Chapter One

INTRODUCTION AND PROBLEM STATEMENT

The continuing development of various educational technology tools is transforming the education system as we know it today. Educational technology is changing why, what, when, where and how people will learn. The information age in which we live is being driven by learning and knowledge. As a result, demand for effective learning opportunities will increase dramatically. Foot (2000) tells us this will be both a challenge and an opportunity for the educational system. The community college system must accept that the effective deployment of educational technology will play a pivotal role in meeting this demand (Deegan and Tillery, 1991).

As early as the mid 1980's Malcom Knowles (1984, p.32) wrote the following analysis:

> We are nearing the end of the era of our edifice complex and its basic belief that respectable learning takes place only in buildings and on campuses. Adults are beginning to demand that their learning take place at a time, place, and pace convenient to them. ...Our great challenge now is to find ways to maintain the human touch as we learn to use the media in new ways.

The Higher Education Program and Policy Council for The American Federation of Teachers openly and clearly recognized the significance of educational technology by stating "...technology is such an important, compelling force in higher education today that we who represent the interests of the academic community simply must come to grips with it" (American

Federation of Teachers, 1996). Indeed, Schmidt and Olcott (Hanna, p. 290) see technology enabling recent changes in Higher Education more so than political and social forces.

Educational technology has the potential to increase access to learning for a wider range of learners anytime, anywhere. It makes access to learning less time and place bound. It also has the potential of making available to the learner a wider variety of learning opportunities. This results in the needs of individual learning styles more likely to be met. Because of its flexibility, educational technology also has the potential of increasing the success rate of our learners.

Don Norman, the president of Unext Learning Systems puts it this way:

> I'm not a fan of technology. I'm a fan of pedagogy, of understanding how people learn and the most effective learning methods. But technology enables some exciting changes. It lets us do what-if questions and simulations. It lets us make visible things that would otherwise be invisible, and make abstract issues more concrete and understandable. I believe we are moving toward lifelong learning and just-in-time learning. And often it's technology that makes this possible. (Technology 2000, p. 14).

The American Federation of Teachers (1996), in asking its members to look carefully at the direction that educational technology is taking, offers the following rationale for its request. "We are asking you to do these things because technology already is changing the way we teach, changing the way we do research, changing basic employment rights. In short, because we've become convinced that over time the influence of technology in higher education will grow even

more pervasive" (p.3). How positive this influence will be and how well the potential of educational technology will be fulfilled will depend, to a great extent, on how well faculty will deal with this challenge.

Privateer (1999) in *The Journal of Higher Education* argues that current academic strategic policies, on the whole, misunderstand the potential of education technology because higher education tends to marry eighteenth-century models of learning with nineteenth century models of organizational management. He further argues the academic technology of colleges and universities "...should be focussed on the production of intelligence rather than on the storage and recall of random and quickly out-moded information" (p.61). His clarion call is "...to develop learning outcomes that are consistent with how instructional technologies can be integrated throughout the curriculum" (p.65). Privateer's ultimate vision for higher education is "..how can computer- and telecommunication-mediated instruction assist colleges and universities in reinventing themselves as "virtual" and "real" places in which students can transcend outmoded ways of gathering information to become new kinds of learners, driven by the desire to use their intelligence to solve problems" (p.64).

Dyson (Hanna, 2002, p. 121) further points out the following:

> It is a fallacy to believe that technology will automatically change a culture or cultures. Although technology allows and, in some ways, reinforces the flattening of organizations, it does not do so by itself. Organizational leaders must have the will to make the necessary culture changes, and then technology can help make it easier. A better computer network will not buy instant

> collaboration and a culture of sharing. If people think their power continues to rest in hoarding their knowledge, they are not likely to start giving it away.

The challenge for faculty and administration in the Ontario community college system is to learn how to embrace this educational technology as a tool (not at the exclusion of others) which is seamlessly integrated in the learning cycle that will facilitate and enhance learning rather than see it as a threat to the learning process and faculty job security. To date, experience shows us that colleges in the Ontario community college system are more likely to use technology to transfer or transmit education rather than to transform it. Hanna (2002, p. 338) points out that Colleges are tempted to implement technology in a linear way that simply allows them to do more of what they are doing albeit more efficiently. This prevents them from redesigning instruction and learning from the ground up and taking advantage of the powerful interactive capabilities of educational technology. A lack of experience and a full appreciation of the potential of educational technology appears to be the key reasons why this is happening. The successful integration of educational technology will require a better understanding of the need for improved teacher training and curricular development and support, as well as technical support. Privateer (1999) points out that teaching must become a "value-added-intelligence producing occupation" to survive the modern day challenge.

In a recent monograph, The Harvard Policy Group of the John F. Kennedy School of Government warns of the same problem. "The enormous potential benefits of IT are often compromised if it is used merely to entrench old work process and organizations rather than to fundamentally redesign them" (Harvard Policy Group, p. 7). It gives the following advice:

"Don't focus on incremental improvements to the exclusion of more aggressive innovation" (Harvard Policy Group, 2000, p. 7).

The well-planned adoption of educational technology will make learning more accessible and thereby a community college education more universal. Failure to adopt educational technology as an enabling tool may result in the community college system being less competitive and less able to meet the changing and evolving needs of today's learners. One needs only to look at the phenomenal growth of private colleges and universities like the University of Phoenix to see that their offerings are in great demand.

The University of Phoenix catalogue summarizes this concept in this way.

> As we enter the new millennium, [institutions of] higher education must exert their proper leadership role in the development of the educational structures and programs capable of meeting 21st Century needs. While existing higher education practices will continue to make important intellectual and cultural contributions to society, innovative educational methods and practices are required to meet future needs as well as the unmet needs of the present. The University of Phoenix is an example of how innovative educational methods can be institutionalized successfully to identify and meet the changing educational needs of American society" (University of Phoenix Catalog, p.1).

Unfortunately higher education, including the Ontario community college system, has been preoccupied with the restructuring of the education system rather than its re-engineering. Restructuring suggests taking existing work processes and organizational structures and

reshaping them. Re-engineering implies fundamentally re-thinking and redesigning work processes and organizational structures to meet the current and future needs of the learners. It has yet to learn the lesson business painfully learned in the Eighties. Survival is contingent upon a complete re-engineering of its infrastructure and not simply a wishful, cosmetic make-over. Computers on faculty desks and new computer laboratories for learners are simply a restructuring of the infrastructure if new pedagogical forms are not utilized. Streamlining of administrative systems using technology, while perhaps making the system more efficient, does not necessarily help to improve learning. The recent findings of the third annual **McGraw-*Hill* *Technology and Student Success*** survey carried out in higher education institutions across Canada in 2002 suggests that "...current uses in teaching are more administrative than pedagogical, and year-to-year, faculty are not achieving their predications of more web-based course delivery. Indications are that faculty may be experiencing diminishing returns for their efforts and need support in integrating technology more fully into students' learning so its full potential can be realized" (McGraw-Hill, p.2).

It is now clear that the adoption of educational technology means a major change in the organization of work and the role of faculty. The role of faculty is being transformed from that of a "teacher" to a "learning facilitator". "Faculty will serve as knowledge navigators for the learners they are mentoring. For many learners, at various stages, faculty will need to serve as co-pilot" (Dolence & Norris, 1995, p.62). But for this to happen the community college system must have a clear vision of how educational technology can enhance learning, the role that faculty must play in this vision and how this vision will be implemented.

> And although...technology can be a powerful force to improve education, it is often adopted today *without* a clear educational focus and *without* sensible strategic planning. Unfortunately, it is not unusual for an expensive technology to be purchased primarily because it is promoted by a large company, or offered for free or at a discount, or because it is technically "leading edge" or because it is seen as a way to cut corners on faculty and facilities (AFT, 1996, p.3).

An example of the lack of clarity inherent with the implementation of an educational technology plan was painfully illustrated in a call-in radio talk show on CFYI640 in Toronto (February, 2000). A college teacher called in and made the following statement: "I am not opposed to technology. It's just that it sidetracks us from the real issues it is supposed to address." Technology will sidetrack us from the real issues only if we use it inappropriately. We need to rethink the relationship between new pedagogical forms and how they can be supported by technology. We are often too quick to see technology as an efficient, cost-saving tool rather than one to promote collaborative learning, drive problem-based cognitive theories and create a new "real" or "virtual" community college driven by a desire to embrace new kinds of learning based on the use of intelligence to solve problems rather than simply a mechanical input of data to achieve a rote answer.

Privateer (1999) suggests that higher education is using technology to give us more of what we need least. There is a tendency to use technology simply to convey more information. The ultimate result of this automation of knowledge conveyance through technology, Privateer, tells us "...will require fewer professors to teach primarily content-driven courses to cyberstudents enrolled in digital colleges, this in a world requiring groups of intelligent people to solve critical problems. In fact, the more colleges and universities transfer their traditional

methods of instruction to computer-mediated forms of instruction – with the computer becoming nothing more than a large lecture room – the more chance they have of limiting their socioeconomic value" (p. 73).

In a recent Educause monograph called *Putting students at the center: a planning guide to distributed learning,* Oblinger (1999) wrote of the need to have clear expectations and well-articulated outcomes to avoid failure and disappointment (p.18). While Oblinger was speaking specifically of distributed learning, the same can be said to be true of the implementation of all educational technology in the learning process.

The use of educational technology in teaching and learning in the community college system suffers from a number of major problems. First, there is a lack of an established, consistent and credible pedagogy. This is a result, in part, of a lack of empirical evidence that educational technology does indeed enhance and/or improve both teaching and learning.

Privateer (1999) would argue that the lack of such evidence is the result of not taking the "right" path (p.61). Clark (1994), in looking at educational technologies from a different perspective, provides an insight as to their impact on the learner. Clark suggests that we examine educational technologies by distinguishing between two components: delivery technology and instructional technology. Clark defines delivery technology as the technology used to distribute the instruction to the leaner. This typically includes the hardware and software. Instructional technology is the pedagogy and comprises the underlying instructional methods used. Traditionally, it is the delivery technology that comes under scrutiny when new technologies are

introduced. Unfortunately, often the instructional technology is overlooked or given scant attention. Clark postulates that this is one possible reason studies often do not show differences or improvements with new technologies over traditional methods. While the delivery method may change the instructional method often remains the same. Clark contends that, to see improvement, the instructional methods need to change also.

While few would argue that educational technology has the capacity to enhance teaching methods, many have doubts or concerns that the degree of improvement is worth the time, effort and price. There is an apparent need to provide further research that the use of educational technology is not only worth this time, effort and price, and the reward will be improved learning among many learners. Second, there is an ever evolving subject base that makes it particularly difficult to keep abreast of all the literature. What further exacerbates the problem is that much of the literature is not peer reviewed or adjudicated. We have reached the point that the supporting literature associated with educational technology must go beyond simple passion, either for or against, and be based on sound reasoning and substantiated research. Brown and Duguid (2000, p. 18) put it the following way: “The logic of information must ultimately be the logic of humanity. For all information’s independence and extent, it is people, in their communities, organizations, and institutions, who ultimately decide what it all means and why it matters”. This thesis hopes to make a contribution to this area.

Purpose

The primary purpose of this thesis is to investigate the perceptions of Ontario community college faculty about the use of educational technology to promote student learning and the factors that encourage or discourage their use of it. Further, it will investigate which faculty are most likely to use educational technology as well as the extent and nature of its use. It is hoped that this investigation will yield implications for the appropriate implementation and use of educational technology in Ontario's community colleges.

Definition of Educational Technology

For the purposes of this thesis we will use the definition of educational technology advanced by Boettcher and Conrad (1999):

> The technology of education is the body of materials and methods used to extend or enhance the ability to learn, collect data, solve problems, and promote communication between and among faculty and students (p.7).

Green (2000) calls it academic computing that he defines as "...the use of computing and information technology resources to support and enhance instruction and scholarship (p.3).

Hanna (2002) calls technology the fourth force in the classroom. The other three forces are the content to be learned, the teacher and the student. Hanna claims that this fourth force,

until recently "... was employed primarily to extend the teacher rather than to empower the student" (p119).

In the context of this thesis educational technology means the application of computer and microprocessor technologies to the teaching-learning process. Further we see educational technology as part of a process that uses technology to:

1. further communication between and among students, faculty and members of the community college system;
2. gather information, mainly through the Internet, to supplement the traditional printed material used in the development of instructional material and
3. facilitate the preparation of instructional material and enhance its delivery in an engaging and dynamic way.

To these definitions we add the concept of collaborative knowledge building which is sometimes seen as a "by-product" of educational technology. Knowledge building is promoting "student interaction through referencing, connecting ideas, sharing authorship, and 'building-on' the work of others to advance knowledge" (Knowledge Forum) through electronic and/or digital means. While Brown and Duguid (2000) talk about the "community-forming character of the 'Net" there is a danger that technology, by its very nature, can isolate rather than unite or enhance knowledge community building. For this reason, care must be taken in our use of educational technology so that it enhances the social relationship between the learner and the facilitator rather than promote a dangerous social and geographical chasm.

A clear distinction needs be made between knowledge building, as it will be used in this thesis, and simply knowledge management. Knowledge management tends to use educational technology in a very rudimentary way. Knowledge building uses educational technology to manage intelligence, promote collaborative learning and support different kinds of learning to stimulate new workplace skills. Microsoft defines knowledge management as

> ...the use of technology to make information relevant and accessible wherever that information may reside. To do this effectively requires the appropriate application of the appropriate technology for the appropriate situation.
>
> Knowledge management incorporates systematic processes of finding, selecting, organizing, and presenting information in a way that improves an employee's comprehension and use of business assets (Brown, Duguid, 2000, p.117).

Brown and Duguid (2000) tell us that shared knowledge is very distinct from a collective pool of discrete parts. They see knowledge "...less like an assemblage of discrete parts and more like a watercolor painting. As each new color is added, it blends with the others to produce the final, in effect which the contributing parts become indivisible" (p.106).

They suggest that since one of the primary concerns of universities is the communication of knowledge "...radical innovation in communication technologies inevitably suggests radical change in universities" (p. 230). This can also be said to be true of community colleges. With the radical changes in educational technologies we can, or at the very least, should expect radical changes in our community colleges.

Significance of the Study

Educational technology is having and will continue to have a significant impact in the advancement of education in the Ontario community college system. Faculty play a major role in how this educational technology will be successfully integrated into the system and at what speed. In many respects, faculty have both the most to gain and the most to lose if educational technology is not integrated into the system in a rational and logical manner. As Skolnik (2000) points out in ***The Virtual University and the Professoriate***:

> Thus far, discussion about the virtual university has concentrated largely on predictions of how it will impact higher education and debates about whether these developments are good or bad. Judgements of good or bad have been offered mainly with respect to learning and student development. What the virtual university might mean for the professoriate has gotten some attention but mostly in a secondary way. Yet, since professors are in a key position to influence both the speed and manner of implementation of the virtual university, consideration of how it will affect them would be warranted (p.56).

The review of the current literature suggests that there is not a sufficient research base, especially in the Ontario community college forum, to support and validate many of the proposed or recommended strategies for implementation of educational technology outlined in the literature. This thesis will explore community college faculty's perception of the use of educational technology. Further, it is hoped that this investigation will yield implications for the appropriate implementation and use of educational technology in community colleges.

Chapter Two

LITERATURE REVIEW

An Outline

The intent of the literature review section is to lay the foundation for the research this thesis will undertake. First, the literature review will deal with the cultural and societal context of technology and the debate about educational technology in the postsecondary milieu. Second, the literature review will examine the central issues relating specifically to the faculty adoption of educational technology. Third, the review will deal with how faculty can and do use educational technology.

The literature reviewed and examined the following areas:

A. The cultural and societal context and debate about educational technology in the postsecondary milieu.

B. Central issues relating specifically to the faculty adoption of educational technology.

C. How faculty can and do use educational technology.

D. Studies conducted in the Ontario community college and university domain.

THE REVIEW

The Shift to the Knowledge Economy

Our North American economy has changed drastically in the last several decades. Tapscott (1996) points out in his *Digital Economy* that "The new economy is also a *knowledge economy* based on the application of human know-how to everything we produce and how we produce it. In the new economy, more and more of the economy's added value will be created by brain rather than brawn" (p.7). This shift to a knowledge economy brings with it a shift from a manual worker to a knowledge worker. Drucker (1999) tells us this shift will require a change in attitude both of the worker and of the organization. The shift to a knowledge economy and a value-added society is so rapid and so intense that the process of intellectual change often happens at a pace greater than the ability of the human mind to cope with. When this happens, a high level of stress is created accompanied by an equally high degree of fear about one's ability to keep pace and survive. Knowledge, the very currency of the college system, has now become both exhilarating and debilitating.

What impact does this have on our community college system and the faculty? The recently released *Portals and Pathways: A Review of Postsecondary Education in Ontario* (2001) report by the Investing in Students Task Force points out the following:

> Ontario postsecondary institutions face many challenges as global competition for talent and investment increase, technology and e-learning continue to change how and where students learn, and

> students become more demanding consumers of education. ...Maintaining the *status quo* will not prepare us for the future. We must continue to "raise the bar" in postsecondary education through innovation and the pursuit of excellence. (p.iii).

Privateer (1999) goes even further, suggesting that it will not be enough simply to restructure the system, he sees a need to re-engineer it completely.

While this change may be easy to talk about, it will likely not be as easy to bring about. Community colleges as a whole, and faculty in particular, have a great deal invested in the system as it exists today. Consequently, there may be a great deal of resistance to any massive and substantive change.

The Social Context of Technology

Norman (1999) suggests that technologies have a life cycle. Like humans, they must pass through a developmental stage from youth to maturity or adulthood. He believes that the computer industry is still in the rebellious teenage years experimenting with and revelling in all its intriguing complexities. But, as Norman points out, this is not the real problem. Technology is the easy part to change. The difficult parts to change are the social, organizational and cultural aspects. Computers are digital. People are analog. Norman tells us it is time for "...a human-centered technology, a humane technology" (p.viii).

When discussing educational technology we must be open to the "bigger picture" and ensure that we do not have tunnel vision. Technology has had and is continuing to have a

tremendous impact on our society. As education is inextricably interwoven with the fabric of our society, so is the concept of educational technology interwoven with the social aspects of both the community college system and society as a whole.

Brown and Dugid (2000) have written an eminently readable and a highly insightful book called *The Social Life of Information*. The authors give us a clear and understandable view of the pivotal importance information has in shaping the role of business, education and society as a whole. A close examination of the salient points they make will underscore the importance of the use of educational technology as a tool and an undeniable component of the learning and social process.

Tunnel Vision and Unintended Consequences

We need to guard ourselves against tunnel vision. Sometimes we become so focussed on using technology to meet our objectives that we lose sight of the other issues, some of which are just as, if not more important. Chronic tunnel vision often causes us not to see, negate the existence of, or simply discount potential problems or issues if they are viewed as causing a problem or possibly slowing down the achievement of our main objective. Brown and Duguid (2000) put it this way:

> This central focus inevitably pushes aside all the fuzzy stuff that lies around the edges—context, background, history, common knowledge, social resources. But this stuff around the edges is not as irrelevant as it may seem. It provides valuable balance and

> perspective. It holds alternatives, offers breadth of vision, and indicates choices. It helps clarify the purpose and support meaning. Indeed, ultimately it is only with the help of what lies beyond it that any sense can be made of the information that absorbs so much attention (p.1).

In our zeal to ride the technology express through the tunnel we sometimes tend to overlook that the technologies we use create as many problems as they solve. Norman (1999) calls this disruptive technology. Often these unintended problems are a direct result of ignoring information outside our narrow field of focus. The answer is not only to avoid such tunnel vision in the first place but to be courageous enough to address unintended consequences when they occur. What we tend to do is to bury these unintended consequences in the mounds of information and data that we amass along our journey. Brown and Duguid (2000) suggest the use of a more productive approach: "It is for the new to learn from the old" (p.3).

The World Beyond

Things do not happen in isolation. Educational technology does not exist in a vacuum. In its journey to improve, learning educational technology calls upon and makes use of a myriad of other resources. Brown and Duguid (2000) "...want to draw attention to the resources people use in the belief that what are resources for people are, by extension, resources for design of useful tools. Tools that ignore these resources will be, in great part, tools that are best ignored, at worst a burden on those who use them (p.7)." This means that educational technology must become part of the closely knitted strategy to enhance learning in any strategic

plan. "...it might be time to celebrate less speed and separation and more the ways information and society intertwine" (p. 18).

Brown and Duguid (2000, p.67) also suggest that the transformation caused by technology will pose some significant challenges. As technology dismantles some of the social ties that have kept us together can it also "...pick apart the uncomfortable social ties that bind, but leave the wanted ones intact. Can it undo the unprofitable ties, but leave the profitable ones?" Implementation of any educational technology strategy will require close monitoring of the social structures that are affected – those that are dismantled, replaced or irrevocably changed. The community college system is a very social system. Changes to the social fabric need to be recognized and dealt with. Downes and Mui (1998) talk of the "Law of Disruption" which holds that "...social, political, and economic systems change incrementally, but technology changes exponentially." Again, Privateer (1999) acknowledges this phenomenon but emphasizes the need for higher education to re-engineer its entire structure if it is to meet its mission.

Technology has made education more accessible to more people than ever before. There is a rapid movement by colleges and universities to provide online courses and diplomas and degrees that can be completed entirely on the World Wide Web. However, this often lauded panacea is not without its dangers. Brown and Duguid (2000) talk of the inherent geographical and social distances that are created. Further, the research of Cameron and Heckman (1993) suggests that employers place more value on employees who have had the social experience of the classroom over those who have completed their work in isolation. They call this the

"nonequivalence of equivalent diplomas." This is an issue the community colleges must keep in mind as they strategize the use of technology in their curriculum.

Resistance to Change

Terry O'Banion, in a speech to the faculty and staff of Sir Sandford Fleming College, jocularly said "It's as difficult to change the curriculum as it is to move a cemetery. You don't get much help from the residents" (April 23, 1998). Perhaps not surprisingly, his comments were well received from a group of people who had just undergone a massive structural change because of an unprecedented 15% government-mandated budget cutback.

Skolnik (1998) further defines the source of resistance in *Higher Education in the 21st Century* when he writes "Some reasons why change might be far more pervasive in the first decade of the 21st Century than in the last three decades of the 20th Century are the increasingly harsh economic environment of higher education, the increasing integration of higher education with the world of business and industry, and the widespread use of information technology. It is suggested that the only constituency from which there will be opposition to the scenarios depicted in the 21st Century higher education literature is faculty of colleges and universities" (p.635).

But is it not the very nature of people in general to resist change and innovation? Niccolò Machiavelli once wrote in *The Prince*:

> There is nothing more difficult to plan, more doubtful of success, nor more dangerous to manage than the creation of a new order of things...Whenever his enemies have the ability to attack the innovator they do so with the passion of partisans, while the others defend him sluggishly, so that the innovator and his party alike are vulnerable (p.49).

Considering what is at stake, such resistance is quite understandable. Faculty have a great deal invested in the system as it exists today. And this investment in the system is not totally altruistic. There is a sincere belief by many that faculty in the community college system have done an admirable job in training and educating their learners. In the view of many faculty, to simply discard this investment of time, energy and personal commitment and dedication in favour of a new technology without substantive empirical data to support its efficacy seems foolhardy.

Tapscott (1996) points out in his *Blueprint for a Digital Economy* that, while technology has the potential of meeting many of the educational needs of the next century, the change will not be without its challenges. It will not only be a challenge to the faculty but also to the entire educational system. He writes that "the potential for meeting the next century's educational needs is striking. But in transforming current teaching methods, the global learning infrastructure also challenges the educational system as a whole. Change will be rewarding but difficult (p.180)".

