2000) inclusion of "external controls" as one aspect of perceived ease of use.

In summary, the sample was quite small (30). Nonetheless, the data demonstrate positive value in using the Technology Acceptance Model (Davis, 1989) when considering the introduction of technology into an academic setting. The two major criteria in the TAM --- usefulness and ease of use --- rated well within the

"positive influence" range, and were the two top influences reported. Further, the very parsimony of the TAM makes it a very practical instrument for the study of new technology.

Coincidence between the data and the "diffusion of innovations" model was not so clearly demonstrated; however, this study concerns ongoing use, not adoption (reaching the decision to try an innovation). The data do demonstrate the relevance of some innovation attributes (complexity and relative advantage), and the data on observability are contradictory.

RECOMMENDATIONS FOR PRACTICE

The results of this study can provide guidance to those involved in introducing technology tools into a post-secondary education environment; the limitation is stated in recognition of the fact that this study only concerned the specific environment.

The need to consider innovations prior to investments is easily explained. Technology can be extremely costly in terms of funds for hardware, software, infrastructure, and support, as well as time and effort required for implementation and ongoing use. In addition, allocation of these resources to new systems often means diverting resources from other (often ongoing) systems, sometimes to the detriment of the performance of these systems.

Further, implementation of inappropriate technologies can have serious implications for budgets, the reputation of the institution, the trust of those who actually deliver courses, and the trust and the academic progress of the students.

"Usefulness" is a primary belief that can persuade users to accept new technology, with ease of use a major contributing factor, too. The question for

managers and technology administrators is the definition of "useful." The truly important matter is the perspective from which that attribute is seen.

The obvious statement is that the technology has to be viewed from the users' perspective. The not-so-obvious second half of the statement is that the view should not be solely the manager's, or the technologist's. The user, in this discussion, is the teacher. The research demonstrates that a key measure is the potential a system has for contributing to the teaching-learning exchange; i.e., the degree to which the new tool will promote students' academic progress. Alternatively or additionally, there may be a case for suggesting that innovative technology should provide administrative or course management aid to that teacher (e.g., improved and easier record keeping, or simplified and improved content preparation and presentation, or distinct enhancement of student-student and student-teacher interaction). This is a matter for further study.

The study demonstrates that voluntarism is not an important factor, thus opening a door to imposition of new systems. However, care is needed to assure that the potential adopters are willing and able to use the innovative technologies. The question of usefulness has just been discussed. The other major issue raised in the TAM is ease of use. This study found that I.T. self-efficacy was not a major influence for or against use of the system under study, *for continuing users*. There still remain several possible implications, and one is that the system, itself, must provide that ease of use.

There also is utility in pointing out Surendra's (2001) and Morgan's (2003) finding concerning the importance of training. In addition, one aspect of the sample

that has not been discussed is the significant number of long-term users involved: the mean number of semesters of use was 4.0; 17 (57%) of the respondents were in their fifth semester of using a CMS. As mentioned previously, self-efficacy in I.T. use might not be a factor for these veterans.

The implication for ongoing use is that familiarity with the specific system may "trump" general technical competence and confidence, but one cannot assume this to be true for those considering (by choice or mandate) use of a new systems or the move beyond one's own first trial.

Trust in an institution's technology infrastructure also may play a part; if the users do not believe the system (e.g., the institution's computer networks) can support their work reliably they will discount "ease of use," in fact if not in words. In a presentation on use of Blackboard at Centennial College, Michael Evans, the Director, Academic Technology and IT Business Planning at the college, pointed out that one probable cause of the successful diffusion of Blackboard use was trust in the firm foundation provided by the college's I.T. infrastructure (Evans & Kane, 2003). The Tetiwat and Huff (2002) study points to this issue, as well.

Institutional support should be an important consideration. This study's conclusions on the issue are not clear, but indicate a connection between the perception of support quality and the influence (positive or negative) on decisions to continue using a system. The reviewer may recall that support issues ranked low as "positive influences" (even garnering "counter-influence" responses) and support was not consistently highly rated.

Finally, potential adopters may not see the utility or simplicity of a system without the opportunity to try it out. This study did not probe this matter, nor was it expressed as an issue voluntarily. However, this study dealt with ongoing use, not adoption, so the matter was not judged to be important. Rogers' (1983, 1995) "trialability" may prove to be more important at the adoption stage, or the point at which a user decides to continue past a first trial; technology in teaching is a highly visible phenomenon.

Faculty technology enthusiasts, too, must keep these points (true usefulness and true ease of use) in mind as they attempt to persuade colleagues to join them in use of new systems. Systems that serve one person well may not be useful for others. It may be important to point out here that "ease of use" is seen by Davis (1989) as a precursor to usefulness.

Bates (2000) provides many cautions concerning (what he terms) the "Lone Ranger" approach. These cautions include the need for institutional support systems. The technically sophisticated faculty members may find their own (and others') enthusiasm fading as extra work required to maintain or use systems continues without their institution's support. The individual enthusiast who recruits colleagues to use a piece of technology may find herself or himself carrying the support burden.

The individual teacher, too, will reach some choice on her or his use of new technology, even where it appears that no choice is given. After all, that teacher can choose how thoroughly the system will be used.

Usefulness and ease of use may not be readily evident to a potential or new user, and only can be seen through actual work. As stated above, trialability (Rogers,

1995) could be a factor at the adoption stage and the implementation stage and at the "confirmation" (Rogers, 1995) stage. In the final analysis, the user decides what is useful, and how easy it is to use a system. Other "experts" cannot truly make that decision for the potential user. The teacher also should be aware that accumulated experience may make use of a particular system easier than it seemed at implementation, as well as open up new ways for using it.

RECOMMENDATIONS FOR FUTURE RESEARCH

Two major influences were indicated by the results: the faculty members' perceptions that use of technology in an educational setting aided student learning ("usefulness"), and the technology made at least one major task easy ("perceived ease of use").

However, there is the question, raised above, concerning decisions made by a significant number of faculty members at Centennial College to discontinue use of the CMS. It is these people who may have reported "counter influences," had they been asked.

In addition, the data show a decline in the number of courses supported by those with longer experience with CMSs. Is this a repeating phenomenon? If so, what are its causes?

The Tetiwat and Huff (2002) findings, and gaps in the relationship between this study and the "diffusion of innovations" model (Rogers, 1995), also indicate a need for expansion of the "ease of use" research.

As the four preceding points illustrate, greater depth and breadth of research are required to develop a better understanding of potential relationship between the two models (innovation diffusion and TAM) and use of technology for education.

Rogers' (1983, 1995) discussion of champions and communication channels requires further study. Did one college's decision to use a faculty member as CMS coordinator affect other teacher's decisions to try, and then continue to use, a CMS? There is nothing in the survey or interview that provides any information on this issue.

Earlier statements described the importance of implementation --- initial use. Kerres (1995), Reigeluth (1983), and Fullan (2001) were cited above for their arguments about the importance of the implementation phase. This study concerns ongoing use. It assumes that the proverbial horse was brought to the water! The question of how to get the beast there even after she or he makes the decision to go remains open; i.e., the issue of implementation requires further study. Davis' (1989) TAM chain of events leads to behavioural intention [emphasis supplied]. Intention does not equal action.

Davis' (1989) work was based on Ajzen's (1988) Theory of Reasoned Action. Ajzen defined attitude as "the individual's positive or negative evaluation of performing the particular behavior of interest" (p.118). The distinction that Ajzen (1988) and Davis (1989) made between behavioral intention [emphasis supplied] and action was the possibility of unforeseen events, e.g., a long lapse of time between developing the intention and the opportunity to take action, or administrative prohibitions, or greater than anticipated workload.

For educators, another question exists --- one totally non-technological in nature. Does the technology govern the goals and content in the educational setting? Stated more specifically, the question becomes, "Does the technology control the course content and teacher-student interactions to such an extent that the tools govern what is taught?"

For example, one issue with CMSs is their design --- the separation of content types and activities in specialized "areas" in which educators place elements of their courses. Although some products now make renaming and re-organizing the "areas" possible, CMSs default to content type and activity areas (e.g., "virtual classrooms" for chat).

Further complicating this issue is marketing by large publishers of digital content designed to fit specific technology products. The effect of this phenomenon on pedagogy and content is an open question. Convenience ("ease of use") may limit usefulness, in contradiction to the TAM, if the content source, not the institution, and not the teacher, determines the course content and even sequence.