Kirsten Drotner is quoted in *Growing Up Digital* (Tapscott, 1998) as saying "Those who have invested most in gaining an accepted cultural capital are also the principal victims if this capital loses its currency" (p.49). There is no question that faculty see themselves as having made a significant investment in time, energy and emotional commitment and consequently have the most to lose. What is needed is to show faculty that they will not lose their investment by adopting educational technology but rather they will enhance it in a different way.

But change there will be. The pressures on the community college system have been too great to ignore. There have been significant changes to the student body. There have been significant changes to the competition we face. New technologies themselves are forcing us to change. For the sake of survival and the benefits we provide to our learners, the community colleges must meet this challenge imposed by change.

Initial Reactions to Technology

With the on-going meteoric changes in technology many educators are simply overwhelmed with the resulting implications. Some are slower than others to include appropriate technological strategies in their long term planning.

In *Taming the Beast: Why Technology Evokes Anxiety*, Oshler (1999) writes of the alienation and the overwhelming feeling of loss of control brought on by living in a constantly changing technological lifestyle to the point that we feel that we are victims of this technology. To describe this feeling, Oshler has coined the term victimyopia which is defined as " Either

through apathy, resignation, despondency, or a lack of vision, believing yourself to be overwhelmed, at the mercy of and forever dehumanized by the forces of technology (p.2)."

Donovan and Macklin (1999), in a recent article in the CAUSE/EFFECT journal, talk of the severe consequences to education if we do allow ourselves to become overwhelmed and paralyzed.

> The difficulties inherent in promoting and supporting good instructional uses of technology can be paralyzing. Yet the risk is not so much that faculty and support staff will be paralyzed, but rather that we will become so attuned to our current difficulties that we will fail to understand fully the transformative effect of the technologies we promote and support, and thus will be left trying hard to solve yesterday's problem. (p.1).

A report by the American Federation of Teachers (1996) called *Teaming Up with Technology: How Unions Can Harness the Technology Revolution on Campus* labels the speed of change a moving target. The report points out that "The pace of technological change on American campuses is so rapid that to study it is like aiming at a moving target"(p.1). Realizing the importance of the issue, the report's authors were undaunted by the challenge. They reasonably went on to say that "Nevertheless, technology is such an important, compelling force in higher education today that we who represent the interests of the academic community simply must come to grips with it" (p.1).

The community college system cannot fail to deal with this "moving target." It cannot be like the blacksmith at the turn of the century who, believing (or perhaps wishing and hoping) that the automobile would go away because it was just a passing fancy, continued shoeing his horses with little regard for this "new-fangled technology." Has anyone counted how many blacksmiths there are today making a reasonable living?

In a paper called *Galloping Off in All Directions* Carol McCandless (1997) of Capilano College gives an insightful overview of the 'technological present.' She sees us riding off in all directions; on the one hand excited about the new possibilities of technologies and pedagogical opportunities but on the other overwhelmed by government's off-loading of educational costs, further exacerbated by the lack of stable funding. We need a more focussed and realistic plan for implementing educational technology as a tool to enhance and promote learning. The educational technology implementation plan must consider the **r**eturn **o**n **i**nvestment (ROI), both in terms of financial capital and human resources. If the cost of the implementation of a particular technology is greater than the benefits it brings about, then perhaps the technology should not be implemented. The ultimate goal is for educational technology to enhance and promote learning.

As is often the case with many initiatives in the community college system, we try to be all things to all people. Not only is this unrealistic, but it often leads to dissatisfaction and a sense of frustration since goals cannot often be met. There has to be a balance between the potential of what can be achieved by educational technology and what any individual college can realistically deliver to its learners. If this balance is not reached, a group of frustrated faculty and disgruntled learners is the result.

The Dynamic Tension of Polarities

In his inaugural address as director of the William G. Davis Chair of Community College Leadership, Skolnik (2000) delivered a paper titled "In Praise of Polarities in Postsecondary Education" in which he says that in the study of postsecondary education major goals or functions often ***seem*** to be in conflict with one another. He uses the term "polarity" in a qualitative way to illustrate the presence of "two opposite or contrasting principles or tendencies." Skolnik points out that the conflict often rests upon how we conceptualize the terms we are dealing with. He gives several examples in which, rather than conflict, we find some degree of complementariness.

Such also seems to be the case with educational technology, particularly in its role in enhancing learning. There is frequently a conflict of extremes or polarities. These extremes or polarities need not exist if we remove the debate from an either/or forum of extremes and strive for balance.

Figure 1 graphically illustrates the extremes found in the literature. The evangelists see educational technology as doing no wrong and as a possible solution for all the ills that plague community college education. A phalanx of evangelists will offer a litany of praises for educational technology, everywhere from students who can tackle doctoral theses in a single bound to administrators who will balance their budgets and eradicate the colour red from their ledgers. The Luddites, represented by Noble, would decrease our dependence on technology. The Cynics, represented by experienced users like Stoll, express concern about what technology can bring about. The Cynics lack faith in the system to use technology appropriately. The

mistakes of the past cloud their hopes for the future. A more balanced view is presented by writers like Postman who can see the potential of educational technology. It is this balance that is needed to bring about enhanced learning.

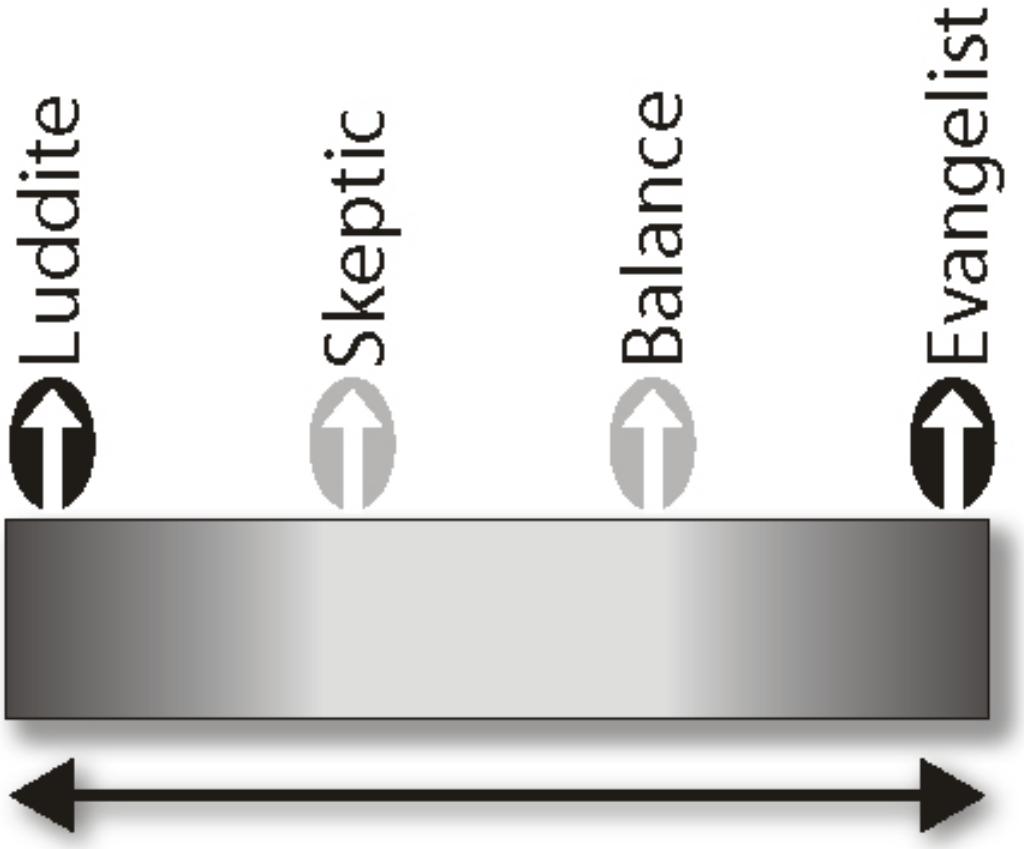


Figure 1 The Dynamic Tensions of Educational Technology

Unfortunately, the present debate about the benefits of technology is not always balanced. The review of the literature suggests that the debate, at both extremes, often brings about a religious like fervour. Extremes tend to polarize people and force them into camps without reaching a common middle ground. The debate regarding the use of educational technology to

enhance learning in the community college system in Ontario is often quite polarized. This frequently leads to the building of barriers that are counter productive to enhanced learning.

Perhaps we have a much too idealized concept of what technology can realistically do, at least in the short term. We may very well have expectations that are simply too unrealistic and not achievable. It will be difficult to find a balance automatically. Brown and Duguid (2000) point out that "More generally, new technology often threatens not to help find a new equilibrium but rather to unsettle equilibria whenever they are found. The rapid innovation endemic to the technology can be destabilizing, even for large organizations with copious resources (p.74)." They further point out that it is not technology, but our expectations that tend to cause this lack of equilibria. "The instability that rapidly changing technology brings, however, often lies less in the technology itself than in enthusiastic expectations that everything being "just a click away" or "at your fingertips" will make life easy. Battered by such hype, it's easy to believe that everyone except you know how to use this stuff without a problem" (p.77). Stoll (1995) is even more emphatic about bloated expectations. He says that " . . . the medium is being oversold, our expectations have become bloated, and there's damned little critical discussion of the implications of an online world" (p.4).

David Noble (1998) epitomizes the debate on the religious plane. In his *Religion of Technology*, Noble postulates that the true goal of technologists goes beyond "their sober pursuit of utility" but rather a "quest for transcendence and salvation" (p.3).

His *Progress Without People* (1995) elevates, with fervour, the debate to a war-like level. Noble talks of the forces of two armies engaged in a war. On the one side he sees a well-equipped army funded by private capital marching to victory to the drum beat of technologies determined to achieve social dominance. On the other side, he draws a picture of an army lacking an agenda taking "refuge in alternating strategies of appeasement and accommodation, denial and elusion, and reeling in desperate disarray before this seemingly inexorable onslaught which is known in polite circles as technological change" (p.4).

Unfortunately, humankind has repeatedly shown that when we deal with issues with religious fervour, zealots tend to flourish on both sides of the debate. In the case of technology, a new vocabulary is spawned. We speak of "technophiles" and "technophobes" battling it out in cyberspace amid "cyberphobic" faculty. The result is that we frequently end with the battlelines drawn up between the "technozealots" on one side and "Luddites" on the other. We now even have "victimyopia" (Oshler, p.2).

Stoll, an MSNBC commentator, lecturer, Berkeley astronomer and Internet pioneer presents a more reasoned argument about the dangers and use of technology both in daily life and in education. While he sees the benefits of technology as a "heavy user", he is skeptical and cynical about how technology will be employed and deployed as it becomes a pervasive force in our daily lives.

Without minimizing the power of technology Stoll (1995), in *Silicon Snake Oil*, outlines a series of concerns that need to be considered. He begins by quoting Thoreau: "Our inventions are wont to be pretty toys, which distract our attention from serious things. They are but improved means to an unimproved end. We are in great haste to construct a magnetic telegraph from Maine to Texas; but Maine and Texas, it may be, have nothing important to communicate."

Among his main concerns are the following:

- Isolation from others - the Net creates a "metaphorical community" where we chat "without speaking, smile without grinning, and hug without touching"
- The exclusionary nature of technocratic culture – "...only the technoliteri will be enfranchised with network access"
- A sense of anonymity brings out the worst in people
- The spread of "garbage". The user never knows whether what is available on the web is "good stuff"
- Thinking patterns subjugated to those of the computer
- Turning to the computer with problems often limits the ability to recognize other solutions

Stoll (1995) forcefully expresses his feelings.

> Computers and online services frustrate virtually everyone. Read the computing literature to feel the aridity of the culture of computing. Or follow Usenet net news to see dolts posting utter drivel reminiscent of the Ostrogoths and Visigoths. Watch any kid play Nintendo to sense the shallowness of computer games.

> Despite the peasant mentality that's online, we're told that anyone without a modem is an inept bumpkin, hopelessly behind the times or afraid of the march of technology. Don't buy it, or the cyberbullies will bury us all (p.12).

In his eminently readable *High Tech Heretic*, Stoll (1999) proclaims that "Yes, I'm critical of computing, but I'm not down on technology. ..My skepticism grows from a love of computing, from a wish to make our technological world better suited for people, rather than people better suited for machines." He validly raises concern about some critical issues. These include the following:

- The need for a wider discussion over the claims and promises of computing
- Computers replacing bad teachers. Stoll feels bad teachers should be replaced by good teachers
- Learning how to use a computer rather than programming a computer
- Students not being taught to understand material being downloaded from a computer
- Computers tend to promote instant gratification and encourage intellectual passivity
- Computers being used as an entertainment medium without emphasizing that learning is sometimes hard work;
- The excessive cost of implementing technology resulting in other valuable programs being cut or under funded
- Blindly turning to computers to deal with social problems and being "...blind to other possible solutions, such as more teacher support, better teaching conditions, tighter discipline, more appropriate curricula, or recasting school goals.";

- The replacement of teachers with “information technology professionals” and “technology coordinators” resulting in “Principals who work in their offices, rather than visiting with teachers, students, and parents. Students who enjoy working alone. Teachers who are more comfortable behind a keyboard than in front of a chalkboard.”

In his widely available series of papers called *Digital Diploma Mills,* David Noble expresses his concern that the high-tech transformation of higher education is taking place from the top down with little or no student and faculty involvement or even despite their involvement in the decision making. He says that the “battle lines” have been drawn between administration and its commercial allies and the “core relations” of education: the students and the teachers.

Noble points out that two general phases have made up this high-tech transformation. The first phase involved the commoditization of the research function. He argues that this commoditization resulted in the reallocation of valuable resources towards the university’s research function at the expense of the educational function. The subsequent result was larger class sizes, the reduction of teaching staff and instructional resources, the freezing of salaries and the reduction of curricular offerings to a bare minimum.

Noble further argues that the second phase, technological transformation, is simply an attempted solution to the crisis precipitated by the first phase. It focuses its attention on increasing the efficiencies of the already extended professoriate. In other words, Noble sees technological transformation of the university as a cost-saving or as a cost-reducing measure. He goes on to argue that the high-tech remedies only compound the problem and consequently

increase, rather than reduce the cost of education. The increased cost of computer-based teaching is the direct result of the increased demands on the professoriate and the burgeoning costs of expanded overhead. Many would make the same argument for the situation in the community college system.

Noble also finds worrisome the increasing control administrators have over performance and course content with faculty spending an ever increasing amount of time preparing virtual courses while keeping virtual hours and racing to keep up with the exponential increase in the flow of e-mail from their students. As faculty feverishly work to produce courseware, Noble sees faculty helping to further transform the university in a commodities market and at the same time paving the road for making their positions obsolete. This commercialization of the universities, Nobles feels, entails a fundamental change in the relationship between the universities and their employees. Up to this point, faculty owned the courseware they developed. The universities want to change this without consulting the faculty. For Noble, course copyright is the sine qua non of the digital diploma mill. Noble senses a declining trend of online learning and sees resistance as rising. He sees the burden of proof, the validation of online learning, shifting from the critics to the promoters. Noble believes that the "high-tech hijackers of higher education" are facing strong resistance both from faculty and students.

While Noble writes in the context of the universities, many of the concerns he addresses are becoming increasing applicable to the community college milieu. Noble would find many community college supporters with respect to the commoditization and commercialization of

education, the issue of copyright and ownership of courseware, as well as the issue of power and the right and legitimacy of the high-tech transformation of community college education.

It can be argued, that while Noble and Stoll do raise some critical issues that need to be addressed their skepticism may very well alienate some of the faculty who most need the encouragement to work with technology and not to be intimidated by such important issues forthrightly. Adding a different perspective to the issue, there are writers like Neil Postman who are inclined to take what appears to be a more balanced view. In *Technopoly: the Surrender of Culture to Technology* Postman (1993, p.123) hypothesizes that "Every technology is both a burden and a blessing; not either-or, but this-and-that". In the same book Postman speaks of the need of the role for the technophiles and the need for a dissenting voice. Technophiles, Postman says, are lovers of technology who can see no blemish in their treasured jewel. He sees himself as the sobering second thought to moderate the zealous enthusiasm.

This more balanced view must be kept in mind as we encourage faculty to adopt educational technology. To speak only of the "benefits" or the "evils" when dealing with the issue is counterproductive. Educational technology is not the ultimate saviour of our educational system. Like any other tool, if used inappropriately, it has its own drawbacks.

Postman (1995) speaks to this issue in *The End of Education*:

> It should also be said that technology education does not imply a negative attitude toward technology. It does imply a critical attitude. To be "against technology" makes no more sense than to be "against food". ... Technology education aims at students' learning about what technology helps us to do and what it hinders us from doing; it is about how technology uses us, for good or ill, and about how it has used people in the past, for good or ill (p.192).

In his book *Bagel Effect*, Paul Hoffert (1998), the Director of CulTech Research Centre at York University and Executive Director of Intercom Ontario, points out the benefits of balance by saying " People and organizations that find a good balance tend to flourish". He also points out that perfect balance is seldom achievable because of the inevitability of constant change. "What may be a perfect balance today may be out of balance next week because events will have altered some aspects of each system...the only time the pendulum appears to stop is at extremes, when its speed is least (zero) and its height is greatest" (p. 6).

Technology: The Magic Bullet or the Broken Arrow

As with any new major paradigm shift there is euphoric hope by many that educational technology will solve most, if not all, the major problems faced by community college educators (O'Banion, 1997, pp.63-65). It is only human nature to embrace a new paradigm that is seen as helpful. It is also human nature to resist or reject it if it poses a serious threat to one's position.

O'Banion (1997) introduces the concept of educational technology as the Magic Bullet or the Broken Arrow. Technology is often viewed as a Magic Bullet by administrators because it is seen as having great potential for reducing costs and improving accessibility. The faculty are just as likely to see it as the Broken Arrow for a multitude of reasons which will be looked at shortly.

The reduction of expenditures is critically important to administrators since it is a matter of "costs of higher education increasing faster than the rate of inflation over a long period" (Skolnik, 1998, p. 645). Elsewhere, Skolnik (1998, p. 11) points out that "What seems to attract governments to the virtual university, besides the novelty of the idea, is the prospect that it will increase accessibility and lower costs, improve productivity, and increase learning effectiveness".

Currently the reality is that cost reductions often become the key motivators. In a somewhat bellicose tone Panitz (1999) epitomizes the Broken Arrow.

> Computers are coming! Computers are coming!" is the cry heard around the world as the technology revolution slowly and insidiously works its way into the classroom from kindergarten through higher education. Administrators dream about the economies of inexpensive computer systems handling hundreds of students relatively independently of faculty, with the additional benefit that computers do not debate issues at staff meetings (p.1).

On the other side of the coin, faculty have a significant concern that there may be inappropriate implementation of educational technology. "A looming dark side holds the

potential for severe social stratification, unprecedented invasion of privacy, and other rights, structural unemployment, and massive social dislocation and conflict" (Tapscott, 1996, p.2).

What is to be done to bring the two sides closer together, to reconcile differences and concerns, to promote student learning?

Noblitt (1997) suggests that the conflict between administration and faculty regarding the use of technology is not always civil. Despite the fact that there is a mutual dependency, Noblitt sees a top-down push to spend valuable and scarce funds on technology without a clear and plausible explanation of the benefits. Responding to one of the basic laws of physics, we see a resistence to this top-down force from an equally powerful bottom-up force for additional resources and faculty release time to work on projects that somehow seldom see fruition. The constant pressure produced by the on-going opposition of these two forces is counter productive to the advancement of learning.

Noblitt (1997) puts forward a major argument to support the thrust of this thesis.

> In reality, these "adversaries" have a deep mutual dependency. The top-down program advocate needs convincing exemplars to justify large investments in technology at a moment when funds are scarce. The bottom-up project advocate needs a well-conceived and reliable working environment for successful implementation of innovative concepts.
> ...It is essential to find ways to bring together faculty, administrators and computer services personnel to discuss problems in implementation. The idea is to ensure that educational

> innovations are not divorced from strategic planning and technical support (pp.1-2).

There is no choice. There is no turning back. Postman (1993, p.5) makes the following observation: "For it is inescapable that every culture must negotiate with technology, whether it does so intelligently or not. A bargain is struck in which technology giveth and technology taketh away." He further writes that "...once a technology is admitted, it plays out its hand; it does what it is designed to do. Our task is to understand what that design is—that is to say, when we admit a new technology to the culture, we must do so with our eyes wide open" (p.7).

The Faculty Perspective

The successful and productive adoption and implementation of educational technology in the community college system will not occur without the co-operation, albeit perhaps either unwillingly or with major trepidation, of the faculty. This thesis will examine the experience some faculty have had with the use of educational technology to enhance and promote learning. From these experiences, insights will be presented which should help other faculty adopt educational technology in a productive and less painful manner.

The best way to deal with fear and resistance is to deal with it openly, honestly and forthrightly. This means that the concerns of the faculty must not only be listened to empathetically, but also addressed. This suggests that a high level of trust must exist between faculty and administration. It also suggests that faculty and administration must share a common

set of goals and a common vision. Any college that does not have this shared set of values and a common vision will have a more difficult time implementing an educational technology strategy that will benefit the learner. Messner (Bollentin, 1998, p.2) believes that the widespread acceptance of education technology will occur if "it makes the job of both the instructor and the student easier". The major challenge, then, is to develop a strategy in which the faculty see that their job to help learners along the road to learning will be made easier and their job will not be trivialized, minimized or even totally eliminated. Furthermore, once faculty are convinced that the appropriate use of educational technology is likely to improve the learning experience, they are more likely to adopt the use of such technology.

Fears of Faculty

Whenever there is a change in the existing order of the day there will always be fears and concerns expressed. It is human nature to be suspicious of the new order of things.

The literature deals with a number of major concerns or fears of faculty about the diffusion of educational technology into the community college system. Among these are the following:

- Fear of change and the unfamiliar
- Fear of technology – "cyberphobia"
- Potential threat of technology – technological progress implies that old ways are inadequate or insufficient which leads to a faculty attempt to defend themselves
- The change from disseminators of knowledge to facilitators of knowledge

- Concern about “losing control” of the learning process
- Genuine concern about educational technology’s suitability for the various learning styles of different learners
- Uncertain about being able to adopt educational technology to meet individual learner needs and
- Potential threat of job loss.

Wright and Stammer (1996) provide a comprehensive list of resistance factors in their paper called “Overcoming Resistance to Educational Technology Innovation.”

There has been a significant turnover rate among faculty in the Ontario college system in the past four to five years. Much of this turnover is the direct result of stringent funding cutbacks. To meet these budget demands, many colleges offered “windows of opportunities” for early retirement which were well received. The system, which was created in 1967, also has an aging faculty leading to a large number of retirements. While the new faculty being hired are likely to have better technological skills, the system simply cannot wait until all the faculty who lack computer educational technological know-how retire.

Overcoming Faculty Fears

Educational Technology is Simply a Tool

Without minimizing or trivializing faculty's concerns, we must remember that it is not technology that produces change. It only enables us to bring about change. Ability to accept and adapt to this change is critical if the community college system is to survive and flourish. Charles Darwin once reminded us that it is not the strongest of the species that survive, nor the most intelligent, but rather the most responsive to change.

Educational technology is inherently neither good nor bad. It is what we do with it that is critical. As Hoffert points out, "It is human behaviour as it uses technology that is good or bad" (p.52).

In a letter to the editor of Time Magazine (July 10, 2000) in response to its technology issue, reader Antonio Valarde of Mexico City probably expressed it best when he wrote "It's senseless to ask whether technology is good or bad. The value comes from how we humans use it and the purpose of its use. When we question technology, we the users are the only ones accountable for its effects, no matter how advanced the technology may be."

The New Role of Faculty

Some of the existing literature suggests that faculty are taking on new, non-traditional roles in the learning cycle, especially in the field of educational technology. Much of this literature comes from noted authors, but just as frequently it comes without solid empirical evidence. Faculty need to be convinced that they do have some control in their new roles as coaches, mentors and facilitators of learning. We should not blame educational technology if faculty feel they lack control; rather we should look at the organizational structure within the college system and see what changes are needed to correct the situation.

Speaking to this new role, Hoffert (1998) tells us that faculty will no longer need to be the source of a significant body of information. "Today teachers must concentrate more on the process than on data. They need to be comfortable sharing some of their power with students, acting as moderators and team leaders frequently as they teach the lesson of the day from the curriculum "(p.252).

In their new role as coaches, mentors and facilitators of learning, faculty will also have the opportunity to be

- Developers of new learner-centred programs;
- Resource managers;
- Entrepreneurs, forging new partnerships;
- Peer tutors – helping other faculty learn; and

- Self-motivated learners, striving to improve their technical skills.

Using a business analogy, Bill Gates (1995) talks of the role of the teacher in customizing learning.

> Just as information technology now allows Levi Strauss & Co. to offer jeans that are both mass-produced and custom fitted, information technology will bring mass customization to learning...There is an often-expressed fear that technology will replace teachers. I can say emphatically and unequivocally, IT WON'T. The information highway won't replace or devalue any human educational talent needed for the challenges ahead: committed teachers, creative administrators, involved parents, and, of course, diligent students. However, technology will be pivotal in the future role of teachers (p.185).

A timely educational technology implementation strategy will recognize that this may be more difficult for faculty who have been in the system for some time. Younger teachers are more likely to play a pivotal role in retraining (Hoffert, 1998, p. 251). Such a strategy will also recognize and publicly acknowledge that all faculty will not be able to become totally proficient with the new technology. These faculty members should be assured that they will not become obsolete or redundant. There is still a great need for content experts and course/program developers to provide excellent material for those with the skills to complete the technical implementation of the courses.

In his sometimes irreverent book *Insult to Intelligence: the bureaucratic invasion of our classrooms,* Frank Smith (1998) supports this point of view. He suggests that not every teacher

and learner needs to be a computer expert but rather just be knowledgeable enough to know "when they are being bamboozled and when they are being helped" (p.22).

Job Security

Beyond resistance to their changing role as facilitators, faculty have a real concern about job security. Personal experience has clearly shown that many faculty fear that their jobs will be eliminated by the implementation and use of technology. There is no question that educational technology will affect how faculty will do their jobs, but they will have a job if they jump into the arena and become a part of the inevitable change.

Tapscott (1998) gives us some reassurance in *Growing Up Digital*. He tells us that a teacher will always be critical in any learning context in helping to structure the "learning experience" (p.144).

Bill Gates (1999) lends his support to the importance of the teacher in implementing the appropriate use of educational technology.

> The success of PCs as educational tools requires teacher involvement. Without teacher training and integration into the curriculum, PCs will not have a big impact. Many PCs have gone into computer "labs" where they sit, seldom used. Schools need to shift from treating the PC as a subject unto itself — teaching about technology — to integrating the PC throughout the curriculum, teaching with technology (p.338).

What Gates is advocating is what many faculty have long supported - teaching across the curriculum. Gates is simply declaring his support for using educational technology to accomplish this key strategic educational objective. However, faculty will require more empirical evidence about their job security if their fears in this regard are to be alleviated.

Identifying Early Adopters

The early adopters of educational technology need to be identified so they can be nurtured and encouraged along in their work. The early adopters are the "pioneers" who need little encouragement to experiment with learning educational technology and implementing it across the curriculum. Early adopters are the vanguard for the implementation of educational technology. They are the role models other faculty will follow, not only because administrators are likely to sing their praises, but also because learners will.

Anderson, Varnhagen and Campbell (1998) of the University of Alberta present their findings "quantitatively and qualitatively, the attitudes, skills and behaviour of the faculty related to the use of instructional technology at a large Canadian research university" (p71). (This report will be looked at in greater detail later in this chapter). They use the innovation diffusion research of Everett Rogers (1995) as a model. Figure 2 graphically illustrates the Rogers model.

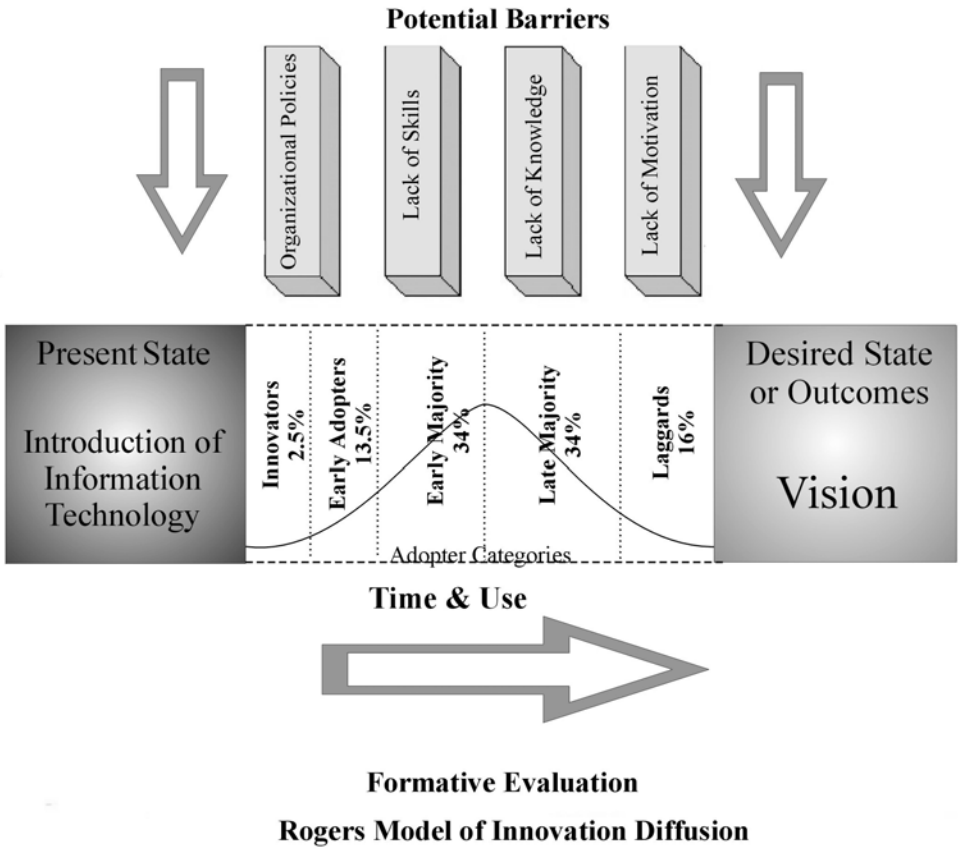


Figure 2: Rogers Model of Innovation Diffusion

Among the factors that are seen as impediments to the adoption of educational technology, the key are organizational policies, lack of skills, lack of knowledge and lack of motivation.

Norman (1999) applies Rogers' model of Innovation Diffusion to the field of technology. He suggests that the leading-edge adopters (the early adopters) need the technology and are prepared to live with both the inconvenience and high cost associated with it to get it. These early adopters keep demanding more and more from the technology. This is why early adopters are

such an important factor in the adoption and advancement of educational technology to promote learning. Only when technology exceeds the basic needs of most of its customers is there a major shift in consumer behaviour. This transitional point is shown in Figure 3.

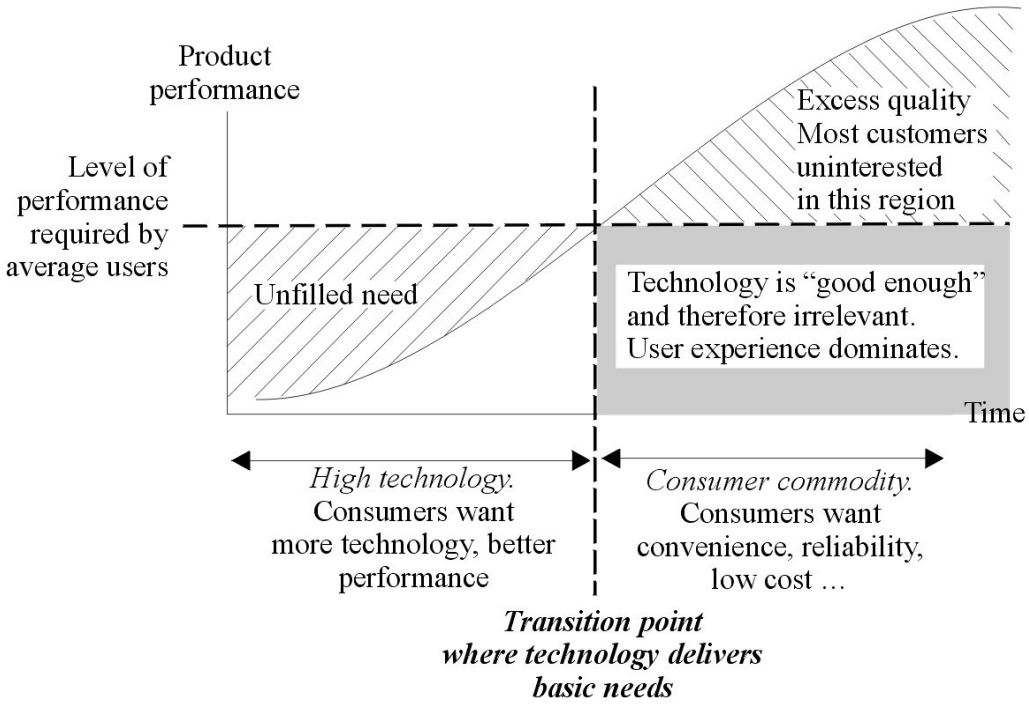


Figure 3: Needs-Satisfaction Curve of Technology

New technologies start at the bottom left of the curve. At this point they deliver less than what the customer needs. Consequently, the customer demands better technology with more features. Little consideration is given to the cost factor. The transitional point occurs when the technology can satisfy the basic needs of the customer.

As the technology matures and satisfies more customer needs there is greater adoption of technology as illustrated in Figure 4.

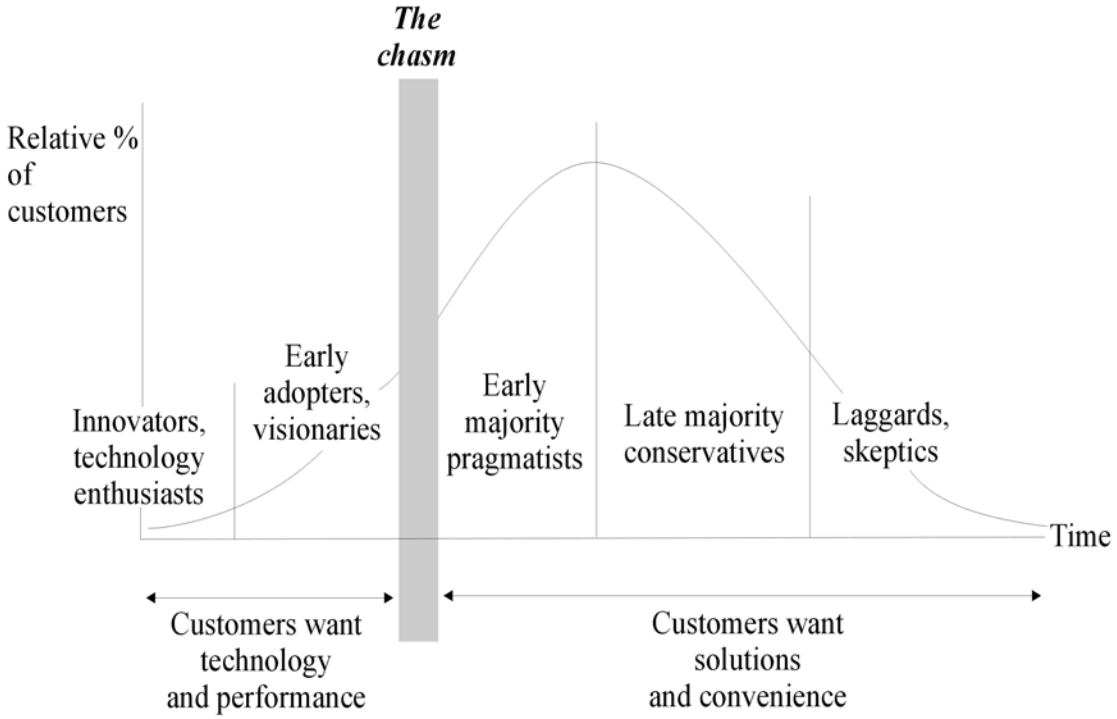


Figure 4: Change in customer adoption as technology matures.

Norman tells us that in the early days of technology, it is the innovators and enthusiasts who drive the market. They are more concerned with the technology than the ease of use and cost, but as time progresses, the 'pragmatists' and the 'conservatives' become the main adopters. This group, the majority, demand ease of use, convenience and solutions. It is this majority in the community college system that needs to be served if educational technology is to be used effectively to promote learning.

The early adopters, though small in number, drive the technology. They make it happen. They are the enthusiasts and the visionaries who need to be nurtured to ensure the advancement of educational technology. As important as the early adopters are, it is the majority, those Norman calls the pragmatists and the conservatives, who will sustain the use of educational technology. This will only happen if their needs are met, if they see some true value in using technology, if this technology is relatively simple to use. This majority will also demand the time to learn to use the technology as a price to adopt it.

Figure 5 illustrates, in Norman's view, the shift from technology-driven products to customer-driven, human centred ones. Technology must prove itself. It must be convenient, easy to use and provide value. It is at this point that educational technology will be truly adopted.

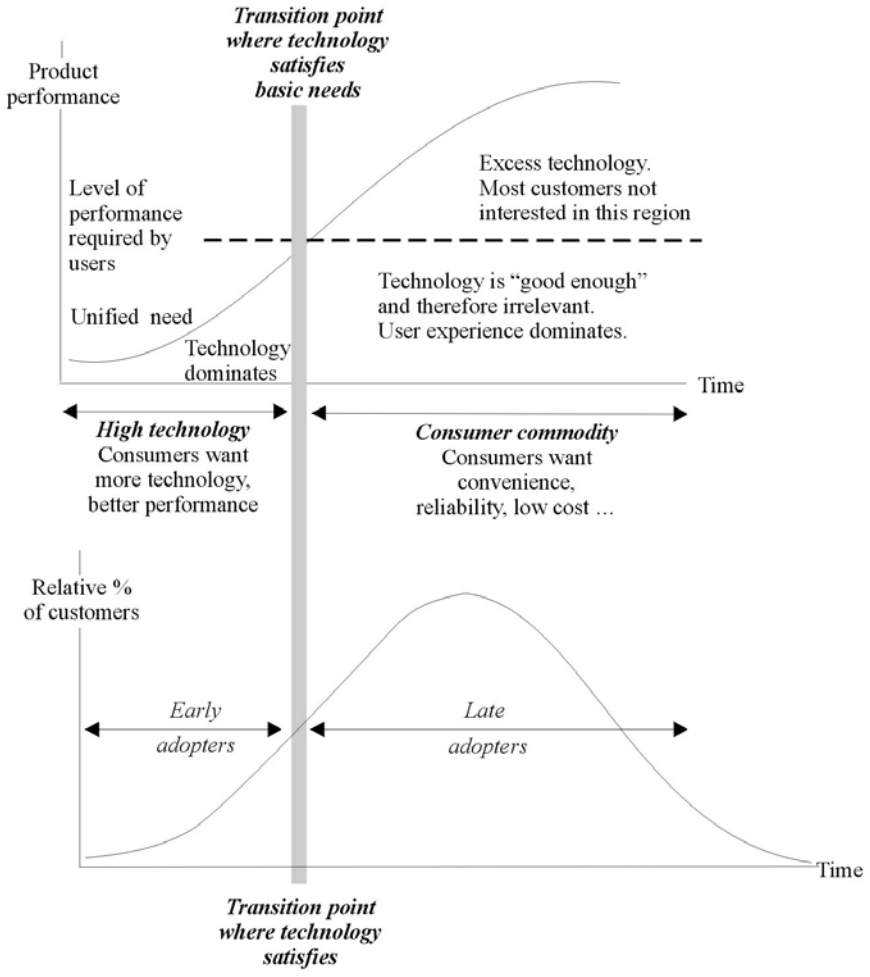


Figure 5: Change from technology-driven projects to customer-driven products.

Marcinkiewicz (2000) makes an interesting distinction between adoption of technology as an innovation and adoption of compliance as part of the infrastructure. They are seen as different strategies to encourage faculty to use educational technology. The basic distinction is that we adopt innovations, but we comply with infrastructure. Creating a dependency on the infrastructure requires both logistical and physical machination. The adoption of educational technology emphasizes communication. Faculty need to be told and shown how educational technology will benefit them. Marcinkiewicz suggests if we create a dependency on educational technology while it is still an innovation, we will be promoting the evolution of the technology and thus changing the user-relationship as well. This, of course, presupposes that educational technology is desirable and worthy of adoption.

Marcinkiewicz also stresses the importance of motivation and its variables in the adoption of technology. These variables are valence, instrumentality, and competency. Referring to Vroom's (1964) expectancy theory, Marciniewicz writes that motivation depends on whether or not the faculty values the outcome (valence). An example of an outcome is improved student learning as a result of the use of technology. Instrumentality refers to whether or not faculty feel their behaviour would contribute to this outcome by learning how to use educational technology in their teaching. Lastly, competence refers to the faculty's capacity to learn how to use educational technology for teaching.

Within the Ontario community college system, it would appear that we have adopted (by default) both a policy of the adoption of technology as an innovation and adoption of compliance as part of the infrastructure. We encourage adoption of innovation, but in many instances we are

forcing adoption of compliance because we feel we simply cannot wait for the former. In planning our strategies, we need to be aware of which policy we are enforcing and encouraging.

Provide Appropriate Training

In many instances faculty are afraid to try educational technology simply because they do not know how. They may be intimidated by it and are too fearful to ask for help.

Bill Gates (1999) makes the following observation about teachers.

> Most teachers have a great love of learning, and they'll get excited about anything that will help kids learn. What teachers don't want is to be thrown into something that they have not had the opportunity to learn about and become comfortable with (p.388).

Oblinger (1999) supports Gates in saying:

> Using technology, in or out of the classroom, is uncomfortable for many instructors since they have rarely (if ever) taken courses using IT and have rarely worked in teams or other environments in which they communicated asynchronously. Part of the challenge in any distributed learning initiative is to help faculty, whose trademark is intellectual prowess, feel comfortable as novices with the technology and pedagogy (p.15).

While Oblinger is referring specifically to the area of distributed learning, it is safe to assume that the same challenge can be applied to all areas of the adoption of educational technology.

Some teachers have a real phobia – "cyberphobia" – about tackling new educational technology and facing their students with it. They are afraid their students will know more about the technology than they do. Further, they fear that they will lose their credibility in the eyes of their students if they make a mistake.

Rewarding Pioneers

Administrators must also be prepared to publically commit to rewarding faculty pioneers in educational technology. Goldman declares that "The easiest way for change to occur...is for administrators to take the lead by indicating that faculty pioneers will be rewarded for the work they do in IT. Absent such a move, it will take a generation of faculty to retire or die before any real shift occurs" (Bollentin, p. 2).

The reward structure must be desirable. It must go beyond just public recognition. An example of such a reward would be to provide funds to purchase additional software to advance specialized skills in the person's field of specialization. The experience of this researcher shows that, in some cases, early adoptors do not want a great deal of public recognition and the multitude of time consuming questions that comes along with it.

Recognition in the form of time-release, upgraded hardware, and software and honorariums are usually well received.

Studies Conducted in the Ontario Community College and University Domain

To set the framework in which the study for the thesis would be carried out a number of studies conducted across Canada and in Ontario were reviewed. This researcher wanted to explore what climate, atmosphere, attitudes and values existed among community college faculty and the university professoriate with respect to the acceptance, diffusion and adoption of educational technology to promote learning. It is hoped that the review of the results of these studies may lead to a useful comparison with the data derived from this thesis.

The researcher first turned to the Association of Community Colleges of Applied Arts and Technology of Ontario for studies that this provincial umbrella association may have conducted. When a web search revealed very little in the way of possible studies to be reviewed, Joan Homer, the Executive Director, was contacted and interviewed. Ms. Homer pointed out that ACAATO does not conduct province-wide surveys where faculty are involved. The main reason is that experience has shown that the return rate is unacceptably low, rendering any possible data obtained unreliable. Where some information is required involving faculty, ACAATO will turn to the literature and possibly conduct some focus groups as a barometer of the climate about a specific issue. This information was later shared with the researcher in a written communiqué (Homer, 2003).

The McGraw-Hill Ryerson Technology and Student Success Study

The next step was to review a national study called ***The McGraw-Hill Ryerson Technology and Student Success in Higher Education: A Research Study on Faculty Perceptions of Technology and Student Success (2002)*** along with the preliminary results of the follow-up Wave 4 study which was just released as this thesis was being written (January 2003). This study was selected because it is current, deals with a number of issues with which this thesis is concerned, and specifically surveyed college faculty along with university faculty. While the participation rate was higher from university professors (56%), there was significant participation from college faculty (42%). Some comparison with the actual data from the McGraw-Hill Ryerson study and the data from this thesis will be made in Chapter Four - Survey Findings.

The overall objectives of this study were to update opinions of university and college faculty with respect to student success and related issues and to capture the most recent trends in the use of instructional and web-based technology. In addition to these overall objectives this study had one key research objective which was of particular interest to this researcher. This key research objective was to assess the challenges faculty face in adapting to web-based and instructional technology.

The Demographics of McGraw-Hill Ryerson Study

Initially a total of 22,439 college/university faculty were contacted by email with a second contact being made with 14,939 faculty members. The ultimate sample size was 1,189 completed questionnaires for a resultant return rate of 7.96%. The study was conducted on a national basis.

Departmentally, the highest participation rate came from the Sciences/Engineering/Math department (38% of the total sample), Business and Economics (25%), Social Sciences/Humanities (19%) and the Arts (13%).

There was a broad range of teaching experience in this wave of the study. Forty-two percent (42%) of the respondents had more than fifteen years of teaching experience while another thirty-six percent (36%) had only up to ten years of teaching experience.

In terms of gender sixty-five percent (65%) of the respondents were male and thirty-five percent (35%) were female. The vast majority of the respondents (87%) were thirty-five (35) years of age or older with the largest group (38%) being between the ages of forty-five (45) and fifty-four (54).

Key Issues

Student success and course preparation are indicated universally as the key issues followed by training and professional development and web-based Technology. It is interesting to note that respondents indicated that computer technology followed by libraries, teacher tutoring and career/job counselling are the most effective campus resources to maximize success.

Technologies (evaluating technology and using a course web site) are shown to be the lowest course preparation activities, but when it comes to course content faculty acknowledge textbooks and technology as the most important delivery tools.

To achieve their professional development objectives, respondents first rely on learning and teaching workshops and second, on campus teaching and technology resource centres. However, the study suggests that there still exists a requirement for enhanced training and professional development in a number of areas. Unfortunately, these areas are not named.

Web-Based Technology

Attitudes towards web-based content and technology is very positive. Between one-half and three-quarters of the respondents view web-based content as highly important and useful and are committed to investing more time as well as to increasing their use of this type of technology. In keeping with this commitment, respondents strongly agree that they require support in locating

and implementing “effective” web-based technology. This finding is consistent with the expressed need for relevant workshops and technical support.