On the other hand, as noted in the results from the SUNY (Fredericksen, Pickett, & Shea, 2000) and University of Florida (Hartman, Dziuban, & Moskal, 2000) studies, templates gave the institutions and the teachers consistency and reduced workload in course setup, which led to greater user (teacher) satisfaction. The fact still remains that neither study reflected student satisfaction or actual contribution to the students' learning.

SUMMARY OF RESPONSES TO RESEARCH QUESTIONS

The questions for this study were posed in the order in which the author believed they would rank in importance. The data produced quite different conclusions. "Voluntarism," perceptions of one's own technical competence, and official institutional support --- the first three research questions --- ranked relatively low in the set of specified influences on continued use of the technology. Thus, one can cautiously state that these three factors do not exert serious influence on decisions to continue use of technology. Use generally was voluntary, and most users felt they were appropriately competent.

The same cannot be said concerning institutional support. Support ratings were not strong. The indication is that support may have had some influence on user acceptance of new technology.

Quite clearly, student response, operationalized as perceptions of student learning, and categorized as usefulness, was seen as a serious positive influence. From this flow the earlier statements in support of the TAM as a model for evaluating (and promoting?) innovative technologies in post-secondary education. "Usefulness" itself could have been more thoroughly explored, though, as described in the "Recommendations for Practice," earlier in this chapter.

The relationship of instructional design (ID) and pedagogy to ongoing use of technology was not clear. While the results showed the combination to have relatively little (but still positive) influence, the data also showed contradictions in the background. While a majority of respondents declared that they had sufficient ID

knowledge, the mean response on that item was much closer to "neither agree nor disagree." ID support rated the poorest of the three support areas, too.

Ease of use clearly is a strong influence to continue using technology. Admittedly, this was measured for only one feature of the system in question. Thus, any further research on this study's subject should apply "ease of use" to the system as a whole, in addition to its application to specific aspects of the technology. Nonetheless, the strength shown for the influence of this item is a matter of importance, especially in light of its relationship to the TAM.

Control issues (site design and site organization) also were strong positive influences, at least relative to those included in this study. Possible reasons for the influence of these matters remain a subject for further study.

Finally, (as noted earlier) when respondents were presented with an open question concerning the strongest influence in their decisions to continue using a CMS, the results echoed the survey: usefulness (student response) and ease of use were the most common answers.

Issues related to Rogers' "diffusion of innovations" model remain unresolved in relation to technology in the environment studied. Rogers' (1983, 1995) work is too well established to be dismissed as easily as the data seem to indicate. The relationship of the innovation attributes and the transition to continued use may prove to be stronger than seen here. "Champions" and communication channels were not even mentioned. Rogers (1995) identified the stage after implementation as "confirmation," including within that stage the possibility of reversing an implementation decision; the experience --- end-of-use by 140 teachers --- at one

college clearly illustrates that phenomenon. This study concludes with another matter raised by Rogers (1995) --- the bias towards innovation. Evaluating innovative technology should mean making the choice either to promote it or to reject it.

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APPENDIX A – SURVEY QUESTIONS

The actual online form may be viewed at
http://www.tomkane.ca/survey/survey_form.htm

As this survey was conducted solely among faculties of Ontario Community Colleges the term "professor" unambiguously refers to these personnel.

1. Which course management system ("CMS") are you using?	Blackboard	Desire2Learn	FirstClass	WebCT	other
2. In which of the following areas are you using the CMS? (*Select all that apply.*)	Full-time diploma or apprenticeship program	Certificate program	Continuing Education courses (not certificate program)	Post-diploma	Inter-Institutional or Joint programme
3. Indicate the mode in which you are using the CMS. (*Select all that apply.*)	Solely distance education	Hybrid (reduced classroom hours plus online study)	Support for traditional classroom-based course	Other	
4. Does your college automatically create a course on the CMS for every college course section?	Yes	No	I don't know.		
5. If your answer to 4 above is "Yes" select the option to the right that most closely fits the situation at your college.	A professor is free to use or ignore her or his courses on the CMS.	Every course must contain some college-defined minimum content (e.g., course outline)	The course must be used if the students so desire.	Every course must be used actively throughout the semester.	