Study Conclusions

While the perceived importance of technology has not increased since the last two surveys conducted by McGraw-Hill Ryerson, the incidence of the use of course web sites has also stalled. Nonetheless, the study concludes that attitudes towards web-based content and technology are very positive and respondents are clearly committed to investing more time in these areas. The emphasis appears to be more on the effective use of web-based content and technology rather than on expanding its use. The data suggest that respondents know how they want to use the web and its content but, more importantly, they require support for its effective utilization, integration and implementation.

McGraw-Hill Ryerson commissioned a follow-up to the above study which was conducted in December 2003, with a summary distributed to participants and interested parties in January 2003. Because this researcher has had some involvement with McGraw-Hill Ryerson, a pre-publication copy of this report was received. The title of the document is McGraw-Hill Ryerson Survey Summary: “The Role of E-Learning in Student Success” - Wave 4.

The following highlights the results of this study.

- since 1999, the importance of technology as a resource has increased dramatically and currently approaches training/professional development in terms of importance
- technology is acknowledged to be the number one resource for encouraging the success of university/college students
- of the community college respondents eight-seven percent (87%) reported engaging in some form of training in the past year
- respondents indicated that a wide range of training resources were needed with funding and technical support being preferred;
- respondents continued to indicate that they require more specialized knowledge and more implementation and learning time
- over time the need to access basic software and hardware is being met and accordingly assigned less importance
- while the majority (59%) of the respondents are delivering their courses exclusively on a face-to-face basis, the rest are incorporating some online course delivery
- the majority of respondents (54%) indicate they use a web site to post homework assignments and marks

Faculty Adoption of Teaching and Learning Technologies Study – Anderson et al

A study conducted at the University of Alberta by Anderson, Varnhagen and Campbell (1998) called ***Faculty Adoption of Teaching and Learning Technologies: Contrasting Earlier Adopters and Mainstream Faculty*** was also reviewed. This study was of particular interest

because a number of areas studied were similar to or parallelled areas covered by this thesis and will serve as a point of comparison and possible validation of the data gathered in this thesis with the caution that the target audience and the time frame are different.

This study gathered both quantitative and qualitative data which were analysed with respect to Rogers' (1995) categories of adoption of innovation which were discussed earlier. In addition, the study discussed the four factors that have tended to create a chasm (as postulated by Geoghegan, 1994) between early adopters and the mainstream faculty. These four factors are the following (pp. 74-76):

1. **Ignorance of the gap**. Moore (1991) suggests that there is a chasm between innovators and early adopters and mainstream faculty. This study attempts to quantify the differences in terms of demographics, use and attitude towards learning technologies.

2. **The "Technologists' Alliance"** which describes the problem created by self-serving alliances between special interest groups. This alliance is usually forged between faculty innovators and early adopters, technology support staff and vendors. This alliance is often problematic mainly because these groups share a common interest, often to the possible exclusion of other groups.

3. **Alienation of the Mainstream.** Many faculty feel alienated from the culture of technology because of the high priority given to it and the resultant diversion of funds and

attention from other projects in which they may be involved or from which they may benefit.

4. **Lack of Compelling Reason to Adopt.** Geoghegan points out that applications are seldom implemented in such a way as to demonstrate their pragmatic value or how the financial benefits exceed the cost of adoption.

Anderson et al. defined “instructional technology in the more common use of the word as the tools, media and methods developed to facilitate the teaching or learning processes” (p.73). This definition encompasses a somewhat broader scope than the definition of educational technology used for this thesis. This fact must be kept in mind when comparisons are made to the baseline data.

The survey entailed the mailing of an extensive questionnaire to all full-time faculty (1,487) at the University of Alberta. Approximately 37% (557) of the faculty responded. The findings were reported in six sections. These sections are the differences in self-assessed competencies, profiles of the Early Adopters and sections relating to the four factors (described directly above) that contribute to the chasm between early adopters and mainstream faculty.

The findings of this study are summarized below.

1. **Instructional Technology Use**

Faculty were asked to rate their skills at novice or higher on word processing, electronic mail and library database searching (p. 71).

- More than 90% of faculty rated their skills at novice or higher on word processing, electronic mail and library database researching.
- Internet skills (browsing, email list, or newsgroup use) also had over 90% reporting some use, but the number of users reporting excellent or good level dropped below 50%.
- The categories relating to the actual production of learning materials, such as presentation software, WWW page creation and course authoring software, had much lower rates of self assessed competence. Most respondents reported no experience with these instructional tools with the exception of presentation software such as PowerPoint.

From these findings, the authors conclude that faculty are using information tools which are perceived as being valuable for those functions which directly relate to their area of professional interest (p. 77).

The study also revealed that respondents perceived information technologies to be useful for enhancing communications and collaboration between academics, but less than 43% of the respondents believed that instructional technologies improved contacts with students, the quality of teaching or their productivity as teachers (p. 79).

2. **Profile of Early Adopters**

The results of this study indicate that early adopters were younger than the mainstream faculty and were more likely to be members of the Science and Engineering faculty and less likely to be members of the Faculty of Arts. The data also suggest that faculty are generally quite heavy computer users with a mode of three to five hours a day spent on the computer.

3. **Ignorance of the Gap**

Early adopters reported higher perceptions of efficacy in the use of technologies and were significantly more likely than mainstream faculty to believe that technology had improved the quality of their teaching and improved their communication with their students and colleagues (p.81).

4. **The "Technologists' Alliance"**

The survey revealed that early adopters are not spread evenly among the faculties and consequently that the alliance is probably not evenly distributed (p. 82).

5. **Alienation to the Mainstream**

Comments derived from the survey support the concept that alienation exists between mainstream faculty and the social and cultural underpinnings of technological enhancement to teaching and learning (p.83).

6. **Lack of Compelling Reasons to Adopt Instructional Technologies**

The survey revealed nine factors identified as either major or minor barriers by respondents. These barriers are the following:

(I) lack of institutional or departmental funding

(ii) lack of time to learn technologies

(iii) classroom infrastructure

(iv) adequate computer hardware/connectivity

(v) lack of institutional incentives

(vi) knowledge about applying technology to teaching

(vii) access to software

(viii) central or departmental training and support

(ix) lack of information about available technology

Theses Reviewed from The Ontario Institute for Studies in Education of the University of Toronto

Three theses from the Ontario Institute for Studies in Education of the University of Toronto were also reviewed. The theses were the following:

- ***Teaching and Styles and Faculty Attitudes Towards Computer Technology in Teaching and Learning at a College in Ontario*** - a thesis written by David G. Lloyd in 2001

- ***Acceptance of Web Technology based Education by Professors and Administrators of a College of Applied Arts and Technology in Ontario*** - a thesis written by Saketaram Surendra (2001)

- ***An Examination of the Experiences Which University Teachers Have in the Process of Incorporating Computer Mediated Instruction Techniques into Their Courses*** - a thesis written by Richard M. Malinski (2000)

What follows is a summary of the theses as they relate to this thesis.

Teaching Styles and Faculty Attitudes Towards Computer Technology in Teaching and Learning at a College in Ontario – Lloyd

The purpose of Lloyd's thesis was to examine the teaching styles and attitudes towards the cognitive effects of using technology in instruction. Lloyd (2001) administered a survey

instrument to full-time postsecondary faculty at his own college with a final response rate of 40%. Of the valid questionnaires completed, 54.4% were completed by men and 45.6% completed by women. The instrument included seven demographic questions, a teaching style inventory (TSI), three computer attitude scales, a behavioural control, and an instructional computer use scale. Lloyd pointed out that there are a number of common elements in one's teaching style. The most common elements suggests that teaching style manifests itself in the teacher's behaviour, is consistent and stable for the individual teacher and has its origins in the teacher's educational philosophy or beliefs.

Lloyd (p. ii) concluded the following:

- Faculty had positive attitudes towards the cognitive effects of computers in instruction but were more positive about the cognitive effects of computer technology on themselves and their students than the learning environment.
- Faculty were confident about computers and were also using computers in instruction in significant numbers.
- Despite this level of confidence advanced users of computers in teaching were still unusual.
- Women were perceived to be more learner-centred but less likely to believe that computer use in teaching affected them positively, and were less confident than men.
- Faculty in technical programmes were more teacher-centred and confident while faculty in arts, music and theatre were more learner-centred.

Lloyd's final conclusion, after careful analysis of the results with the norming data, is that the instrument used "...should not be used for any future studies involving college faculty in Ontario without undergoing an extensive revision process" (p.128), without adjustments being made. He further warns that "...it would be unwise to assume that the rate of instructional computer use seen in the sample could be extrapolated to the population" (p. 131).

Lloyd makes a number of salient points which are relevant to this thesis, the most significant being:

- Inconsistencies in various studies about the type and level of computer experience among faculty could be accounted for not only by the amount of computer experience but also by the type.
- The literature suggests that the measure of computer competency is a good predictor of computer use in instruction and that any computer competency scale should be designed with a context to satisfy the requirement of the type of computer experience a faculty member has.
- There is a need to bring some consistency to the terminology relating to the human-computer characteristics. A plethora of terminology exists in the literature including such phrases as computer experience, computer competence, computer commitment, computer exposure, computer confidence, computer anxiety and computer relevance.
- The literature does not adequately distinguish among the types of training faculty need. Faculty who do not use computers in instruction will need a different type of training than those who do.

Acceptance of Web Technology based Education by Professors and Administrators of a College of Applied Arts and Technology in Ontario – Surendra

The purpose of Surendra's thesis was to examine the extent to which diffusion factors proposed by Fullan, Rogers and Clinton are useful in predicting the acceptance of innovative educational web technology in a college setting. Surendra administered questionnaires to 552 academic managers and professors of his own college and received 109 responses for a return rate of 20 percent.

Among the major findings of this thesis are the following:

- Access to information is the most crucial of all the diffusion factors.
- Among the various types of access to information, training was found to be the best facilitator of successful adoption of educational web technology by managers and professors.
- Administrators were generally found to be more accepting of the web-based educational innovation than professors.
- The more positive the perception of the diffusion factors for web based educational innovations, the higher the acceptance or adoption of innovations.
- There is no relationship between years of service at the college and user acceptance of innovation or user perception of diffusion factors.
- There is no relationship between the computer knowledge of the adopter and acceptance of innovation.

- There is no relationship between years of computer usage and user acceptance of innovation or user perception of diffusion factors.
- There is a relationship between the computer knowledge of the adopter and acceptance of innovation.

There are a number of salient points derived from Surendra's study which are germane to this thesis. Two key points are the following:

- The social interaction theory deals with the process by which an innovation is adopted once the innovation becomes available to the potential user. This theory suggests that once a few members of a group, in this instance the faculty, have adopted an innovation, the innovation spreads quite naturally to the other members of the affiliated social community through the process of social interaction. (Surrendra, p. 15).
- Fullan's Theory of Educational Change suggests that "Diffusion is only a process and not an event. Hence, it occurs over a period of time. Some of the diffusion factors may be present throughout the diffusion process, and some may not be present at all. As more and more diffusion factors are present and felt or perceived by the users/adopters, the better the diffusion process will be (Surrendra, p. 23).

To examine the extent to which the diffusion he was exploring was useful in predicting the acceptance of educational technology in a college setting, Surrendra proposed six hypotheses (p.50), of which three were accepted and three were rejected.

The three hypotheses which were accepted were the following:

1. The more positive the perception of the diffusion factors in web technology based on educational innovation, the higher will be the acceptance/adoption of the innovation
2. There is a difference in perception of the diffusion factors in web technology based educational innovation between professors and administrators.
3. There is a relationship between computer knowledge of the adopter and acceptance of innovation.

The three hypotheses which were rejected are the following:

4. There is a relationship between age and acceptance of innovation.
5. There is a relationship between years of service at the college and acceptance of innovation or user perception of diffusion factors
6. There is relationship between years of computer usage and acceptance of innovation or user perception of diffusion factors.

An Examination of the Experiences Which University Teachers Have in the Process of Incorporating Computer Mediated Instruction Techniques into Their Courses – Malinski

The main purpose of Malinski's thesis was to explore the experiences of a small number (12) of university faculty in their incorporation of computer mediated instruction techniques

(CMIT's) into their teaching and to draw patterns from these experiences, wherever possible. Malinski is quite clear about pointing out the dangers of making generalizations from such a small data base but points out that "... many of the experiences and issues noted do resonate throughout the literature ..." (p. 137)

Some of the salient points drawn from this thesis which have a bearing on the current research include the following:

- The incorporation process is not so much a monolithic one, but a series of sub-processes (p.117) or "...not so much a grand transformation as there is a slow modifying drift within the set of current processes" (p. 124). One sub-process, in particular, that should be noted is that many faculty begin to use their computers for professional and administrative work before they use them for teaching.
- There were no right or wrong routes in education, but a selection of many more or less successful ones (p. 117).
- As part of this transformational process the faculty members involved in the study talked about the transformation of the students as well. The goal was to broaden the perspective of their students and to develop a creative team approach to relevant problem (p. 121).
- Participants of the study also expressed concern about some possible negative impacts for students, such as an increased workload as the student learns new software, possible lack of access, insufficient technical support and the cost of equipment (p.121).
- Finally, Malinski outlines four policy implications:

    1. The need to train and develop faculty both in CMIT's and instructional design.

2. The need to develop a supportive technical infrastructure.
3. The need for clarification of intellectual property in electronic format.
4. The need for synchronization of strategy formulation and implementation at all levels.

Asking the Right Questions

Addressing educational technology issues can become very emotional depending on whether we view educational technology as a “Magic Bullet” or a “Broken Arrow”. Consequently, even asking the right, unbiased question to promote discussion can become difficult.

The American Federation of Teachers (1996) proposes four reasonable questions to ask about educational technology issues. The four questions are the following:

1. Does the technology make sense educationally? Will it really advance student learning and scholarship?
2. Does the technology make sense financially? Is there a realistic cost/benefit analysis?
3. Will students and faculty all have access to the new technology and know how to use it?
4. Are the rights of the faculty and professional staff protected (p.13)?

On the surface, these questions may appear simple, but they have serious ramifications. The development of the model to promote learning through the use of educational technology will

take these questions into consideration. The model will ensure that the use of technology will make sense educationally, that it is realistic, that students and faculty will have access to it, and that the rights of faculty will be taken into account.

Guidelines for Developing Strategies for Change

While technological change will undoubtedly sweep across the Ontario community college system, its impact on learning and a learner-centred curriculum will prove more beneficial to an individual College if there is a planned and accepted educational technology strategy in place. Such strategies should help avoid extremes that occurred at UCLA and York University.

At UCLA Administrators implemented the "Instructional Enhancement Initiative", making web sites mandatory for all their arts and science courses. Professors at York University went on strike to obtain contractual protection against distance learning and technology (Noble, 1997, p.1).

Such strategies must be based on equitable considerations. Beyond the four questions posed by the American Teachers' Federation, Professor Bates (1997, p.3), the Director of Distance Education and Technology, Continuing Education at the University of British Columbia, gives us four sound reasons for using educational technology.

- to improve access to education and training
- to improve the quality of learning
- to reduce the costs of education
- to improve the cost-effectiveness of education

Since the primary purpose of this thesis is to examine factors that either encourage or discourage faculty from adopting educational technology as a tool to enhance learning, the economic factors will not be discussed.

In *Restructuring the University for Technological Change,* Bates (1997, pp.8-22) goes on to suggest twelve organizational strategies for change which, while developed for the university, can be applied to the community college environment.

- A vision for teaching and learning
- Funding re-allocation
- Strategies for inclusion
- A technology infrastructure
- People infrastructures
- Student computer access
- New teaching models
- Faculty agreement and training
- Project management
- New organizational structures
- Collaboration and consortia
- Research and evaluation

The research to be carried out for this thesis hopes to provide some empirical evidence to support or deny the validity of these strategies.

Research Questions

The primary purpose of this thesis is to investigate the perception of Ontario community college faculty about the use of educational technology. To achieve this purpose the following key questions will be addressed.

1. What are faculty's views on educational technology as a tool to promote student learning in the community college system?
2. Are these views consistently held by all faculty? If not, what is the nature and variance of their views?
3. Do faculty use educational technology as a tool to promote student learning in the community college system?
    - If yes, how do they use educational technology?
    - If no, why not?
4. What is the nature and the extent of their use of educational technology?

The data required to address these questions will come from a questionnaire to be administered to selected community college faculty. The issue of the number of questionnaires to be administered and where and how they will be administered is addressed in the Methodology section of this thesis.

The Literature Review suggested a number of questions for which data will be collected through the questionnaire. These questions are germane to the key research questions posed above.

The questions resulting from the Literature Review are outlined below with the subheading from the Literature Review section in which they were discussed.

Questions Derived from the Literature Review

Social Context of Technology

- The implementation of educational technology often results in unintended consequences or causes problems which were not clearly anticipated. What are some of the possible unanticipated problems?
- What are the key reasons for resistance to change imposed by educational technology given by the faculty studied?
- To what extent do the faculty studied feel a loss of control with the further implementation of educational technology?

Dynamic Tension of Polarities

A number of questions will be included in the research instrument to allow for the descriptive categorization of the sample.

Magic Bullet or Broken Arrow

- What are considered the key benefits of educational technologies?
- What are considered the key drawbacks of educational technologies?

Faculty Fears

- What are the key fears?
- Does educational technology make faculty feel defensive about their role in the learning process?
- Are faculty concerned about losing control as key players in the development and delivery of learning material?
- Are faculty concerned that educational technology will not meet the learning style needs of many of their students?

New Faculty Role

- Do faculty see themselves as taking on a new role with the introduction of educational technology?
- If so, what do they see this new role to be?

Early Adopters

- What are the key characteristics of early adopters?
- What are the key factors that affect the speed and rate of adoption of educational technology by early adopters?

Providing Appropriate Training

- What type and level of training does faculty require to prepare them for the appropriate implementation and use of educational technology?

Rewarding Pioneers

- What type(s) of rewards are necessary to encourage faculty to adopt educational technology?

Chapter Three

Research Methods

Introduction

The purpose of this chapter is to set out the procedural aspects of this thesis. The ontological issue of what is real was dealt with by selecting a quantitative approach using a survey instrument. This quantitative approach was more likely to allow a high degree of objectivity to find out "what is out there" independent of the views of the researcher and to hold the researcher at a distance from what is being researched. The axiological assumption is that the research will be as value-free and unbiased as possible. This is particularly important in this study because of the researcher's strong and consuming involvement on a daily basis in the use of educational technology as a tool to promote learning in the Ontario community college system. This chapter, then, reports on the approaches considered, how the survey instrument was developed and tested and finally how the survey instrument was administered and the data analysed.

Development of the Research Instrument

The survey instrument was designed to address the purpose statement, the four key research questions postulated and the questions that arose from the literature review. There are close interrelationships among the three components. The research questions support the purpose statement. The questions derived from the literature review flow from the research questions. And ultimately, the questions addressed by the literature review are a reflection of the purpose statement.

The questionnaire design called for the intertwining or interweaving of a number of the questions to check the validity of the key questions. This was done by attempting to get responses by asking the questions from different perspectives.

To ensure that this relationship was rigorously maintained, a matrix was developed and used to show the relationship. Each section of the purpose statement, each key research question and each literature review question was coded and related to the questions of the survey instrument to ensure the integrity of the questionnaire. While a psychometrical component was not included in the questionnaire design (mainly because of the extensive nature and length of the questionnaire) the questionnaire was extensively tested as outlined below.

Initial Testing of the Survey Instrument

After the first draft of the questionnaire was developed, the design was discussed on a one-to-one basis with five faculty members to get some initial feedback. Based on this feedback, some adjustments to the questionnaire were made. These adjustments revolved mainly around the clarification of the wording of the questions to make them easier to understand. Suggestions were also made to avoid the usage of certain words that could conjure different meanings in the minds of various respondents depending on their experiences. For example, it was suggested that the word instructor should not be used in the questionnaire. Instructor is a classification that is being considered in addition to the professor classification being currently used in the Ontario community college system. The term instructor raises some negativity in the minds of some professors.

The sample questionnaire was then distributed to twenty faculty members to complete and provide additional feedback. Further changes were made to the design based on this feedback. The questionnaire was then forwarded to the thesis committee where fine-tuning took place and the questionnaire design was approved. A flowchart illustrating the survey protocol cycle is found in Appendix A. A copy of the questionnaire used is found in Appendix B.

Approaches Considered and Explored

After the initial survey instrument was approved by the thesis committee, the researcher met with personnel from the Research Consulting Services of the Curriculum, Teaching and Learning (CTL) Department at the Ontario Institute for Studies in Education of the University of Toronto (OISE/UT) and subsequently the Director of Institutional Research at Sir Sandford Fleming College. The group is known as Fleming Data Research (FDR). Based on the physical proximity of FDR to the researcher and the group's considerable experience in administering such surveys within the Ontario community college system, the researcher decided to work with this group in carrying out the research for this thesis.

After considering a number of methods for distributing the survey instrument, the researcher (on the recommendation of FDR) selected to distribute the questionnaire through electronic mail (e-mail). The main factors were the speed of the expected return and this method of distribution being the least expensive and labour intensive.

Fleming Data Research agreed to create and administer the electronic-based survey and collect the data while ensuring confidentiality. It also agreed to tabulate the results and submit the data to the researcher for further analysis. The software used was the Statistical Package for Social Sciences (Version 10.0 for Windows), commonly known as SPSS. FDR also agreed to act as a consultant to the research throughout the process.

While there were some significant advantages to taking this approach, there was a major concern that could not be ignored. Would the use of a research instrument administered electronically favour a response from those faculty who were already using educational technology and eliminate those faculty who are uncomfortable with or simply avoid the use of educational technology?

Green (2000), in his widely distributed report entitled Campus Computing 2001, indicates that a majority of faculty in colleges and universities in the United States are using e-mail, at least to some degree, in the delivery of instruction. This suggests a reasonable comfort level with the use of e-mail by faculty.

It is generally accepted that the use of e-mail is even greater in Canada. The results of a random check of 10 Ontario colleges (Mior, 2001) showed that one hundred per cent of faculty at these colleges have access to e-mail and have their own e-mail address. One would expect the same level of access to be available at the other community colleges.

In the 13th OISE/UT survey *Public Attitudes Towards Education in Ontario 2000*, the data indicate that while more than half (56 %) of the respondents have access to the Internet from their homes, a significantly larger proportion of teachers (80%) have Internet access at home (Livingstone, Hart & Davie, 2001, p.45).

In conducting the research for McGraw-Hill Ryerson's third edition of *Technology and Student Success* 15,000 Canadian and 8,000 American faculty members received e-mail invitations to take part in the study. The authors note that given the choice of completing the survey online or over the telephone less than seven percent chose the latter suggesting a good comfort level with the technology (McGraw-Hill, 2001, p.4).

Given this background information, the thesis committee accepted the proposal to carry out the survey on the Internet.

Sampling Technique

All the data required for the following stratification procedure are found in Table 3.1.

Table 3.1 Number of Full-Time Students and Full-Time Faculty

Rank	College Name	Students*	Faculty**	% Faculty	Quest. Req'd
1	Seneca	10,428	612		
2	Humber	7,657	402		
3	Fanshawe	7,520	350		
4	Algonquin	6,722	460		
5	George Brown	6,607	399		
6	Centennial	6,371	433		
7	Sheridan	6,245	304		
8	Mohawk	5,268	397		
	Large Size Colleges (8)		3357	57.4	230
9	St. Clair	3,874	233		
10	Niagara	3,843	205		
11	S. S. Fleming	3,691	205		
12	Georgian	3,422	221		
13	Durham	3,437	232		
14	Conestoga	3,287	241		
15	St. Lawrence	2,767	197		
16	Cambrian	2,603	211		
	Medium Size Colleges (8)		1745	29.9	119
17	Canadore	2,022	149		
18	Confederation	1,869	147		
19	Loyalist	1,839	134		
20	Lambton	1,475	97		
21	Sault	1,421	137		
22	Northern	889	76		
	Small Size Colleges (6)		740	12.7	51
TOTAL		93257	5844	100	400

* Data supplied by Brenda Pander-Scott, Director of Institutional Research - Sir Sandford Fleming College 08/06/01.