6 How many semesters have you used the CMS, including the current one?	1	2	3	4	more than 4
7 How many course sections are you teaching with the CMS this semester?	1	2	3	4	more than 4
8. Which of the six selections to the right is or most closely matches your *primary* motivator to use the CMS?	My own interest in course management systems or technological innovation	My students asked for it.	Colleague(s)' suggestion	Strong pressure from colleague(s); e.g., from coordinator or course leader.	Incentive program
	Management directive				

9. Please indicate your level of agreement or disagreement with the following statements.

"My decision to use the CMS was completely voluntary."	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
"I have the technical ability to use the CMS effectively with little or no assistance."	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
"I have the instructional design background required to use the CMS effectively with little or no assistance."	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree

"In the beginning I used the CMS because I did not have to change the way I teach."	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree

10. Please rate your college's support for the CMS and its users.

Rate your college's technical support for the CMS and its users.	Very poor	Poor	No opinion	Good	Excellent
Rate your college's instructional design support for CMS users.	Very poor	Poor	No opinion	Good	Excellent
Rate your college's administrative support for CMS users.	Very poor	Poor	No opinion	Good	Excellent
11. Please indicate the degree of help you get from colleagues for use of the CMS.	Never needed nor asked for any help from colleagues	None	Little	Some	Quite a lot
12. Who helped you when you needed assistance or guidance concerning course design? *Select all that apply.*	No one	teaching colleague(s)	college resources	other, not in my college	
13. Please indicate how most of your students rate use of the CMS.	Strongly dislike it	Dislike it	Generally neutral	Like it	Strongly like it

14. Please indicate the level of student use of the CMS portion of your classes.	Very low	Low	Moderate	High	Very high
15. Please indicate your students' expressed opinion of use of the CMS in other professors' classes	none expressed Strongly like it	Strongly dislike it	Dislike it	Generally neutral	Like it
16. How much formal training have you had in online teaching course design or methodology?	None	One or two isolated courses or workshops	Courses within a larger program	Completed a certificate, diploma or degree in the area of online instruction.	
17. How has use of the CMS affected your workload?	Seriously increased the amount of work I do for the course	Somewhat increased the amount of work I do for the course	No effect on my workload	Somewhat decreased the amount of work I do for the course	Seriously decreased the amount of work I do for the course
18. How has use of the CMS affected discussion in your course, both online and in the classroom?	class discussion has decreased significantly.	class discussion has decreased somewhat.	No effect on class discussion	Class discussion has increased somewhat	Class discussion has increased significantly
19. How has use of the CMS affected document distribution when compared with not using the CMS?	Document distribution now is seriously hampered.	Document distribution now is somewhat hampered.	No effect on Document distribution	Document distribution now is somewhat better than it was without use of the CMS.	Document distribution now is significantly better than it was without use of the CMS

20. How well has use of the CMS contributed to your students' learning the skills and concepts in your course?	Use of the CMS has seriously hampered my students' ability to learn.	Use of the CMS has somewhat hampered my students' ability to learn.	Use of the CMS has neither hampered nor helped my students' ability to learn.	Use of the CMS has somewhat helped my students' ability to learn.	Use of the CMS has significantly helped my students' ability to learn.
21. Please indicate your level of satisfaction with the CMS	Very dissatisfied	Somewhat dissatisfied	Neither dissatisfied nor satisfied	Somewhat satisfied	Very satisfied

22. Please rate the course management system's features from the teaching perspective. The default answer is that you didn't use the specific feature in your course.

How well did uploading documents (e.g., handouts, PowerPoint™, assignment handouts, admin documents) help you in this course?	did not use this	hindrance more than help	not at all helpful	somewhat helpful	very helpful
How well did calendar and announcements features help you in this course?	did not use this	hindrance more than help	not very helpful	somewhat helpful	very helpful
How much did online quizzes and tests help you in this course?	did not use this	hindrance more than help	not very helpful	somewhat helpful	very helpful
How well did an online gradebook help you in this course?	did not use this	hindrance more than help	not very helpful	somewhat helpful	very helpful

How well did communication tools (discussion board, chat, online whiteboard, email) help you in this course?	did not use this	hindrance more than help	not very helpful	somewhat helpful	very helpful
23a. What other feature of the CMS requires a rating?					
23b. How would you rate this other feature?	didn't use this	hindrance more than help	not very helpful	somewhat helpful	very helpful