** Data obtained from the Council of Regents Web Site 28/03/03

The colleges were stratified by the number of students enrolled rather than by region. The underlying assumption was that the institutional educational technology infrastructure would more likely be determined by the number of students using the system (and commensurate budgets) rather than the geographical location of the campus.

Colleges were allocated to the large, medium or small category based on the total full-time student enrollment. Colleges with an enrollment of more than 4,000 students were placed into the large category. A total of eight (8) colleges fell in this category. Colleges with enrollment between 4,000 and 2,001 students were placed into the medium category. A total of eight (8) colleges fell in this category. Colleges with an enrollment less than 2,001 students were placed into the small category. A total of six (6) colleges fell into this category. In total, twenty-two colleges (22) were considered for inclusion in the sample. The Francophone colleges were excluded from the sampling procedure.

The number of full-time faculty for each college was obtained from the Council of Regents' website. While full-time counsellors and librarians are part of the same bargaining unit as full-time professors they were excluded from the sample since they would not be teaching on a full-time basis. Similarly, part-time and sessional faculty were excluded from the sample because there is no easy way of determining how many hours individual faculty teach. Assigning an equal weighting factor, for example, to a faculty member who taught for only three (3) hours a week as to a faculty member who taught eighteen (18) hours could possibly skew the results. The percent of faculty teaching in each college category [large (57.4%), medium (29.9%) and small (12.7%)] was calculated to determine the number of responses required for each category.

Both CTL Research Consulting Services and FDR recommended a completed sample size of 400 faculty. With a population size of 5844 (the updated number of full-time faculty in the Ontario community college system as reported by the Council of Regents at the actual time that the survey was being prepared for distribution), the number was adjusted to a total of 375 completed valid surveys rendering a confidence level of 95%, with a margin of error of ±5%.

Fleming Data Research was asked to randomly select the colleges that would be surveyed. Two colleges from each category were randomly selected for a total number of six colleges. Because of the difficulties encountered in obtaining timely approval to distribute the survey instrument from the above colleges, the target sample was modified after consultation with FDR and the approval of the thesis committee. The details of how the target sample was changed are discussed in the Timing and Sample Realignment section of this chapter.

A total of 210 completed valid surveys was received. This provides a confidence level of 95% with a margin of error of ±7%. A 95% confidence level means that if this survey was repeated with the same population, the same or similar results would be obtained 95 times out of 100. A 7% margin of error means that if 80% of the faculty indicated that they had a computer, then the actual number of faculty with computers in the target population would range from ±7%, or 73% to 87%.

Distribution and Data Collection

With the guidance of the researcher, FDR converted the paper-based survey for delivery via the web. The penultimate web-based survey was then piloted to ensure that it could be easily viewed with different web browsers, was clearly understood by the faculty answering the questionnaire and that the responses were accurately received. Details of the pilot study are given later in this chapter.

FDR provided the researcher with an electronic link to the survey. This link was then provided by the researcher to each of the Vice-Presidents Academic (VPA) at each of the targeted colleges. A sample of the correspondence sent to each college is provided in Appendix C.

Each college was asked to use its full-time faculty email distribution list to invite all faculty to participate in the survey. These distribution lists contained the email addresses for all full-time faculty at the college. This means that all full-time faculty in each participating college had an opportunity to participate in the survey. The researcher, at no time, had access to the actual email addresses of the participants adding a degree of confidentiality for the participants.

To ensure the maximum level of confidentiality practically possible, FDR used Perseus software to set up the survey so that when the submission button was clicked by the respondent, the survey was sent back via the web to an FDR electronic mailbox. It came back to the FDR mailbox without identifying the individual email account of each respondent. The respondent's email address for each response coming back to FDR was shown as "nobody." Therefore, neither

FDR, the researcher nor the managers of the server was able to identify the individual completing the survey. This also meant that the researcher did not know from which individual college the response came. However, for analytical purposes, respondents were asked to self-identify the college size category in the survey.

All completed raw survey data were imported from Perseus into the Access database and from Access into SPSS by FDR. A group summary report by question that included frequencies, percentages and all comments was prepared by FDR. This report, along with all the necessary computer files, were given to the researcher to complete the analysis for the thesis. These data, along with the resultant electronic files generated from these data, have been burned to a Compact Disk and will be stored in a safe location both at the researcher's college and home offices for a period of five years.

Final Testing and Pilot Project

To ensure that there were no technical difficulties both with the distribution of the survey instrument and electronically collecting the data, a final pilot project was conducted with randomly selected faculty at Sir Sandford Fleming College. This pilot project also afforded the researcher one final opportunity to ensure that the survey instrument was clear, easy to read and follow and could be filled in easily.

An invitation to participate went out to twenty randomly selected faculty. The president of the local union was specifically asked to participate to ensure that there were no questions or wording that would prevent the union from supporting this project. The participants were asked to

complete the survey and return it within one week. They were also asked to comment on how long it took to complete the survey, the clarity of the survey questions and the ease of completion. Eleven faculty (without any follow-up on the part of the researcher) completed the survey and personally sent the researcher comments about specific questions which would add to the clarity of the reading of the survey instrument. The pilot study also allowed the researcher to remedy a technical difficulty that was encountered by some of the participants.

Support for the Study

Each Vice-President Academic for the targeted colleges was contacted to explain the purpose of the study, the potential benefits to the college system and to gain his or her endorsement and support. After the initial contact, regular communications (such as electronic and paper postcards) were sent to each of the VPAs to keep the request in the forefront of his/her busy agendas.

The support of the local union executive at each college was solicited. The president of the researcher's local union reviewed the project and endorsed it. This endorsement was communicated to each local union along with the copy of the information sent to each college VPA. Support was received from each union local.

The President of the researcher's college also personally contacted the Presidents of each college asking for co-operation in ensuring that the survey would be distributed within his/her college.

Timing and Sample Realignment

The initial request for participation went out to the selected colleges at the beginning of the semester in January 2002. Some of the colleges responded quickly while others had further queries which were answered as quickly as possible. The colleges with the fastest response were those which did not have an applied research committee. Despite regular follow-up on the part of the researcher, it became apparent after four months that the colleges which had not agreed to participate, to date, would need to be replaced in the sample in order for the project to proceed.

After further consultation with personnel from FDR and with the approval of the thesis committee, a request for participation in the study went out to a number of colleges. These colleges were selected because each college had, on staff, a member of the Community College Leadership Program Cohort and were familiar with and supported this project. Sheridan, George Brown and Durham Colleges agreed to be included in the sample. These colleges were replacements for the originally selected colleges which for whatever valid reasons, were unable to respond with the required time line of the survey. With these colleges included in the sample, the final surveys were collected by mid-April.

Return Rate

Table 3.2 shows the colleges included in the final survey and the return rate. The number of surveys emailed is based on the assumption that all full-time faculty at each college received an email inviting them to participate in the study. The response rate can only be calculated by size

category. To maintain a high level of confidentiality, respondents were asked to classify themselves by college size rather than by the actual college to which they belong.

Table 3.2 Colleges Surveyed

Category	Name	Surveys Emailed	Surveys Returned	Percent Returned
Large	George Brown	399		
	Sheridan	309		
		703	76	10.8
Medium	Durham	232		
	Niagara	205		
		437	85	19.5
Small	Canadore	149		
	Sault	137		
		286	48	16.8
	Total	**1426**	**209***	**14.7**

* The actual number of surveys returned was 210. One respondent did not indicate the college size category.

The return rate was disappointing and lower than the researcher had originally anticipated. In retrospect, the researcher hypothesised a number of reasons for this return rate. Approval to conduct the surveys took significantly longer than anticipated. While the initial request to distribute the survey went out in January with an anticipated distribution of the surveys in February, this did not happen. Many of the surveys were not distributed until March and April which is a critically busy time of the year for most faculty. This is a period when end of semester

marking and final exams with all the associated administrative work consumes a great deal of the faculty's time.

Survey fatigue is another issue which may have played a factor in the less-than-anticipated return rate. More than ever, faculty are regularly requested to complete surveys both from internal and external sources. Ironically, the use of technology and the easy with which surveys may now be administered and the data collected can lead to the increase of survey fatigue. In several instances, colleges advised the researcher that they had already conducted an internal survey regarding faculty's technology requirements and that this would inhibit the response rate. With the increase of the number of college leaders in Masters and Doctoral programs, the number of province-wide surveys has increased significantly in the past three years (Homer, 2003). The survey itself was rather lengthy which may have intimidated some of the potential respondents.

If the researcher's own college had been included in the sample, it is expected that the return rate would have been improved significantly because the researcher is well known at all campuses and sits as the faculty representative on the Board of Governors. Understandably, the researcher's own college was excluded from the sample to ensure that no bias would enter into the collection and analysis of the data and to maintain the integrity of the overall research.

Perhaps the key reason for the low return rate is explained in an electronic communication from Joan Homer (Executive Director of the Association of Colleges of Applied Arts and Technology of Ontario) to the researcher in which she states the following:

> Provincial surveys of the Ontario colleges have always been a challenge. Due to the workload of administrative, academic and support staff, especially since 1995 funding decreases, most college personnel are stretched beyond capacity. Responding to surveys, gathering data and thoughts to provide useful feedback, ensuring the feedback is accurate and valid – these are activities that college people just don't have much time for anymore. Unless the survey was conducted within one institution where the surveyor was well known to the field, response rates of 15% or less are the norm.

Table 3.3 compares the sample size and the return rate of this research study to others.

Table 3.3 Return Rate Comparison

Report/Study/Thesis	Area	Surveys Distributed	Number Returned	Response Rate
Mior	Ontario	1,426	210	14.7
Lloyd	One College	404	158	39.1
Surendra	One College	552	109	19.7
McGraw-Hill Ryerson	National	14,939	1,189	7.9
Anderson et al	One University	1,487	557	37.4

Ethical Review

An ethical review protocol was completed as required by the Ontario Institute for Studies in Education of the University of Toronto. The ethical review protocol submitted provided details of how the survey was to be conducted including information on how anonymity and confidentially were to be maintained. Appendix E is the letter of approval from the Ethics Review Office. Appendices F and G contain copies of the letters of informed consent sent to the participants.

Data Analysis

The analysis of the data was carried out using the advanced analytical tools found in SPSS. Further information on how SPSS was used to analyse the data is found in the Detailed Findings chapter of this thesis.

The significance or alpha level was predetermined at .05. The .05 level is widely used in education because it is considered an adequately good risk (Wierrma, p. 71).

Limitations

There are a number of limitations encountered in carrying out this study that must be acknowledged. The final sample obtained for this research, for a number of reasons, was not random and therefore cannot be deemed to be completely representative of the Ontario Community College system population. However, while the results cannot be generalized for the entire Ontario Community College system, the thesis did draw a sample from across the province. Consequently, the data do give a good indication of the perception of faculty with respect to educational technology.

While the use of the Internet to administer a research instrument electronically is becoming more commonplace today, especially in the academic milieu, it is a possible limitation as it may have influenced those who chose to respond. This question is even more important when the administered instrument deals with perceptions about technology as it raises the possibility that those who chose not to respond may be less comfortable with using technology.

The low return rate is another limiting factor that prevents generalization to the entire population. It would be unwise to assume that the results of this sample can be extrapolated to the entire community population. However, the findings can offer insights based on those who responded.

Chapter Four

Survey Findings

Introduction

This section of the thesis presents the findings from the analysis of the data gathered from the survey instrument described in Chapter Three. Chapter Five will present the implications and recommendations resulting from the analysis of the data in this chapter. The data were analysed using the software package called Statistical Package for the Social Sciences commonly known as SPSS (Version 10.0 for Windows).

In the initial data analysis the following cross tabulations were examined: total responses, college size, gender, age, years of teaching experience and departmental categorization. The resulting data, especially in the age category, years of teaching experience and departmental affiliation, resulted in such small subsets that the data did not lend themselves to close analysis. Consequently, the initial categories were collapsed. The bands into which they were collapsed are shown in the corresponding section of this chapter.

The full SPSS analysis resulted in a significant number of printed pages. Consequently, all the data could not be practically included in the Appendices of this thesis. All data have been saved both electronically and in hard copy for reference and possible future use.

The t - test was used to see whether there is a significant difference between the means of two independent groups. The analysis of variance (ANOVA) was used to see whether there was a significant difference among the means of various groups. Pearson's Chi-square (χ^2) statistic was computed with each cross-tabulation analysis to test for the independence of the two variables in each cross-tabulation.

The significance or alpha level was predetermined at .05. The .05 level is widely used in education because it is considered an adequately good risk (Wierrma, p. 71).

To enable the electronic processing of the data, each question was numerically coded. For example, if the choices for the response were "strongly agree", "agree", "neutral", "disagree", "strongly disagree" and "don't know" the following coding was used: Strongly Agree (1), Agree (2), Neutral (3), Disagree (4), Strongly Disagree (5) and Don't Know (6). It is this protocol that is used for reporting the data in this chapter. Unless otherwise indicated, the Don't Know responses were eliminated in calculating the descriptive statistics.

In some instances, the respondent did not indicate the category to which he or she belonged (for example, the size of the college) resulting in a "missing value." These missing values are not reported in the tables but are recorded in the processing of the data through SPSS.

First, this chapter will provide both a demographic profile of full-time faculty represented by the selected sample as well as full-time faculty from the entire C.A.A.T. system.

The thesis will then address the research questions posed which are the following:

1. What are faculty's views on educational technology as a tool to promote student learning in the community college system?
2. Are these views consistently held by all faculty? If not, what is the nature and variance of their views?
3. Do faculty use educational technology as a tool to promote student learning in the community college system?
    - If yes, how do they use educational technology?
    - If no, why not?
4. What is the nature and extent of their use of educational technology?

Third, the chapter will further analyse the data using data mining. Data mining is defined as the process of extracting valid, previously unknown or unexamined comprehensible information from databases and using it proactively to help make crucial decisions. This technique has been used to provide some in-depth analysis of possible existing opposing views or contrasting principles which may be helpful in explaining implications for the appropriate implementation of educational technology. The technique and how it is used is explained in further detail later in this chapter.

Sample Size

According to the Council of Regents Human Resources Secretariat's latest available report on Full-time Academic Employees for 2001-2002 there were 5,842 full-time faculty in the Anglophone colleges in Ontario C.A.A.T system.

The original survey design called for a sample size of 350 to 400 completed valid surveys . With a population size of 5,844, a total of 375 completed valid surveys would render a confidence level of 95%, with a margin of error of ±5%.

Because of difficulties encountered in obtaining timely approval to distribute the survey instrument from the colleges involved, the target sample size was modified. (The circumstances affecting obtaining approval for the distribution of the survey instrument are described fully in Chapter Three). The change took place only after consultation with Fleming Data Research and the approval of the thesis committee.

Demographic Profile of the Respondents

Respondents' College of Origin

Six colleges were surveyed. The colleges were classified into the small, medium and large categories as defined in Chapter Three. A summary of the colleges surveyed, the number of surveys returned by college size and a comparison to the provincial distribution is summarized in Table 4.1.

Table 4.1 Colleges Surveyed and Surveys Returned

College Size	Number Surveyed	Total Ontario Faculty		Returned Surveys	
		Number	Percent	Number	Percent
Small (8)	2 (Canadore, Sault)	740	12.7	48	23
Medium (8)	2 (Durham, Niagara)	1745	29.9	85	41
Large (8)	2 (George Brown, Sheridan)	3357	57.4	76	36
Total (24)	6	5842	100	210	100

The table suggests that faculty from small and medium colleges were over-represented and faculty from the large colleges were under-represented. This is an acknowledged limitation of this thesis. While the number of faculty surveyed by college size is not completely representative of the provincial distribution, the data analysed by college size does show the variation in this dimension.

With only two colleges in each size category, it is quite possible that unspecified idiosyncratic differences among the colleges probably exert an influence on the data. That is to

say, it is possible that if one replaced the two large or small colleges with two others of the same size, the correlations between size and other variables could possibly be different. This is part of the nature and culture of the community colleges in Ontario over which the researcher has no control except to acknowledge it as a possible limitation. For this reason, the data were not weighted for college size. But concurrently, the aggregate results are strengthened by the fact that the sample was stratified by size.

An almost equal number of male and female faculty members completed the survey. However, as Table 4.2 points out, there are more male faculty than female faculty in the C.A.A.T. system. Therefore, female faculty are somewhat over-represented for this study. For the purpose of further in-depth analysis a weighting factor was applied for gender to compensate for this over-representation.

Table 4.2 Respondent Distribution by Gender

Gender	% Faculty Surveyed	% in Province
Male	48.8	56.1
Female	51.2	43.9

Age Distribution of Respondents

The majority of the respondents (53.6%) fell between the ages of 46 and 55. This picture of an aging faculty suggests that there will be an infusion of new and possibly younger faculty over the next decade. One can hypothesize that this faculty will have had more exposure to and

experience with educational technology. This further suggests that this faculty will have a higher degree of comfort and skill in implementing the use of educational technology as a tool in the learning cycle.

Table 4.3 Age Distribution of Faculty

Age	Frequency	Percent
Under 26	1	0.5
26 – 30	9	4.3
31 – 35	12	5.7
36 – 40	16	7.7
41 – 45	33	15.8
46 – 50	50	23.9
51 – 55	62	29.7
56 – 60	19	9.1
61 or over	7	3.3
Total	209	100

* One respondent did not complete the age category question.

The original age bands in the survey resulted in subsets that were too small to allow for proper analysis. Consequently, some of the age bands were collapsed or aggregated so that an analysis by age could be carried out. The age bands were selected based on the number of responses made in each category so the subsets of the data could be analysed. An effort was also made to reflect the age range within the system itself. The researcher was unable to ascertain the actual provincial age statistical distribution. Therefore, one cannot conclude that the age

distribution of this sample is representative of the actual faculty population in the Ontario community college system. Table 4.4 shows the aggregated distribution of faculty by age.

Table 4.4 Aggregated Age Distribution

Age	Frequency	%
Under 26 – 40 (Early)	38	18.2
41 – 55 (Middle)	145	69.4
56 – 61 or over (Late)	26	12.4
Total	209*	100

* One respondent did not complete the age category question.

Years Experience Teaching in The Community College System

Respondents were asked to indicate how long they have been teaching in the community college system. Table 4.5 shows their responses by gender.

Table 4.5 Years Taught in College System by Gender

	Total (%)	Male (%)	Female (%)
< 5 years	24.8	25.7	24.5
5 - 10 years	13.8	16.8	11.3
11 -15 years	16.7	17.8	14.2
16 - 20 years	22.4	24.8	19.8
21 - 25 years	11.0	8.9	13.2
26 - 30 years	10.0	5.0	15.1
≥ 31 years	1.4	1.0	1.9

Because the original year categories resulted in subsets of data that were too small to properly analyse, the groups were aggregated into larger categories as shown in Table 4.6. The ranges selected are those routinely used within the college system when discussing the length of service.

Table 4.6 Aggregated Years Taught in College System by Gender

	Total	Total (%)	Male (%)	Female (%)
< 5 years – 10 years	81	38.6	42.6	35.8
11 – 20 years	82	39.0	42.6	34.0
21 – ≥ 31 years	47	22.4	14.9	30.2

Departmental Affiliation

Respondents were asked to indicate what school/department or centre with which they are generally affiliated. The categories selected are the ones most commonly used by colleges. However, because the original categories in the survey resulted in subsets that were too small for proper analysis, some of the categories were aggregated. The selection was based on the commonality of the subjects and program areas taught. Applied Sciences and Applied Technology were aggregated as were Social and Community Services and Law. Table 4.7 shows the aggregated departmental affiliation by total and by gender.

Table 4.7 School/Department/Centre of Affiliation of Respondents

School/Department/Centre	Number of Respondents			Percent
	Male	Female	Total	
Applied Sciences/Technology	41	3	44	21.8
Business	28	17	45	22.3
Health Sciences	6	21	27	13.4
Information Technology	20	5	25	12.4
Liberal Arts and Sciences	11	21	32	15.8
Social/Community Services/Law	9	20	29	14.4
Total	115	87	202	100

As the data suggest, there is an uneven distribution of gender within the various departments. In the analysis of the data, when reference is made to either gender or departmental affiliation, care is taken to study the interaction or interdependency of the two factors to see whether it was gender or the departmental affiliation which accounted for the variance.

Research Questions

The findings of this section of the thesis have been organized around the primary and secondary research questions presented in Chapter One under the heading of Research Questions and outlined again at the beginning of this chapter.

Overall Attitudes Towards Educational Technology

The literature suggests that there are some quite dramatic differences in how technology is viewed and accepted. To determine their overall fundamental disposition towards educational technology, respondents were asked to indicate their level of agreement to a series of statements. The three basic statements were the following:

1. I believe that technology is inherently good.
2. I believe that technology is inherently bad.
3. I believe that technology is neither inherently good or bad. It depends on how it is used.

Table 4.8 outlines their views in this regard. The responses to these statements clearly show that faculty do not view technology as being intrinsically bad. They are more likely to see technology as being a positive force and appear to feel strongly that the key factor is how technology is used. The overall implication is that faculty are receptive to the use and adoption of educational technology if it is used to promote learning in such a way that it conforms to their beliefs.

These three statements were part of a series of twenty-two (22) statements to which respondents were asked to respond. For the sake of readability and ease of formatting the online survey, the word “technology” alone was used. However, the introductory statement soliciting the

respondents' views clearly stated that the statement referred to "educational" technology to avoid any possible confusion.

Table 4.8 Faculty's Basic Disposition towards Educational Technology

	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree	Don't Know
Inherently good	14.9	36.1	29.8	12.5	5.3	1.4
Inherently bad	.5	.5	27.1	31.4	36.2	4.3
Neither – Depends how used	45.2	31.7	19.7	1.4	1.4	.5

Importance of Educational Technology to Promote Learning

Respondents were given a series of statements to elicit both their views about educational technology and its importance as a tool to promote learning. The results of these probes are reported in detail below.

Quality and Accessibility of Education

Respondents were probed about their views of the importance of technology in improving the quality and accessibility of a college education. Overall, the vast majority either agreed or agreed strongly that technology is essential for improving the quality (88%) and accessibility (85%) of a college education. This suggests that faculty see educational technology as an essential component in any effort to promote learning. The data are reported in Table 4.9.

Table 4.9 Technology Essential for Improving Quality and Accessibility of Education

	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree
Essential for improving quality of education	46	42	7	2	3
Essential for making education more accessible	47	38	9	5	1

Nonequivalence of Equivalence Diplomas

The literature and experience show there is a strong movement among colleges to provide online courses and even diplomas that can be completed entirely online. But this rush to use technology is not without a price. Cameron and Heckman (1993) suggest that employers place more value on employees who have had the social experience of the classroom over those who have completed their work in isolation. They coined this the "nonequivalence of equivalence diplomas".

To test faculty's attitudes in this regard, they were asked if they believed credits achieved through online delivery are equal to credits achieved in the traditional in-classroom fashion. While the largest proportion of faculty express some level of agreement (42.6%) there is a significant proportion (38.7%) who disagree. More than one in ten (12.0%) remain neutral in this regard. The data are reported in Table 4.10.