24. For each of the items identified below please indicate how the item influenced your decision to continue using the Course Management System (CMS). In each case where a "degree" or "level" of an item is discussed use your personal experience, not a theoretically positive experience.

level of student learning in your classes	Strong counter-influence	Moderate counter-influence	No influence	Moderate influence	Strong influence
degree of voluntary choice in your deciding to use the CMS	Strong counter-influence	Moderate counter-influence	No influence	Moderate influence	Strong influence
degree of ease in using the CMS for document distribution	Strong counter-influence	Moderate counter-influence	No influence	Moderate influence	Strong influence
the CMS' tools for fostering discussion	Strong counter-influence	Moderate counter-influence	No influence	Moderate influence	Strong influence
the level of technical competence required (or not required, as the case may be).	Strong counter-influence	Moderate counter-influence	No influence	Moderate influence	Strong influence

the level of pedagogical or instructional design knowledge needed (or not needed)	Strong counter-influence	Moderate counter-influence	No influence	Moderate influence	Strong influence
the level of your college's CMS administrative procedures and support	Strong counter-influence	Moderate counter-influence	No influence	Moderate influence	Strong influence
the level of formal or informal support you received from colleagues and the college support personnel	Strong counter-influence	Moderate counter-influence	No influence	Moderate influence	Strong influence
the degree of control you had over visual design of the course presentation	Strong counter-influence	Moderate counter-influence	No influence	Moderate influence	Strong influence
the degree of control you had over organization of the areas or units of the course.	Strong counter-influence	Moderate counter-influence	No influence	Moderate influence	Strong influence
the degree of control you had over navigation through the course pages	Strong counter-influence	Moderate counter-influence	No influence	Moderate influence	Strong influence

25. What other comments do you have concerning your use and opinion of the CMS?

APPENDIX B – RELATING SURVEY QUESTIONS TO RESEARCH QUESTIONS

Survey Question (paraphrased)	Related Research Question	Other Purpose
1) identification of CMS used		Determination of differences caused by CMS
2) type of academic program		General statistics
3) Course mode (e.g., hybrid)		General statistics
4) College automatically creates accounts and courses?	1) voluntarism	
5) If answer to 4 is "yes teachers obligation	1) voluntarism	
6) Number of semesters of CMS use	4) accumulated experience	
7) Number of classes supported with CMS currently	4) accumulated experience	
8) Primary motivator to try CMS	1) voluntarism	
9) disagree / agree (Likert): next 4 items		
--- use of CMS completely voluntary	1) voluntarism	
--- have sufficient technical ability	2) technical competence	
--- have sufficient instructional design background	6) pedagogy / instructional design	
--- used CMS because no change in teaching seen	6) pedagogy / instructional design	
10) Rate college supports (Likert) next 3 items		
--- Rate tech support for CMS users	3) institutional support	
--- Rate instructional design support for CMS users	3) institutional support	
--- Rate administrative support for CMS users	3) institutional support	
11) degree of help received from colleagues for CMS use	3) institutional support	
12) identify of those providing assistance	3) institutional support	
13) student rating of CMS use	5) student response	
14) level of student activity in CMS		relationship to "usefulness"
15) student opinion of CMS use in other classes		relationship to "observability"
16) user's formal training in online teaching		relationship to "ease of use"
17) effect on workload		none at present
18) effect of CMS on class		relationship to "usefulness"

discussions (in class & online)

Survey Question (paraphrase)	Related Research Question	Other Purpose
19) effect of CMS use on document distribution		relationship to “usefulness”
20) effect of CMS on student learning		relationship to “usefulness”
21) level of satisfaction	4) accumulated experience	
22) Rate helpfulness of CMS features		relationship to “usefulness”
--- uploading documents		“
--- calendars and announcements		“
--- online quizzes and tests		“
--- online gradebook		“
--- communication tools (chat, discussion board, whiteboard)		“
23a) Other features meriting a rating (identify the feature)		“
23b) Rate the feature		“
24) Indicate the level and type of influence of each factor on the decision to continue use of the CMS		
--- level of student learning in the class		relationship to “usefulness”
--- degree of voluntary choice to use the CMS	1) voluntariness	
--- degree of ease of using the CMS for document distribution	7) ease of use for document distribution	
--- tools for fostering discussion		relationship to “usefulness”
--- level of technical knowledge required	2) personal technical competence	
--- level of pedagogical knowledge required	6) pedagogy / instructional design knowledge	
--- level of college administrative support	3) institutional support	
--- level of formal or informal support from the college	3) institutional support	
--- degree of control over visual design	8) degree of control of the technology	
--- degree of control over course site organization	8) degree of control of the technology	
--- degree of control over course site navigation	8) degree of control of the technology	