This data suggest that faculty have a positive attitude toward using online delivery to give students the opportunity of achieving their credits. While this view is further confirmed by strong faculty agreement that educational technology can help improve learner accessibility to a high level of quality education, there is some concern expressed. Almost thirty-nine percent (38.7%) of the respondents suggest that online credits are not as acceptable as traditional credits. While the data do not specifically suggest why this is so, the implication is that the concern revolves around how these credits are developed and offered.

Table 4.10 Equivalency of Online and Classroom Credits

	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree	Don't Know
Total	11.0	31.6	12.0	25.8	12.9	6.7

Learning Styles

Respondents were asked about their view of technology being essential for meeting the diverse learning styles found in today's community college system. Almost eighty percent (79.5%) of the respondents expressed a level of agreement. The data suggest that faculty see technology as a positive force in helping meet learners' diverse learning styles.

Table 4.11 Technology Essential to Meet Diverse Learning Styles

	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree
Essential for Learning styles	40.5	39.0	12.0	7.5	1.0

The Economics of Using Educational Technology

Funding is a critical issue in the Ontario community college forum. Often, it is the key driver in making critical decisions. Since the funding unit per learner has decreased significantly over the last few years with other expenses rising not insignificantly, faculty often question how money is spent, the motives for certain cutbacks and initiatives and how these actions affect them directly or indirectly. There is some suspicion among some faculty that technology is often promoted mainly to reduce the per learner cost and make faculty more efficient and not necessarily to increase accessibility or to promote learning.

Respondents were given a series of issues to probe their views regarding the costs associated with the use of educational technology and their perceptions of why technology is promoted by administrators.

The issues were explored using the following statements:

- Technology is used to reduce the costs per student for delivering education
- Administrators promote technology to reduce faculty salary costs
- Money invested in technology should be spent to hire and train more faculty
- More money should be spent to train faculty in proper use of technology

Educational Technology to Reduce Costs

Perceptions regarding the use of educational technology to reduce the costs per student of delivering education are diverse. There is no general agreement. While twenty-six percent (26%) of the respondents are neutral in this respect, almost thirty percent (28.9%) express some agreement, with another thirty-seven percent (36.5%) disagreeing or strongly disagreeing. The data are displayed in Table 4.12.

Table 4.12 Technology Essential for Reducing Costs of Delivery

	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree	Don't Know
Total	10	19	26	22	15	9

This suggests that the largest proportion of faculty do not see the reduction of delivery costs as the key reason for the promotion and adoption of technology. However, there is a notable proportion of faculty who at least harbour some suspicion that technology is promoted for economic reasons. The rest of the respondents remain neutral or have not made up their minds in this regard. This would suggest that there is room to change or shape the views of faculty with respect to the prime motive for the promotion of the adoption of technology.

Use of Technology to Reduce Faculty Salary Costs

Some faculty express concern about the promotion of technology at the cost of faculty jobs. The respondents were asked whether or not they felt that the use of technology is promoted by administrators simply to reduce faculty salary costs. While views vary to some extent, the largest number of respondents (42.6%) express some level of agreement. This suggests there is some sensitivity in this area which should be kept in mind when this issue is raised or is discussed. Table 4.13 outlines the responses. The results suggest that there may be underlying suspicions on part of some faculty with respect to administrators' motives in promoting technology.

Table 4.13 Administrators Promote Technology to Reduce Faculty Salary Costs

	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree	% Don't Know
Administrators promote technology to reduce faculty salary costs	19.6	23.0	19.6	23.9	6.7	7.2

Training and Hiring More Faculty

Respondents were asked to indicate whether or not they felt that money being invested in technology should be redirected to hire and train more faculty. While there is not overall agreement, the largest proportion of faculty (41.1%) express some level of agreement. It is also important to note that slightly more than thirty-two percent (32.4%) expressed some level of disagreement, with another twenty-four percent (24.2%) remaining neutral. The data suggest that, given the strong support faculty give technology for improving the quality and accessibility of a college education, they are caught in somewhat of a dilemma. While they want to support technology, they are reluctant to give up the training and hiring of more faculty. Table 4.14 gives a detailed summary of the findings. This bimodality in response is discussed further in the Data Mining section later in this chapter.

Table 4.14 Money Spent on Technology Should be Used to Train and Hire More Faculty

	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree	Don't Know
Total	15.0	26.1	24.2	29.0	3.4	2.4

The Training of Faculty

The literature, anecdotal comments by faculty on a daily basis and the researcher's personal experience suggest that there is a need to train faculty to be able to use technology as a

tool to promote learning. Experience shows that the lack of training on the part of faculty causes a high degree of frustration on the part of the faculty and ultimately on the part of the learner. Faculty will tend to avoid or resist areas in which they are not properly trained or in which they do not feel adequately competent. To explore this area, respondents were asked if more resources should be devoted to the training of faculty in the proper use of technology. Not surprisingly, this is one of the few areas where faculty speak in a clear, loud and almost unanimous voice. A majority of the participating faculty (51.9%) strongly agree with almost forty percent (39.5%) agreeing. Table 4.15 outlines their responses.

Table 4.15 More Resources Should be Devoted to Train Faculty in Proper Use of Technology

	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree
More resources should be used to train faculty in use of technology	51.9	39.5	4.8	1.4	1.4

Fear of Job Losses

One of the possible factors causing resistance to adoption of educational technology is the fear of job loss or the loss of traditional teaching positions. Resistance to any idea, change or concept is usually the greatest if the people most likely affected perceive themselves to be affected in a negative way. To gain insight into the faculty's perception in this regard, respondents were

asked to indicate their level of agreement with the following statement: “The further integration of technology will mean a loss of traditional teaching positions”.

The data show that there is a bimodal distribution. While almost forty-two percent (41.6%) of respondents express some level of agreement with this statement, it is significant to note that an almost equal number (38%) disagreed. Another twenty-one percent (21%) either remained neutral (15.3%) or did not know (5.7%). The responses are shown in Table 4.16. This suggests that, while there is a concern that technology may mean a loss of traditional teaching positions, there is another group of faculty who are not fearful that the adoption of technology will mean a job loss because they can accept that things will simply be done differently. Perhaps, the key issue here lies in the term “traditional”. Technology has the potential of positively impacting both faculty and learners. To achieve this goal, technology will require faculty to do things in different and innovative ways. This bimodality of response is explored further in the Data Mining section of this chapter.

Table 4.16 Integration of Technology will Mean Loss of Traditional Teaching Positions

	% Agree Strongly	**% Agree**	**% Neutral**	**% Disagree**	**% Strongly Disagree**	**% Don’t Know**
Integration of technology means loss of traditional teaching positions	11.0	30.6	15.3	31.6	5.7	5.7
	% Agreement		**% Neutral**	**% Disagreement**		**% Don’t Know**
	41.6		15.3	37.3		5.7
	Mean		**Median**	**Std. Dev.**		**SE Mean**
	2.90		3	1.13		8.33E-02

Control of Technology

The literature suggests that there are concerns about the purpose of using technology and who should have and may have the ultimate control of how it is used. Faculty see themselves as the content experts and as such should maintain control of the curriculum and how it is to be delivered. To test this view, respondents were asked whether or not they felt faculty should have total control of how technology is used.

The data show there are mixed feelings on this issue. While almost forty-seven percent (46.7%) express some level of agreement that faculty should have total control, twenty-two percent (22.4%) remain neutral in their view with an additional thirty percent (29.5%) expressing disagreement. Table 4.17 outlines the actual results. The results suggest that there is room for the shifting of attitudes about the issue of who controls technology. If there is genuine consultation and collaboration between the faculty and administration, the issue of control would be minimized or become a non-issue. This bimodality of response is discussed further in the Data Mining section of this chapter.

Table 4.17 Faculty Should Have Total Control of How Technology is Used

	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree
Total	14.4	32.7	22.6	25.2	4.3

Efficient Use of Existing Resources

Chronic underfunding in the college system continually puts pressures on existing resources. To determine the potential impact technology might have on the use of these resources, respondents were asked their perceptions as to whether or not technology allows for their efficient use of these resources.

Overall, faculty (56.3%) perceive that technology allows them to make efficient use of existing resources. This suggests that faculty clearly see a beneficial use for technology in this regard. Table 4.18 outlines the level of agreement.

Table 4.18 Technology Allows the Efficient Use of Existing Resources

	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree	% Don't Know
Total	12.5	43.8	19.2	18.3	3.4	2.9

Efficiency and Productivity

Respondents were probed about their perception of the impact of educational technology on administrative efficiency and their productivity as a teacher. Faculty hold very favourable views with respect to technology in helping improve their productivity as teachers. Faculty are much more likely (76.5%) to see technology having improved their personal productivity than administrative efficiency (44.9%) as highlighted in Table 4.19. Understandably, here as in other

areas, faculty tend to express more positive views when they feel they have or they perceive to have some degree of control.

Table 4.19 Technology Has Improved Administrative Efficiency and Productivity as a Teacher

	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree	% Don't Know
Improved administrative efficiency	9.2	35.7	14.5	23.7	11.6	5.3
Improved productivity as a teacher	34.4	42.1	10.5	10.5	2.4	0.0

Technology as a Means of Improving Communication

Good communication is always a critical factor in the success of any organization. Respondents were asked a series of questions to probe their perceptions about the use of educational technology to improve communication between and amongst the key stakeholders in the education system, namely, the students, the faculty and administration. Clearly, faculty perceive technology as being most beneficial in making them more accessible to students (75%) while at the same time improving the level of communication amongst faculty (67%). While there is general agreement that technology has also improved communication between administration and faculty (55%), the level of agreement is noticeably lower. The supporting data are presented in Table 4.20. Overall, then, faculty support educational technology as a tool that makes them more

accessible to their students and improves communication amongst and between the key stakeholders.

Table 4.20 Technology Has Improved Level of Communication

Faculty more accessible to students	**% Agree Strongly**	**% Agree**	**% Neutral**	**% Disagree**	**% Strongly Disagree**	**Don't Know**
	39.2	36.4	9.1	12.4	2.9	0.0
	Mean	**Median**	**Std Dev**		**SE Mean**	
	2.03	2.00	1.12		7.72E-02	
Improved communication amongst faculty	**% Agree Strongly**	**% Agree**	**% Neutral**	**% Disagree**	**% Strongly Disagree**	**Don't Know**
	22.0	44.5	12.4	15.8	5.3	0.0
	Mean	**Median**	**Std Dev**		**SE Mean**	
	2.38	2.00	1.15		7.93E-02	
Improved communication with administration	**% Agree Strongly**	**% Agree**	**% Neutral**	**% Disagree**	**% Strongly Disagree**	**Don't Know**
	14.4	40.7	15.3	21.1	6.7	1.9
	Mean	**Median**	**Std Dev**		**SE Mean**	
	2.64	2.00	1.17		8.17E-02	

There is some variance in views about whether technology has improved communications based on the size of the college. A one-way ANOVA was carried out showing there was a significant difference. ($F = 5.109$, $p = .007$). The Scheffé post hoc test showed the difference ($p = .017$). Faculty in small colleges are more likely to agree that technology has improved the level of communication amongst faculty. Table 4.21 shows the faculty views regarding improved levels of communication by college size.

Table 4.21 Technology Has Improved Level of Communication by College Size

	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree	% Don't Know
Faculty more accessible						
Large	39.5	52.1	6.6	9.2	2.6	0.0
Medium	41.2	34.1	8.2	10.6	4.7	0.0
Small	35.4	31.3	14.6	18.8	0.0	0.0
Improved communication amongst faculty						
Large	17.1	44.7	14.5	17.1	6.6	0.0
Medium	22.4	36.5	14.1	20.0	5.9	0.0
Small	29.2	58.3	6.3	4.2	2.1	0.0
Improved communication with administration						
Large	18.4	44.7	11.8	18.4	6.5	0.0
Medium	10.6	38.8	18.8	20.0	5.9	4.7
Small	14.6	37.5	14.6	25.0	8.3	0.0

Early Adopters

There is an abundance of literature on the basic characteristics of early adopters, some of which is discussed in the literature of review. While there is some research with respect to the early adopters of educational technology in higher education in Canada (Anderson, Vernhagen and Campbell, 1998) and the C.A.A.T. system (Surrendra, 2001), the body of documented research in this field with respect to faculty in the C.A.A.T. system would benefit from further research.

In an effort to get some preliminary perspective as to how faculty see themselves with respect to the adoption of software and/or hardware, respondents were asked to express their level of agreement with the following three statements:

1. I will try out new software and/or hardware as soon as it becomes available.
2. I will try out new software and/or hardware after it has been on the market for a while. This way, **many** of the bugs will have been worked out.
3. I will try out new software and/or hardware after **all** the bugs have been worked out.

In designing the questionnaire, the supposition was made using Rogers' Innovation Diffusion Model that the innovators, early adopters and the early majority would try new software and/or hardware as soon as it became available. The late majority would try new software and/or hardware after it had been on the market for a while with the result that many of the bugs would have been worked out. The laggards would try new software and/or software after all the bugs had been worked out.

On a self-reporting basis, faculty indicate that they are open to trying new software and hardware even if all the bugs have not been worked out. This suggests that many of the faculty surveyed view themselves, at least to some extent, as innovators and early adopters. A summary of their responses is outlined in Table 4.22.

Table 4.22 Willingness to Try New Software/Hardware

	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree	% Don't Know
Will try new	12.0	41.1	23.4	18.7	2.9	1.9
Will try when many bugs removed	7.1	46.2	26.7	14.3	4.3	1.4
Will try when all bugs removed	3.9	25.2	32.0	24.8	12.1	1.9

A Pearson Chi-Square analysis showed a statistically significant difference ($p = .003$) for the data between genders. As the data outlined in Table 4.23 indicate, male faculty are more likely

to try new software and/or software as soon as it becomes available. This suggests, then, that male faculty are more likely to perceive themselves as early adopters than female faculty.

Table 4.23 Willingness to Try New Software/Hardware by Gender

Will Try as Soon as Available	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree
Male	13.2	43.0	32.5	8.8	2.6
Female	11.4	39.8	17.0	28.4	3.4

Nature and Extent of Use of Educational Technology by Faculty

One of the key research questions was to determine the nature and extent of the respondents' use of technology. To obtain this information, survey participants were asked to respond to a series of statements and questions eliciting the following information:

- current level of usage of technology in promoting learning
- possible interest in using technology in the future and
- what support would be required to pursue this interest.

Level of Usage of Instructional Material

Respondents were asked to think of their current teaching practices and then indicate which instructional materials, equipment or facilities they use or plan to use. Respondents were to check all the choices that applied to their particular circumstances. Their responses are summarized in Table 4.24.

Highlights indicate the following:

- Word processing is almost universally used (97.1%) as is electronic mail (89.0%).
- The majority of faculty (63.8%) are currently using computer projection to deliver their lectures and/or seminars but more than thirteen percent (13.3%) have no plans to do so.
- The majority of faculty (59.5%) are currently using a presentation software package to deliver their lectures and/or seminars, but over sixteen percent (16.7%) have no plans to do so.
- Faculty are using web pages to deliver or supplement instructional material delivered to their students. These web pages are either personally created (36.7%), created for the faculty through college resources (27.6%) or created by using online publishers' resources (27.1%). It is also interesting to note, however, almost an equal number of faculty who have no plans to use this type of resource material.

Table 4.24 Level of Usage of Instructional Material

	Currently Use (%)	Within next 3 months (%)	Within next 3.1 - 5.9 months (%)	Within next 6 - 12 months (%)	Within 12.1 months or more (%)	Don't plan to use (%)
Computer projection	63.8	4.3	3.8	5.7	6.7	13.3
Presentation software	59.5	4.3	4.8	7.1	6.7	16.7
Word Processor	97.1	1.0	0.5	0.5	0.0	1.0
E-Mail	89.0	1.0	2.4	1.0	1.4	4.8
Authoring software	8.6	2.9	4.8	6.7	12.4	61.9
Create Web page(s)	36.7	6.2	3.3	8.6	14.8	28.6
Web pages created by College	27.6	9.5	6.2	9.5	12.9	31.9
Create Web pages using publisher's resources	27.1	6.7	2.9	7.6	12.4	41.0
WebCT, Blackboard	24.3	9.0	3.8	11.0	14.8	34.8
E-Books	10.0	6.2	3.8	3.8	12.9	59.0
Other**	0.0	0.0	0.0	0.0	0.0	0.0

* Numbers do not total to 100% because respondents did not answer all categories.

** Analysis shows no individual instructional material or facility was mentioned more than twice.

Level of Usage of Instructional Material by College Size

Some differences on the level of usage of instructional material based on the size of the college are worthy of note. Since respondents were asked to check only those categories that apply, there are subset categories where the response level is too low to allow for accurate reporting of results.

- Faculty in small colleges are the least likely to be using presentation software such as PowerPoint® to deliver their lectures/seminars.
- Faculty in small colleges are the least likely to create their own web pages to supplement their material.
- Faculty in medium colleges are the least likely to use web pages created for them through college or online publishers' resources.

Table 4.25 Usage Level of Instructional Material by College Size

Instructional material, Equipment or facilities	Currently Use (%)	Do Not Plan to Use (%)
Presentation Software		
Large	65.8	17.1
Medium	60.0	17.6
Small	50.0	14.6
E-Mail		
Large	92.1	3.9
Medium	89.4	5.9
Small	83.3	4.2
Create Own Web Pages		
Large	46.1	27.6
Medium	36.5	23.5
Small	22.9	39.6
Web Pages - College Resources		
Large	30.3	36.8
Medium	23.5	28.2
Small	31.3	31.3
Web Pages - Publishers' Resources		
Large	30.3	44.7
Medium	23.5	36.5
Small	29.2	43.8
WebCT or Blackboard		
Large	35.5	34.2
Medium	17.6	30.6
Small	18.8	40.3

A one-way ANOVA test conducted on faculty creation of web pages to deliver or supplement material for their students, by college size, shows that there is a significant difference between the three groups ($F = 4.118$, $p = .018$). The Scheffé post hoc test showed that the difference is between large and small colleges ($p = .022$). Faculty in large colleges make more use of web pages for delivering supplemental material.

Further, a one-way ANOVA test conducted on faculty use of WebCT or Blackboard to create and deliver instructional material for their students, by college size, indicates a significant difference among the three groups ($F = 3.603$, $p = .029$). Most community colleges in the Ontario system have licenses for either WebCT or Blackboard. The Scheffé post hoc test showed that the difference is between large and small colleges ($p = .031$). Again, it is faculty in large colleges that make more use of this delivery method. A possible reason for this difference is that the larger colleges are more likely to have the technical, financial and human resources available to promote and support this technology.

Future Use of Technology

To get some indication of the extent and nature of the future use of technology in instruction, respondents were asked to what extent they anticipated using technology in the next three years. Further, faculty who responded that they anticipated to use technology more were also asked to indicate in what ways they expected this to happen.

A large majority (86.7%) of the faculty anticipated that they would be using technology

more in their instruction. This would suggest a strong commitment on the part of the faculty to the on-going use educational technology to promote learning. More than twelve percent (12.4%) saw no change from their current use of technology. The data are presented in Table 4.26.

Table 4.26 Future Use of Technology in Instruction

	% Much More	% Some More	% Some Less	% Much Less	% No Change
Anticipated increase of technology over next 3 years	33.8	52.9	0.5	0.5	12.4

Areas of Increased Use of Technology in Instructions

Respondents who indicated that they would be using technology more to support their instructions were asked to indicate in what ways they anticipated this happening. There were a total 164 individual responses with a wide range of areas.

The areas most commonly mentioned were increased use of technology was likely to happen included the use or increased use of WebCT (15.2%), the creation of a web site or web pages (11.6%), and the incorporation of PowerPoint® software or similar presentation software in the instructional process (8.5%) . It should be noted that an additional 6.7% of the respondents answering this question said they would increase their use of technology in the instructional process once computers and proper Internet connections were available in the classrooms.

The answers to this query are outlined in Table 4.27. This data could prove useful for strategic planning and professional development purposes.

Table 4.27 Ways Technology Will be used in the Instructional Process

Area	Number Responses (N =164)*	Percent
WebCT (Use or increase usage)	25	15.2
Creating Web Site/Pages	19	11.6
PowerPoint®/presentation software	14	8.5
When classrooms are connected	11	6.7
Online tests and quizzes	10	6.1
E-mail	6	3.7
Online discussion groups	5	3.1
No Response	46	21.9

*There were 28 responses where the area was only mentioned once and consequently was not including in the reported data.

Need for New or Upgraded Skills

Respondents were asked whether or not they felt they would need to acquire new skills or to upgrade existing skills to work with the increased use of technology to support their instruction. A clear majority felt they would (85.7%) while nine percent (9.0%) felt that the skills they currently possessed would be adequate for the increased use of technology to support their instruction. This suggests a strong need for professional development.

How New Skills Will be Acquired or Upgraded

There are a number of ways that faculty could acquire or upgrade their skills in technology to support their instruction. As a follow-up question to determine how professional development for faculty could and should be offered, survey participants were asked to respond to a series of statements which ranged from learning on their own without any support to taking formal classes either inside or outside the college. They were then asked to rate each statement as being "Most preferred" to "Do not like at all".

Clearly, the most preferred method of acquiring or upgrading skills in technology is to learn on their own with support and assistance provided by the college when it is asked for. This suggests that faculty are committed to taking responsibility for their own training and professional development. The least preferred method is to learn these new skills on their own without support. It is interesting to note that there is a slight preference to attend college sponsored professional development sessions over externally provided professional development sessions. Table 4.28 outlines the preferences stated by the respondents.

Table 4.28 Preferred Method of Acquiring/Upgrading Skills in Technology

	Most Preferred (%)	Less Preferred (%)	Least Preferred (%)	Do not like at all (%)	Don't know (%)
Learn on own without support	20.6	48.5	23.5	6.9	0.5
Learn on own with access to support when needed	62.4	29.8	5.4	2.4	0.0
College P.D. workshops	49.3	34.0	9.1	6.7	1.0
External P.D. workshops	46.4	26.1	7.7	12.1	7.7
Work in a team	47.3	28.5	12.1	6.3	5.8
Packaged material	26.7	34.0	18.0	12.6	8.7

According to the Pearson Chi-Square, there is a statistically significant difference ($p = .005$) between genders. In the data reported in Table 4.29, male faculty are more likely than female faculty to prefer to learn on their own as the skill is required without any formal instruction or support.

Table 4.29 Preferred Method of Acquiring/Upgrading Skills in Technology by Gender

Learn on own without support	Most Preferred (%)	Less Preferred (%)	Least Preferred (%)	Do not like at all (%)
Male	29.2	48.7	19.5	2.7
Female	12.6	48.3	28.7	10.3

Factors Inhibiting Use of Educational Technology in Instructional Practices

While the majority of faculty appear to be using educational technology to support their instruction and are prepared to learn new skills or update their current skills to continue using educational technology to promote learning, there are a number of factors which may prevent or inhibit faculty from fully doing so. To determine what some of these factors could be, faculty were given a series of seventeen statements and asked to what extent these factors may inhibit or encourage their use of educational technology.

The top five key inhibitors reported by faculty which prevent them from fully using educational technology in their instructional practices are the following:

- Lack of time to learn how to use educational technologies
- Inadequate technical support from their college
- Inadequate access to necessary software tools at work
- Inadequate release time provided on the Standard Workload Form (SWF)
- Inadequate availability of computer hardware or connectivity at work

Faculty appear to be saying that they need the time, technical support and the software and hardware necessary to fully integrate educational technology in their instructional practices. Table 4.30 summarizes their responses.