APPENDIX C – SURVEY SCRIPT

Interview – Script Notes:

1) Interviewee:
   a) NAME: _____
   b) INSTITUTION: _____
   c) TELEPHONE: _____
   d) EMAIL: _____

2) Introduction:
   a) Identify myself (name, purposes of study, Centennial College)
   b) Athabasca University/MDE)
   c) Confirm respondent's willingness to be interviewed.
   d) Thank interviewee for agreeing to participate (or for coming this far)
   e) Confirm the data in item one, above.
   f) Remind her/him that all responses will remain confidential between respondent and researcher.
   g) Confirm that the respondent has a copy of her/his responses to the survey; confirm correctness of our recording of the data.

3) Review unanswered questions on survey.

4) Question 12: If the respondent specified "other" get the job title or relationship of the helper.
   _____

5) Further to why s/he chose to use the course management system:
   a) How did the respondent become aware of the CMS?
      i) Presentations by _____
      ii) Internal newsletters _____
      iii) Word-of-mouth _____
      iv) Manager order or suggestions _____
      v) Other
         _____
         _____
   b) Was there, in fact, a combination of factors that convinced the respondent to use the CMS in her/his class(es)?
      _____ (yes/no)

(part c on following page)

c) Identify the factors, and their relative influencing strengths.

_____ _____

_____ _____

_____ _____

6) Did the respondent feel any element of coercion to use the CMS? _____

(yes/no)

7) If the answer to interview question 6 is yes, identify the coercive elements, and rate the influence on the respondent's decision to use the CMS (1 = very strong, 3 = weak but effective).

a) Manager's directive _____
b) Manager's urging _____
c) Colleague teaching same course _____
d) Strong Peer pressure _____
e) Students' demands _____

8) How does the respondent classify her/his usage level of the CMS?

a) ___ proforma ("Well, I can say I used it.")?
b) ___ Basic
c) ___ Made reasonably good use of it (respondent's evaluation).
d) ___ Pushed myself in trying it out.

9) What determined the respondent's initial usage level?

_____

_____

_____

_____

_____

10) Did the respondent's usage level change during the school term?

_____ (yes/no)

11) In what way did her or his usage change?

a) Changed intensity of use of at least one course: **- 0 +** *(circle respondent's choice)*

b) Other? _____

12) Did the respondent's usage level change from one school term to another?

_____ (yes/no)

13) In what way did her or his usage change?

a) Change in number of courses: **- 0 +** *(circle respondent's choice)*

b) Changed intensity of use of at least one course: **- 0 +** *(circle respondent's choice)*

c) Other? _____

14) What was the respondent's *original* rating of the CMS (from 1 to 5, one being totally unsatisfactory and counter-productive, five meaning and indispensable and a highly useful part of their teaching "toolkit.")?
_____ (1 – 5)

15) What is the respondent's *current* rating of the CMS (from 1 to 5, one being totally unsatisfactory and counter-productive, five meaning and indispensable and a highly useful part of their teaching "toolkit.")?
_____ (1 – 5)

16) How much did peer usage (usage, not pressure) influence respondent's decision to try Blackboard (1 to 5, increasing effect).

_____

17) How much did peer pressure influence respondent's decision to try Blackboard (1 to 5, increasing effect).

_____

18) How much did peer usage (not pressure) influence respondent's decision to continue using Blackboard (1 to 5, increasing effect).

_____

19) How much did peer pressure influence respondent's decision to continue using Blackboard (1 to 5, increasing effect).

_____

20) How strongly did student response to the CMS affect the respondent's decision concerning continued use of the CMS?

_____

_____

21) What was the strongest influence on the respondent's decision to continue use of the CMS?

_____

_____

22) Does the respondent have further comments to make concerning their opinion and use of the CMS?

_____

_____

_____

_____

_____

23) Thank the respondent, again.

24) Provide office, home phone numbers, and email address.

416-289-5000, x2182

416-531-6930

tmkane@look.ca

APPENDIX D – INFLUENCE RESPONSES BY COLLEGE

Influence studied	Degree of Influence	college 1	college 2	college 3	college 4	college 5 (alt CMS)	Totals	Rank (by means)
College count		4	8	9	5	4	30	
College % of total		13%	27%	30%	17%	13%	100%	
Voluntarism	Strong Counter						0	
	Moderate counter						0	
	No influence	2	3	1	3	1	**10**	
	Moderate Positive	2	4	4	1	1	**12**	
	Strong Positive		1	4		2	7	
	No response				1		1	
College Mean		2.5	2.8	3.3	1.8	3.3	2.8	**5**
own tech competence	Strong Counter						0	
	Moderate counter					1	1	
	No influence	1	2	3	3	1	**10**	
	Moderate Positive	3	5	5	1	1	**15**	
	Strong Positive		1	1	1	1	4	
	No response						0	
College Mean		2.8	2.9	2.8	2.6	2.5	2.7	**7**
Administration support	Strong Counter		1				1	
	Moderate counter		1	1			2	
	No influence		4	3	1	1	**9**	
	Moderate Positive	2		4	4	3	**13**	
	Strong Positive	2	2	1			5	
	No response						0	
College Mean		3.5	2.1	2.6	2.8	2.8	2.6	**10**
overall support	Strong Counter		1				1	
	Moderate counter						0	
	No influence		2	3	2	1	**8**	
	Moderate Positive	3	3	5	1	2	**14**	
	Strong Positive	1	2	1	1	1	6	
	No response				1		1	
College Mean		3.3	2.6	2.8	2.2	3.0	2.7	**6**
Student learning	Strong Counter						0	
	Moderate counter						0	
	No influence		1	3			4	
	Moderate Positive	2	4	2	3	2	**13**	
	Strong Positive	2	3	4	1	2	**12**	
	No response				1		1	
College Mean		3.5	3.3	3.1	2.6	3.5	3.2	**2**
pedagogy	Strong Counter						0	
	Moderate counter		2		2	1	5	
	No influence	1	4	5	1	1	**12**	
	Moderate Positive	3	2	2	2	1	**10**	
	Strong Positive			2		1	3	
	No response						0	
College Mean		2.8	2.0	2.7	2.0	2.5	2.4	**11**

Influence studied	Degree of Influence	college 1	college 2	college 3	college 4	college 5 (alt CMS)	Totals	Rank (by means)
College count		4	8	9	5	4	30	
college % of total		13%	27%	30%	17%	13%	100**%**	
control of visual design	Strong Counter				1		1	
	Moderate counter						0	
	No influence	1	2	2		2	7	
	Moderate Positive	1	5	4	2	2	**14**	
	Strong Positive	2	1	3	2		**8**	
	No response						0	
College Mean		3.3	2.9	3.1	2.8	2.5	2.9	**4**
control of site organization	Strong Counter						0	
	Moderate counter						0	
	No influence	1	1	2		2	6	
	Moderate Positive		5	3	3		**11**	
	Strong Positive	3	2	4	2	2	**13**	
	No response						0	
College Mean		3.5	3.1	3.2	3.4	3.0	3.2	**3**
control of navigation	Strong Counter				1		1	
	Moderate counter						0	
	No influence	1	3	4		2	**10**	
	Moderate Positive	2	4	3	2		**11**	
	Strong Positive	1	1	1	2	2	7	
	No response			1			1	
College Mean		3.0	2.8	2.3	2.8	3.0	2.7	**7**
Ease of use for document distribution	Strong Counter						0	
	Moderate counter					1	1	
	No influence		1	2	1	1	5	
	Moderate Positive		3	2	2	1	**8**	
	Strong Positive	4	4	5	2	1	**16**	
	No response						0	
College Mean		4	3.4	3.3	3.2	2.5	3.3	**1**
communication tools	Strong Counter						0	
	Moderate counter						0	
	No influence	2	3	4		2	**11**	
	Moderate Positive	1	5	4	3	2	**15**	
	Strong Positive	1		1	1		3	
	No response				1		1	
College Mean		2.8	2.6	2.7	2.6	2.5	2.6	**9**