Table 4.30 Factors Inhibiting Faculty Use of Educational Technology

Factor	% Inhibit Greatly	% Inhibit Somewhat	% Neither	% Encourage Somewhat	% Encourage Greatly
Lack of time	47.1	39.0	12.9	1.0	0.0
Availability of computer at work	39.5	25.2	25.2	4.8	3.8
Inadequate technical support from college	38.1	33.3	26.7	0.5	1.0
Release time (SWF)	38.1	33.3	26.7	0.5	1.0
Inadequate access to software at work	34.8	35.7	18.6	4.8	3.8
Inadequate availability of software at home	25.7	36.7	25.7	5.2	2.9
Training not provided by college	25.7	33.3	31.4	7.1	1.9
Availability of computer & connectivity at home	23.8	35.7	27.1	8.1	3.8
Lack of formal college policy	21.9	25.7	45.7	4.8	1.4
Lack of knowledge about applying technology in instruction	18.6	37.1	31.9	5.7	4.3
Lack of interest from administrators	17.6	25.2	41.9	10.0	3.8
Lack of equitable intellectual property policy	16.7	22.4	55.2	1.9	1.9
Lack of personal interest or commitment	14.8	13.3	45.7	8.6	11.4
Lack of financial incentives	12.9	27.1	56.7	2.4	0.0
Lack of interest on part of students	11.4	27.1	45.2	9.5	5.7
Belief potential of technology is exaggerated	10.0	18.1	52.9	8.1	7.6
Lack of interest or support from union	10.0	15.2	69.5	2.9	1.4

According to the Pearson Chi-Square, there is a statistically significant difference (p = .029) between genders. As the data in Table 4.31 indicate, female faculty are more likely to find that the lack of knowledge about applying technology to their instruction is inhibiting. This seems to support Campbell and Varhnhagen (2002) who hypothesize that female faculty may be more inclined to focus on instructional methodology than specific delivery technology, and consequently the delivery technology would be chosen or selected on the basis of its ability to facilitate discussion (p.35).

Table 4.31 Factors Inhibiting Faculty Use of Educational Technology by Gender

Lack of Knowledge About Applying Technology in Instruction	**% Inhibit Greatly**	**% Inhibit Somewhat**	**% Neither**	**% Encourage Somewhat**	**% Encourage Greatly**
Male	13.2	32.5	42.1	7.0	5.3
Female	25.3	42.5	24.1	4.6	3.4

There was also a significant difference by college size with respect to providing adequate release time on the Standard Workload Form. An ANOVA conducted on these data showed that the difference was significant (F = 4.235, p = .016). The Scheffé post hoc test showed a difference between large and small colleges (p = .016). One can hypothesize that small colleges, traditionally having smaller budgets with fewer resources, are the least likely to be in a position to provide faculty with release time to prepare for the use of educational technology in instruction. The actual results are shown in Table 4.32.

Table 4.32 Factors Inhibiting Use of Educational Technology by College Size

Factor	% Inhibit Greatly	% Inhibit Somewhat	% Neither	% Encourage Somewhat	% Encourage Greatly
Inadequate release time (SWF)					
Large	32.9	28.9	32.9	1.3	2.6
Medium	35.3	37.6	27.1	0.0	0.0
Small	52.1	31.3	16.7	0.00	0.00

Importance of Leadership Sources

The implementation and adoption of new educational technologies can often benefit from the support of a leader within the college who may be seen as a role model, someone to emulate. This leadership can come from a variety of sources. To test this hypothesis, respondents were asked to rate the importance of leadership from the following sources:

- The President
- The Vice-President Academic
- Other Vice-Presidents
- Deans/Department Chairs
- Co-ordinators
- Colleagues

Deans and Department Chairs (69%) are seen as very important in this leadership role followed by their colleagues (57%) and then their coordinators (56%). The implication is that support from people with whom they work more closely is important for implementing educational technology strategies. The "very important" and "somewhat important" responses were then joined together to get a broader sense of importance. The results are shown in Table 4.33

Table 4.33 Importance of Leadership Sources.

	%Very Important	% Somewhat Important	% Not Important at All	% Don't Know
President	44	27	24	3
Vice-President	51	27	18	2
Academic Other Vice-Presidents	26	35	32	7
Deans/Department Chairs	69	21	9	2
Co-ordinators	56	26	15	6
Colleagues	57	33	9	5

Self Reported Computing Skills

Lloyd (2001) suggests that measures of computer competency are good predictors of computer use in instruction. Respondents were asked to rate their skill level in a series of

computer related skills both to determine their current computing skills levels to get an overview of existing capabilities and to determine possible institutional training needs for the adoption and use of technology to promote learning. The scale used ranged from “excellent skills” to “none”. The highest skill levels were reported in word processing, web browsing and presentation software such as PowerPoint®. The lowest reported skills levels were in course authoring software, database management and web page creation. Table 4.34 outlines the self-reported skill levels.

Table 4.34 Self-Reported Computer Skill Levels

Area	Excellent (%)	Good (%)	Fair (%)	Beginner (%)	None (%)
Word Processing	52.2	39.2	8.1	0.5	0.0
World Wide Web searching, browsing	50.7	32.9	14.0	1.4	1.0
Presentation Software (eg. PowerPoint®)	34.4	29.2	20.6	11.0	4.8
Spreadsheets (eg. Excel)	24.5	25.0	14.4	23.0	13.0
Internet Listservs and/or Newsgroups	18.3	20.2	21.6	26.0	13.9
Web Page creation and editing	18.3	18.8	13.9	21.6	27.4
Databases (eg. Access)	12.0	18.8	13.9	17.8	37.5
Course Authoring software	10.0	13.4	12.0	18.2	46.4

It is interesting to note that, while in most areas males and females generally rate themselves equally in terms of skill levels, male faculty tend to rate their skill levels significantly higher in the use of spreadsheets and database management and in web page creation and editing. One possible explanation for this difference is the field of study the male faculty are engaged in.

Actual experience shows that more male faculty teach in areas of study such as chemistry and physics that require greater use of these software programmes.

According to the Pearson Chi-Square, a statistically significant difference exists between genders, in the areas of spreadsheets, databases and the creation of web pages. Male faculty rate themselves as being more skilled in these areas than female faculty. The accompanying p value is listed below:

- Spreadsheets ($p = .000$)
- Databases ($p = .000$)
- Web creation and editing ($p = .001$)

Computing Power of Respondents

Access to A Computer at Work

The large majority of respondents (94.8%) have access to a computer at work which is connected to the campus computing network (99.5%). Of those who have access to a computer, almost sixteen percent (15.7%) are required to share it with a colleague.

Computer Usage for College Related Work

Respondents were asked to indicate how many hours a day they spend on the computer for their college-related work. While more than one in two (53.6%) faculty spend between one and

three hours a day on the computer doing college-related work, more than one in five respondents (22.5%) claim to spend more than five hours a day doing similar work. Table 4.35 outlines their responses.

Table 4.35 Daily Hours Spent on Computer for College Work

Number Hours	Total (%)
Less than 1 hour	3.8
1 - 2 hours	24.9
2.1 - 3 hours	24.9
3.1 - 4 hours	15.3
4.1 - 5 hours	8.6
More than 5 hours	22.5

A two-way ANOVA ($p = .002$) suggests that faculty in the Information Technology department spend the greatest number of hours on their computer for college-related work. The supporting data is shown in Table 4.36

Table 4.36 Daily Hours Spent on Computer for College Work by Department

Department	Mean	Std. Error
Applied Sciences and Applied Technology	3.361	.480
Business	3.892	.230
Health Sciences	2.992	.353
Information Technology	4.990	.370
Liberal Arts and Sciences	3.716	.283
Social/Community Services/Law/Legal	3.215	.299

At first glance the number of hours spent on the computer for college related work seems higher than one would expect. A possible reason for this unusually high level of computer usage is likely because of the high number of respondents from the IT department. However, further research shows that this high level of computer usage in these data is not unique. The Anderson (1998) study at the University of Alberta a similar level of usage as illustrated in Table 4.37.

Table 4.37 Comparison of Hours Spent on Computer for College Work

Number of Hours	**Mior**	**Anderson**	
	%	% Mainstream Faculty	% Early Adopters
Less than 1 hour	3.8	12	11
1 – 3 hours	49.8	44	24
3 – 5 hours	23.9	29	39
More than 5 hours	22.4	13	34

Satisfaction With Technology Equipment

Overall, there is dissatisfaction with the current technology equipment in the classroom. While almost forty percent (39.5%) are very or somewhat satisfied with the equipment, forty-seven percent of the respondents (47.4%) are dissatisfied or very dissatisfied. This high level of dissatisfaction can be a barrier or a disincentive to learning to use the necessary hardware and software which would allow faculty to more fully integrate educational technology in their instructional practices.

Table 4.38 Satisfaction with Classroom Technology Equipment

	Very Satisfied (%)	Satisfied (%)	Neutral (%)	Dissatisfied (%)	Very Dissatisfied (%)
Total	11.1	28.4	13.5	31.5	15.9

The Wish List

To determine what type of classroom enhancements are most desired by faculty, respondents were asked to rate a series of possible enhancements without regards to any budgetary concerns. Knowing what faculty need and want in terms of technological enhancements should help colleges in preparing their capital budgets both in the short and long term. Once these faculty wants and needs are met, it is likely that faculty will be more motivated to try to fully integrate educational technology in their instructional practices since a key self-reported inhibitor would be removed.

It is interesting to note that, when the wish list is sorted in terms of 'must have' and 'should have' the two key items are the computer itself with some form of projection unit to share the information with the learner and the support required to ensure that faculty can do their job properly. Table 4.39 summarizes this wish list.

Table 4.39 Desired Classroom Equipment

Desired Classroom Equipment	% Must Have	% Would Be Nice	% Not Important
Networked computer with projection	73.8	23.8	2.4
VCR/TV monitor for video playback	56.5	28.5	15.0
Telephone access to IT Help Desk	53.4	33.5	13.1
Student computer connectivity at all seats	45.4	38.5	16.1
Film and slide projectors	28.4	25.5	46.1
Electronic Blackboard/Smartboard	21.3	49.0	29.7
Satellite receiving links	14.9	43.1	42.1
Two-way video conference capability	10.3	43.6	46.1

Access to A Computer at Home

Again, the large majority of respondents (97.6%) report having access to a computer at home with the majority (94.6%) reporting their computers are connected to the Internet. Just over seventy-six percent (76.4%) claim that their home computer is adequate for their current needs. If faculty do not have the adequate computer hardware and software at home, they will be less likely to spend time their on work-related issues, thereby possibly stifling efforts to further integrate educational technology in their instruction. This is particularly important since data elsewhere in this thesis suggest that faculty spend a considerable amount of time each day on their computers doing college-related work.

Variance of Views by Experience Level and Departmental Affiliation

A number of factors are likely to affect how educational technology is viewed as a tool to promote learning. Two key factors examined by this thesis are level of teaching experience and departmental affiliation, where there are some notable differences to report. Having an overview of what these variances are could be helpful in preparing professional development material for the adoption and promotion of educational technology.

It is important to know, for the purpose of planning professional development, whether level of teaching experience has any impact on faculty views with respect to the use of educational technology to promote learning.

Departmental affiliation is likely to have an impact on attitudes towards educational technology. While one may assume that faculty in the Information Technology area would have a positive attitude towards education technology, it would be helpful to know whether such is the case and what the attitudes are in other departments.

This section of the chapter examines the detailed findings of variance of views by level of experience and departmental categories. The data will be reported only for areas where there is a statistically significant difference in views within a group.

Overall Attitudes Towards Educational Technology

To determine their overall fundamental disposition towards educational technology, respondents were asked to indicate their level of agreement with a series of statements. The three basic statements were the following:

1. I believe that technology is inherently good.
2. I believe that technology is inherently bad.
3. I believe that technology is neither inherently good or bad. It depends on how it is used.

The one-way ANOVA carried out highlighted a significant difference ($F = 5.453$, $p = .005$) with respect to overall attitudes towards technology held by respondents by years of experience. The Scheffé post hoc test showed where the difference existed ($p = .005$). Respondents with ten or fewer years of experience are more likely than respondents with eleven to twenty years of experience to say that technology is inherently good.

The one-way ANOVA carried out highlighted the significant difference ($F - 4.037$, $p = .019$) with respect to overall attitudes towards technology held by respondents' years of experience. The Scheffé post hoc test showed where the difference existed ($p = .020$). Respondents with ten or less years of experience were also more likely than respondents with eleven to twenty years of experience to indicate that technology is neither good or bad but is dependent on how it is used.

The inference can be drawn that faculty with less teaching experience are younger and are more likely to have had more exposure to and a positive experience with computers. Consequently, they are more likely to be favourably disposed to educational technology.

Table 4.40 shows the responses by teaching experience categories.

Table 4.40 Faculty's Basic Disposition towards Educational Technology by Experience Level

Disposition	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree
Inherently good					
<5 – 10 years	24.4	34.6	29.5	9.0	2.5
11 – 20 years	6.3	36.3	32.5	16.3	8.6
21 – ≥ 31 years	14.9	40.4	27.7	12.8	4.2
Inherently Bad					
<5 – 10 years	2.9	0.0	28.6	34.3	34.3
11 – 20 years	0.0	0.0	28.2	33.8	38.0
21 – ≥ 31 years	0.0	4.3	26.1	26.1	43.5
Neither – Depends on how used					
<5 – 10 years	32.4	45.9	16.2	0.0	5.4
11 – 20 years	49.0	28.0	20.3	2.1	0.7
21 – ≥ 31 years	42.3	34.6	23.1	0.0	0.0

Respondents affiliated with the Liberal Arts and Sciences are less likely than respondents affiliated with the Health Sciences to view educational technology as inherently good. The one-way ANOVA carried out highlighted the significant difference ($F = 4.498$, $p = .001$). The Scheffé post hoc test showed where the difference existed ($p = .001$).

Table 4.41 shows the responses by department categories.

Table 4.41 Faculty's Basic Disposition towards Educational Technology by Department

Disposition	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree
Inherently good					
Applied	18.4	34.2	28.9	15.8	2.6
Business	11.4	36.4	31.8	15.9	4.5
Health	31.0	44.8	24.1	0.0	0.0
IT	17.4	39.1	26.1	17.4	0.0
Liberal	11.8	17.6	32.4	23.5	14.7
Social	3.2	48.4	38.7	3.2	6.5
Inherently Bad					
Applied	0.0	0.0	37.1	22.9	40.0
Business	0.0	2.3	27.9	32.6	37.2
Health	0.0	0.0	10.7	35.7	53.6
IT	0.0	0.0	30.4	43.5	26.1
Liberal	2.8	0.0	22.2	41.7	33.3
Social	0.0	0.0	43.3	2.0	36.7
Neither – Depends on how used					
Applied	35.1	37.8	24.3	2.7	0.0
Business	40.9	25.0	31.8	2.3	0.0
Health	32.1	39.3	21.4	3.6	3.6
IT	54.2	20.8	20.8	0.0	4.2
Liberal	63.9	25.0	8.3	0.0	2.8
Social	40.6	46.9	12.5	0.0	0.0

Importance of Educational Technology to Promote Learning

Respondents were given a series of statements to elicit both their views about educational technology and its importance as a tool to promote learning. Where statistically significant differences occur, the results are reported below.

Efficient Use of Existing Resources

To determine the potential impact technology might have on the use of existing resources, respondents were asked their perceptions as to whether or not technology allows for the efficient use of existing resources.

The one-way ANOVA carried out highlighted a significant difference ($F = 8.601$, $p = .0000$) in faculty's view with respect to technology allowing for the efficient use of existing resources. The Scheffé post hoc test showed where the difference existed ($p = .001$). Faculty with ten years of experience or less are more likely to agree that technology allows for the efficient use of existing resources

A possible explanation for this positive disposition by younger faculty is that they are more likely to have had exposure to the practical use of computers and also less likely to have had negative experience with them.

Table 4.42 outlines their responses.

Table 4.42 Technology Allows the Efficient Use of Existing Resources by Experience Level

Experience	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree
<5 – 10 years	23.1	47.4	17.9	11.5	0.0
11 – 20 years	7.8	40.3	20.8	26.0	5.2
21 – ≥ 31 years	4.3	48.9	21.3	19.1	6.4

Improvement of Administrative Efficiency

Respondents were also probed about their perception of the impact of educational technology to improve administrative efficiency. The one-way ANOVA carried out showed that a significant difference existed ($F = 5.793$, $p = .004$). The Scheffé post hoc test showed this difference existed between the least experienced respondents and those respondents with eleven to twenty years of service ($p = .005$). Specifically, respondents with ten years of service or less are the most likely to respond that educational technology has improved administrative efficiency. Again, a possible explanation for the positive disposition shown by this segment of the faculty is either that the less experienced faculty are the ones least likely to have had negative experience in this area or are simply more disposed to viewing educational technology as having a positive impact in this area.

Table 4.43 Technology Has Improved Administrative Efficiency by Experience Level

Experience	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree
<5 – 10 years	15.8	43.4	15.8	18.4	6.6
11 – 20 years	5.3	32.9	14.5	30.3	17.1
21 – ≥ 31 years	6.8	36.4	15.9	27.3	13.6

Technology as a Means of Improving Communication

Respondents were asked a series of questions to probe their perceptions about the use of

educational technology to improve communications among the key stakeholders in the college education system, namely, the students, the faculty and administration. While the data indicate that the majority of faculty see educational technology as a means of improving communication among all three groups, the one-way ANOVA carried out showed a significant difference ($F = 5.453$, $p = .005$) in the communication between administration and faculty. The Scheffé post hoc test showed the difference existed ($p = .005$) between respondents with ten years of experience and less and those with eleven to twenty years of experience. The supporting data is shown in Table 4.44.

Table 4.44 Technology Has Improved Level of Communication with Administration by Level of Experience Level

Experience	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree
<5 – 10 years	15.6	53.2	16.9	11.7	2.6
11 – 20 years	13.6	37.0	14.8	25.9	8.6
21 – ≥ 31 years	14.9	29.8	14.9	29.8	10.6

Early Adopters

In an effort to get some perspective as to how faculty see themselves with respect to the adoption of software and/or hardware, respondents were asked to express their of level agreement with a series of statements geared to measure their readiness to adopt educational technology at various stages of development.

The one-way ANOVA showed that a significant difference existed ($F = 8.826$, $p = .000$). The Scheffé post hoc test showed the difference existed between respondents with 10 years of experience or less and those with eleven and twenty years of experience ($p = .001$). The same test showed that other differences existed between respondents with less than 10 years of experience and those with twenty-one or more years of experience ($p = .014$). Overall then, the data suggest that respondents with less than ten years of experience are the most likely to try out new software and/or hardware as soon as it is available and are the most likely to be considered innovators, supported by the data shown in Table 4.45.

Table 4.45 Willingness to Try New Software/Hardware by Experience Level

Experience	% Agree Strongly	% Agree	% Neutral	% Disagree	% Strongly Disagree
<5 – 10 years	19.2	50.0	20.5	10.3	0.0
11 – 20 years	9.9	30.9	32.1	19.8	7.4
21 – ≥ 31 years	4.3	47.8	15.2	32.6	0.0

Nature and Extent of Use of Educational Technology by Faculty

To determine the nature and extent of respondents' use of technology survey participants were asked to respond to a series of statements and questions eliciting the following information:

- current level of usage of technology in promoting learning
- possible interest in using technology in the future and
- what support would be required to pursue this interest.

Level of Usage of Instructional Material

Respondents were asked to think of their current teaching practices and then indicate which instructional materials, equipment or facilities they use or plan to use. The analysis of the data indicates the following:

Differences by Level of Experience

- The one-way ANOVA showed that the significant difference existed among the different levels of experience groups ($F = 4.033$, $p = .019$) . The Scheffé post hoc test showed the difference existed between respondents with 10 years of experience or less and those with twenty-one to thirty-years of experience or more ($p = .028$). Respondents with ten years of experience or less are more likely to use presentation software than respondents with twenty-one or more years of experience. This supports the previous supposition that faculty with less experience teaching are more likely to have had a good level of experience with educational technology.
- The one-way ANOVA showed that the significant difference existed among the different levels of experience groups ($F= 3.514$, $p = .032$). The Scheffé post hoc test showed the difference existed between respondents with 10 years of experience or less and those with twenty-one to thirty-years of experience or more ($p = .038$). Respondents with 10 years of experience or less are more likely to create their own web pages than respondents with twenty-one or more years of experience.

Differences by Departmental Affiliation

- The analysis of the data showed that differences between groups by departmental affiliation were numerous. To make the reporting of these data easier, the results are shown in tabular format in Table 4.46. In way of explanation, the symbolic representation IT➡Liberal/Sci means that the IT Department members are more likely than the Liberal Arts and Science Department members to use the particular type of instructional material, equipment or facility.

The data suggest that faculty with the least teaching experience are most likely to be receptive to use new technology. One can assume that faculty with less experience are likely to be younger and consequently have had more exposure to technology as part of their early experience training.

Table 4.46 Differences in Usages of Instructional Material by Departmental Affiliation

Instructional Material	ANOVA	Scheffé
Computer Projection		
IT ➡ Liberal/Sci	F = 5.345, p = .000	p = .025
Presentation Software		
Business ➡ Liberal/Sci	F = 6.133, p = .000	p = .005
IT ➡ Liberal/Sci		p = .003
IT ➡ Social		p = .026
Create Web Page(s)		
IT ➡ Health	F = 3.998, p = .002	p = .045
IT ➡ Social		p = .039
Create Web Page(s) - Publisher's Resources		
Business ➡ Liberal	F = 3.510, p = .005	p = .031

How New Skills Will be Acquired or Upgraded

Depending on individual characteristics, circumstances and past experiences, faculty need various types of training to upgrade their skills. Each has a different training need and, like other learners, a preferred learning style.

The one-way ANOVA showed that a significant difference existed ($F = 3.848$, $p = .023$). The Scheffé post hoc test showed among which groups the difference existed ($p = .031$). The analysis of the data indicates that respondents with less than ten years of experience are more likely than respondents with eleven to twenty years of experience to attend professional development workshops provided by external training centres but paid for by the college. Table 4.47 details the data.

Table 4.47 Prefer Upgrading by Attending External Workshops by Experience Level

Experience	Most Preferred %	Less Preferred %	Least Preferred %	Do Not Like at All %
<5 – 10 years	64.5	19.7	7.9	7.9
11 – 20 years	37.0	38.4	8.2	16.4
21 – ≥ 31 years	47.6	26.2	9.5	16.7

Factors Inhibiting Use of Educational Technoloy in Instructional Practices

The data indicate that the majority of faculty appear to be using educational technology to support their instruction and are prepared to learn new skills or update their current skills. To determine what, if any, factors inhibit this momentum faculty were given a series of seventeen statements and were asked to what extent these factors may inhibit or encourage their use of educational technology. While there were no significant differences among the groups by departmental affiliation, there were some differences when the data were examined by level of experience.

The two areas where the differences appear are the inadequate release time provided on the Standard Workload Form and the lack of knowledge about applying technology in instruction. This highlights the importance of the need not just for training but for specific and focussed training that goes beyond the bounds of specific hardware and software knowledge and expertise. The response data are detailed in Table 4.48.

The one-way ANOVA showed that a significant difference existed ($F = 10.593$, $p = .000$). The Scheffé post hoc test showed among which groups the difference existed ($p = .002$). The analysis of the data suggests that faculty with eleven to twenty years of teaching experience are more likely than faculty with ten or fewer years of teaching experience to see inadequate release time as an inhibitor. Faculty with more experience (because of the greater number of Standard Workload Forms negotiated) are more likely to have had difficult experiences in how they were treated in the

formulation of their SWF's. Consequently, it is quite understandable that this group of faculty are more likely to see the SWF as a possible stumbling block.

Further analysis suggests that faculty with twenty-one or more years of teaching experience are more likely than faculty with ten years or less of experience to see the lack of knowledge about applying technology in their instruction as an inhibitor. The one-way ANOVA showed the existence of this difference ($F = 3.685$, $p = .027$). The Scheffé post hoc test showed the difference existed between these two groups ($p = .028$).

Table 4.48 Factors Inhibiting Use of Educational Technology by Experience Level

Experience	Inhibit Greatly %	Inhibit Somewhat %	Neither Inhibit or Encourage %	Encourage Somewhat %	Encourage Greatly %
Inadequate Release Time					
<5 – 10 years	23.8	31.3	42.5	1.3	1.3
11 – 20 years	41.5	39.0	19.5	0.0	0.0
21 – ≥ 31 years	57.4	27.7	12.8	0.0	2.1
Lack of Knowledge					
<5 – 10 years	16.5	34.2	32.9	7.8	8.7
11 – 20 years	12.5	46.3	36.3	2.5	2.5
21 – ≥ 31 years	34.8	30.4	26.1	8.7	0.0

Satisfaction With Technology Equipment by Experience Level and Departmental Affiliation

If a college wants its faculty to further incorporate educational technology into its curriculum, it must provide not only the appropriate training but also the hardware and software the faculty feel it needs. Consequently, respondents were asked their level of satisfaction with the current technology equipment in the classroom. The data suggest that there is no significant difference in views by experience level. However, the data suggest a significant difference by departmental affiliation (ANOVA F = 7.095, p = .000). Faculty in the Informational Technology department are the most likely to be satisfied with the equipment in their classroom, and consequently these faculty are the most likely to ask for and receive the high end types of equipment. This is not surprising since computer hardware and software are the core tools for this subject area. Members of Health Departments express the highest level of dissatisfaction. Table 4.49 shows the level of satisfaction by departmental affiliation.

Table 4.49 Satisfaction with Classroom Technology Equipment by Department

Hours	Applied (%)	Business (%)	Health (%)	IT (%)	Liberal/Sci (%)	Social (%)
Very Satisfied	7.7	22.7	0.0	20.8	8.6	6.5
Satisfied	33.3	34.1	10.3	41.7	25.7	22.6
Neither	17.9	15.9	6.9	8.3	14.3	9.7
Dissatisfied	25.6	18.2	51.7	25.0	37.1	35.5
Very Dissatisfied	15.4	9.1	31.0	4.2	14.3	25.8

Data Mining and the Examination of Polarities

Through the use of data mining, some of the data derived from the survey were explored in greater detail. Data mining, for the purpose of this thesis, is defined as the process of extracting valid, previously unknown or unexamined comprehensible information from the database and using it productively to help draw implications, arrive at conclusions or make important decisions. This technique has been used to provide further in-depth analysis of possible opposing views or contrasting principles which were not initially noted but could be helpful in explaining implications for the appropriate implementation of educational technology.

Following the concept of polarities in postsecondary education introduced by Skolnik (2000) in his inaugural address as director of the William G. Davis Chair of Community College Leadership, the results of the data were examined. The analysis showed that there were three areas where a bimodal distribution of responses was observed. A bimodal distribution often suggests areas of possible opposing views or that varying principles may exist. Bimodality may indicate a polarization of opinions.

Three key areas demonstrated a bimodal distribution and were analysed further. The areas were the following:

- Money invested in technology should be spent to hire and train more faculty
- Faculty should have total control of how technology is used.

- The further integration of technology will mean a loss of traditional teaching positions

If a faculty member would prefer to redirect money invested in technology to hiring and training faculty, the implication is that this faculty would support the investment in human resources at the expense of the investment in technology. Faculty supporting the total control of technology by faculty would not be inclined to share this power with others. Lastly, faculty concerned that the further integration of technology would mean a loss of traditional teaching position, are the faculty who would most likely oppose the further integration of educational technology in the instructional cycle. Knowing who supports which position could be a crucially important piece of information in the development and implementation of an educational technology plan.

Using the capabilities of SPSS, all respondents who agreed with the specified statement were grouped and recoded into a data set, and the same was done with respondents who disagreed with the statement. Respondents who remained neutral in their response or who did not answer were removed from the analysis. A cross-tabulation of the data was then conducted using these new categories. Areas where there were statistically significant differences are reported.

People versus Technology

To examine the depth of support for the use of educational technology to promote learning, respondents were asked how strongly they agreed with the statement that "Money invested in technology should be spent to hire and train more faculty". For the purpose of this analysis and for the ease of reporting the data in tabular form, respondents who agree with this statement will be reported under the heading of "People". Those disagreeing with this statement will be reported under the heading of "Technology". It should be noted that respondents were forced to make a choice. One cannot conclude from the responses that faculty who agree with the statement are entirely opposed to the use of technology or vice versa

In summary, faculty who are in favour of using money spent on technology to hire and train more faculty are more likely to have a negative attitude or disposition towards educational technology. They are more likely to believe the following:

- Increased use of technology is promoted by administrators to reduce faculty salary costs ($p = .000$) (Table 4.50)
- More resources should be devoted to training faculty in the proper use of technology ($p = .036$) (Table 4.51)
- Faculty should have total control of how technology is used ($p = .012$) Table 4.52)
- Credits achieved online are not equal to traditionally earned credits ($p = .023$) (Table 4.53)

- Further integration of technology will mean a loss of traditional teaching positions (p = .000) (Table 4.54)
- Inadequate release time on the Standard Workload Form is an inhibitor to using educational technology in their instructional practices (p = .003) (Table 4.55)
- Lack of knowledge about applying technology in their instruction is an inhibitor to fully using instructional technology (p = .016) (Table 4.56)

Table 4.50 Technology Promoted by Administrators to Reduce Faculty Salary Costs

	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree
People (N = 77)	35.1	27.6	18.2	15.6	3.9
Technology (N = 112)	10.7	24.1	23.2	33.0	8.9

Table 4.51 Devote More Resources to Training Faculty in Use of Technology

	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree
People (N = 85)	65.9	28.2	2.4	1.2	2.4
Technology (N = 117)	43.6	47.0	6.8	1.7	.9

Table 4.52 Total Control of Technology by Faculty

	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree
People (N = 84)	20.2	45.5	21.4	20.2	2.4
Technology (N = 117)	10.3	30.8	23.9	29.9	5.1

Table 4.53 Equivalency of Online and Classroom Credits

	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree
People (N = 82)	8.5	30.5	11.0	29.3	20.7
Technology (N = 107)	14.0	36.4	14.0	26.2	9.3

Table 4.54 Integration of Technology will Mean Loss of Traditional Teaching Positions

	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree
People (N = 81)	19.8	39.5	17.3	18.5	4.9
Technology (N = 108)	12.2	32.3	16.9	32.8	5.8

Table 4.55 Lack of Release Time Inhibits Faculty from Using Educational Technology

	% Inhibit Greatly	% Inhibit Somewhat	% Neither Inhibit or Encourage	% Encourage Somewhat	% Encourage Greatly
Technology (N = 85)	43.8	40.0	16.5	0.0	0.0
People (N = 116)	33.6	28.4	35.3	.9	1.7

Table 4.56 Lack of Knowledge Inhibits Faculty from Using Educational Technology

	% Inhibit Greatly	% Inhibit Somewhat	% Neither Inhibit or Encourage	% Encourage Somewhat	% Encourage Greatly
Technology (N = 84)	25.0	39.3	29.8	2.7	3.6
People (N = 113)	13.3	56.6	34.5	8.8	5.3

Control of Educational Technology

In an ideal learner-centred learning environment, the question of who should control the use and integration of educational technology to promote learning should not be an issue. Faculty, support staff and administrators would work together in a collegial atmosphere to achieve the best results possible. However, reality and experience tells us that this is not always the case. To gain an insight into this issue, faculty were asked their views on the following statement: " Faculty should have total control of how technology is used." For the purpose of reporting the results of

this analysis, respondents who expressed any level of agreement will be labelled “Faculty Control”. Respondents who expressed any level of disagreement will be labelled “Other Control”.

Respondents who favour faculty control are more likely to feel that administrators promote the increased use of technology to reduce faculty costs (p = .001) . The same group of respondents are also more likely to agree that money invested in technology should be spent to hire and train more faculty (p=.004). The supporting data are as shown in Table 4.57.

Table 4.57 Views on Salary Costs and Need for Training

	% Strongly Agree	% Agree	% Neutral	% Disagree	% Strongly Disagree
Technology promoted by administrators to reduce faculty salary costs					
Faculty Control (N = 95)	27.5	33.0	14.3	20.9	4.4
Other Control (N = 106)	15.7	17.6	27.5	29.4	9.8
Money should be spent to hire and train more faculty					
Faculty Control (N = 95)	22.1	27.4	48.0	36.7	28.6
Other Control (N = 106)	8.5	26.4	24.5	35.8	4.7

The data also indicate that there were some significant differences between the two groups in terms of what they are likely to see as inhibitors to the full use of educational technology in instructional practices. Respondents who favour faculty control of technology are more likely

to see the lack of time release on their Standard Workload Form (p = .020) as an inhibitor and less likely to see inadequate technical support from the college (p = .045) as an inhibitor. The supporting data are presented in Table 4.58.

Table 4.58 Lack of Release Time Inhibits Faculty from Using Educational Technology

	% Inhibit Greatly	% Inhibit Somewhat	% Neither Inhibit or Encourage	% Encourage Somewhat	% Encourage Greatly
Lack of Release Time					
Faculty Control (N = 97)	46.4	29.9	22.7	1.0	0.0
Other Control (N = 109)	30.3	36.7	31.2	0.0	1.8
Inadequate Technical Support from College					
Faculty Control (N = 98)	35.7	29.6	25.5	8.2	1.0
Other Control (N = 109)	45.9	34.9	11.9	6.4	.9

Fear of Job Losses

The literature and daily experience tells us that the further integration of educational technology raises concern among some about the possible loss of teaching jobs or loss of what are considered traditional teaching positions. To measure the respondents' view on this issue, they were asked to indicate their level of agreement with the following statement: "The further integration of technology will mean a loss of traditional teaching positions." The overall response

shows a bimodal distribution as indicated by previous data. The data were recoded so that respondents who indicated some level of agreement were labelled for reporting purposes as " Job Loss Believers" while those who expressed some level of disagreement were categorized as "No Job Loss Believers".

General Beliefs Regarding Technology

The analysis of the data shows that there were significant difference in views in a number of areas as detailed below.

Not surprisingly, faculty who have been coded as "No Job Loss Believers" tend to show a more positive attitude towards technology as indicated by their higher level of agreement in the following areas:

- Technology is essential for improving the quality of education ($p = .000$)
- The use of technology allows the efficient use of existing resources ($p = .031$)
- Technology has improved administrative efficiency ($p = .023$)
- Technology has made me more accessible to my students ($p = .041$)
- Credits achieved through online delivery are equal to credits achieved in the traditional classroom fashions ($p = .000$).

Faculty who have been coded as "Job Loss Believers" tend to show a higher degree of concern about the benefits of technology as expressed in their higher level of agreement in the following areas:

- Increased use of technology is promoted by administrators to reduce faculty salary costs (p =.000)
- Money invested in technology should be spent to hire and train more faculty (p = .000)
- Faculty should have control of how technology is used (p = .003)

Inhibitors for Using Technology

In an attempt to discover whether there was a difference in opinion between "Job Loss Believers" and "No Job Loss Believers" with respect to inhibitors for using technology to promote learning, respondents were asked a series of questions in this regard. The data show that differences exist in the following areas, with "Job Loss Believers" more likely to see the following as inhibitors

- Lack of time to learn how to use educational technologies (p = .024)
- Inadequate release time on the Standard Workload Form (p = .000)
- Lack of interest on the part of my students (p = .006)
- Belief that the potential of technology is grossly exaggerated and is not worth the effort (p = .014)
- Lack of equitable policy ensuring the benefits of intellectual property (i.e. ownership) (p = .037)
- Lack of time to learn how to use educational technologies (p = .024)

Self-Reported Computing Skill Levels:

Respondents were asked to self-report on their computing skill levels. Overall, respondents who were classified as “No Job Loss Believers” reported having higher computing skill levels than respondents who were classified as “Job Loss Believers”. Significant differences are recorded in the following areas

- Word processing ($p = .018$)
- Presentation software ($p = .002$)
- Course authoring software ($p = .025$)
- Web Page creation and editing ($p = .004$)

Summary

This chapter presented the detailed findings emanating from the research of this thesis. Chapter Five will present a discussion of these findings, drawing out the implications and finishing with a set of recommendations based on the data.

Chapter Five

Summary Discussion and Recommendations

Introduction

This section of the thesis presents a discussion of the findings outlined in Chapter Four including the implications, conclusions and recommendations that arrive out of these findings. It will also discuss how these findings relate to the literature reviewed, whether or not they confirm the findings of others and how they add to the literature.

Problem Statement

The primary purpose of this thesis is to investigate the perceptions of Ontario community college faculty regarding the use of educational technology to promote learning, and the factors that encourage or discourage their use of it. Further, the thesis is to investigate which faculty are most likely to use educational technology as well as the extent and nature of its use.

This goal was accomplished by the administration of a detailed survey to a predetermined sample of full-time faculty in the Ontario community college system. The methodology used is described in detail in Chapter Three. The questions in the survey were carefully prepared to

reflect the views and thoughts expressed by writers and practitioners as outlined in the literature review section.

Finally, this thesis is meant to serve a practical purpose, furthering acceptance of educational technology in Ontario's colleges to promote learning. Each implication and recommendation is based on the result of the analysis of the survey questions asked and the literature reviewed.

Research Questions

The following key research questions were developed to meet the goal of the purpose statement:

1. What are faculty's views on educational technology as a tool to promote student learning in the community college system?

2. Are these views consistently held by all faculty? If not, what is the nature and variance of their views?

   To test for this consistency, the analysis of the data used cross-tabulation analysis by gender, age and college size, reporting the consistency and significance levels

using a number of statistical, analytical tools as explained in Chapter Three and Chapter Four. Again, because of the final composition of the sample, these categories are only used as guidelines or indicators of possible existing views.

3. Do faculty use educational technology as a tool to promote student learning in the community college system?
    - If yes, how do they use educational technology?
    - If no, why not?
    -

4. What is the nature and extent of their use of educational technology?

Reporting Style and Perspective

In reporting implications and reaching conclusions, the researcher has kept in mind that there are always three parties or key stakeholders directly affected by the adoption, application and on-going use of educational technology in the college system. These are the students/learners who reap the ultimate benefits or suffer the unintended consequences of its poor application, the faculty who must adopt the educational technology application and learn how to use it effectively, and the administrators whose responsibility it is to provide the financial resources, training, positive encouragement and an overall rationale to make it all happen. If the interests of any one of these

three partners are not served, the goal of applying educational technology to promote learning is unlikely to be reached.

Summary of Findings

The following summarizes key points found in this study:

- Faculty see technology as being neither inherently good nor bad. Their evaluation of it is dependent upon how it is used.
- Faculty believe that educational technology is important for improving both the quality and accessibility of a college education.
- Faculty believe that educational technology will help meet the needs of the various learning styles of their learners.
- Faculty believe that educational technology allows for the efficient use of resources.
- Some faculty are concerned about the loss of traditional jobs as a result of technology.
- The largest proportion of faculty (46.7%) feel they should have control over how educational technology is used.
- Faculty believe that educational technology has helped improve their productivity.
- Faculty believe that educational technology makes them more accessible to their students and improves communication amongst faculty and between faculty and administrators.

- The large majority of faculty (86.7%) anticipate an increased usage of educational technology.
- The majority of faculty believe that more resources should be devoted to the training of faculty in the proper use of technology.
- More faculty members express a degree of dissatisfaction with the equipment in the classroom than faculty who express a degree of satisfaction.

DISCUSSION

This section of the chapter will discuss the research findings, how they relate to the literature, and their implications for policy, practice, and research. Formal recommendations will be presented later in the chapter.

Overall Attitudes Towards Educational Technology

As the review of the literature clearly suggests, there are some dramatic differences in how technology is viewed and accepted. Dyson tells us: “It is a fallacy to believe that technology will automatically change a culture or cultures. ... A better computer network will not buy instant collaboration and a culture of sharing. If people think their power continues to rest in hoarding their knowledge, they are not likely to start giving it away” (Hanna, 2000, p. 171).

Petra Cooper, President of the McGraw-Hill Ryerson Higher Education Division in a welcoming letter to participants of the recent Nexus Conference at the University of Toronto (Cooper, 2003), summarized well the shift she observed over the last four years in the themes and session focus. In the late 90's, she pointed out, attendees to these conference made "dramatic prognostications" around how educational technology would evolve, how and where students would learn, and how teachers would teach. Recently, Cooper pointed out the message has matured. Faculty now see that technology is not replacing traditional approaches but enlarging the range of delivery options and pedagogical tools available to faculty to help them promote learning.

The findings of this thesis clearly show that the large majority of respondents are receptive to the use of technology. They are more likely to see technology as being inherently good rather than inherently bad. However, clearly the overall disposition or tendency of faculty is to view educational technology as being neither good or bad but dependent upon how it is used. The implication is that faculty feel that educational technology can be a useful tool in promoting learning if properly implemented and used. At the same time, the implication is that faculty feel that educational technology can be somewhat of a barrier to learning if improperly applied. The resultant data culled from this thesis suggested that the overall disposition of faculty towards educational technology is positive. Given this positive attitude, every effort should be made to provide faculty with the tools and training required to promote the adoption of educational technology in the instructional process. The findings of this thesis provide an indication of the

nature and types of tools and training faculty need and want. For all this to take place, a strategic planning process involving the key stakeholders needs to take place.

Importance of Educational Technology to Promote Learning

One of the primary purposes of this thesis is to explore faculty's perception regarding the use of educational technology to promote student learning. The findings clearly suggest that faculty believe educational technology is essential for both improving the quality and accessibility of education in the Ontario community college system. The implication is that faculty accept technology as a key tool for improving both the quality (88%) and accessibility (85%) of the education that our learners receive.

The data clearly showed that faculty are open to the use of technology to promote learning provided it is done in such a way that it meets their personal expectations and keeps the needs of the learner as the focal point. This implies that all stakeholders must work together to promote the use of educational technology.

If educational technology has the potential to significantly improve the learning process, as the data suggested and faculty believe, one must ask why we have not seen such dramatic effects in many areas. As Pocklington and Tucker point out, "Astonishingly, technology boosters have learned little from the over-selling of television as an educational medium in the 1960's...

advanced computer technology has major strengths and weaknesses that must constantly be borne in mind" (p. 161). The lesson to be learned is that educational technology should not be "over-sold". The benefits of adopting educational technology into the instructional process must be clearly demonstrated with supporting data based on research. In a report issued by The American Federation of Teachers, the Federation points out that while technology can be a powerful force to improve education "...it is often adopted today *without* a clear educational focus and *without* sensible strategic planning" (1966, p. 161).

Nonequivalence and Equivalence Diplomas

Technology has made education more accessible to more people than ever before. The literature and experience shows many colleges are anxious to provide online courses and even entire diplomas that can be completed entirely on the World Wide Web. Brown and Duguid (2000) talk of the inherent difficulties geographical and social distances create. One needs to ask if colleges, to keep abreast of the competition, always devote enough time, planning and resources to produce the best material possible. Further, Cameron and Heckman (1993) suggested employers place more value on employees who have had the social experience of the classroom over those who have completed their work in isolation. They coined the phrase "nonequivalence of equivalence diplomas".

How do faculty feel about this issue? The feelings are mixed. While the largest proportion of faculty expressed some level of agreement (42.6%) with respect to online courses being equivalent to courses delivered in a traditional manner, a significant proportion (38.7%) disagreed while another twelve percent (12%) expressed neutrality. The data suggested that some faculty have some concerns about the standards of some online courses. While the data collected cannot give a clear and precise reason why there are such mixed feelings, one can postulate that the responses are based on personal experience and attitudes of the faculty. This can be supported by the fact that, as previously mentioned, faculty feel that the benefits derived from technology are very much dependent on how it is used.

There are some significant implications of such openly expressed mixed feelings about the equivalency of online courses and diplomas. If faculty express any reservations about the quality and equivalency of these online credentials, it is likely that students and employers as well as the general public will harbour the same doubts about such credits, resulting in a self-fulfilling prophecy. Consequently, the development of online credits will require the best efforts of well-trained faculty, top-notch technical resources and the genuine commitment of the administrators if these online offerings are to maintain or increase their level of credibility in the public forum and within the educational community. As Rosenberg (2001) tells us, “An effective e-learning strategy must be more than the technology itself or the content it carries. It must also focus on critical success factors that include building a learning culture, marshalling true leadership

support, deploying a nurturing business model, and sustaining the change throughout the organization" (p. xvi).

Learning Styles

Learning is the process by which a learner acquires new skills and knowledge to enhance individual performance. The exponential growth of information facing our learners makes the need for learning more important than every before. However, the sheer volume of material that learners must absorb and the speed at which they must absorb it makes learning a challenging task. Meeting this challenge means that faculty must use learning resources in such a way as to afford learners the opportunity to learn in a manner in which they are most comfortable.

Current literature suggests that learners have a variety of learning styles. If the curriculum can be delivered in the learner's preferred learning style, the chances for success are improved. Brown and Duguid (2000) point out that educational technology can be used as an additional tool or resource, thereby enhancing the choices available to the learner.

The findings of this thesis suggest that faculty feel that the use of technology is essential for meeting the diverse needs of the learner with 79.7% indicating agreement. The overall implication is that faculty accept educational technology as a viable tool to meet the diverse needs of our learners. Community college faculty are acutely aware of the ever-increasing array of

learning styles and approaches that are required to help students succeed. As other data showed, faculty are prepared to work towards meeting these needs to ensure success. Faculty are prepared to take advantage of the benefits of educational technology and will continue to do so, particularly if they are given proper and timely training and just-in-time technical support. (The need for such training is one of the key findings of the McGraw-Hill Ryerson study). However, there is a danger in placing blind trust in educational technology. If we focus too much on educational technology itself and not enough on how it will be used in the instructional process, we may not meet the ultimate goal of truly promoting learning.

The Economics of Using Educational Technology

Budgetary considerations/constraints are key factors in the decision-making process in Ontario's community college system. The number of faculty over the last decade has decreased while the number of learners has increased, and at the same time the funding unit per learner has notably decreased. The implementation and the continual upgrading of education technology programmes are a major expenditure for any college and are particularly significant for smaller colleges with a smaller financial base.

There are people in the Ontario community college system and elsewhere who suggest that often, the deployment of educational technology within the system is simply promoted by administrators as a cost saving measure rather than to promote learning.

The findings of this thesis suggest that faculty perceptions regarding the use of educational technology to reduce the costs per student of delivering education are diverse. While twenty-six percent (26%) are neutral in this regard, twenty-eight per cent (28%) express some agreement and almost thirty-seven percent (36.5%) disagree or strongly disagree. Why such a diversity of opinions? One can only speculate that these views are based on the actual experience faculty have had with their administrators. The implication is that while the largest proportion of faculty do not see administrators simply promoting educational technology as a delivery cost reducing measure, there is an underlying concern with some that this may be the case. What needs to be done is to assure the faculty that the prime goal of promoting educational technology is to enhance learning, and if delivery cost reduction is a secondary outcome, all the better.

Training and Hiring More Faculty

Often, a sign of strong commitment to a principle is underscored by the financial resources a college or a constituent group within a college is prepared to dedicate to support the advancement of that principle. This often entails forced choices. Spending money in one area, in difficulty budgetary times, often means not spending it in others. While there are key technology leaders like Gates (1995, p.185) who emphatically believe that technology will not replace teachers, this is not a universally held belief.

The findings of this thesis suggest that there is a bimodal distribution with respect to whether or not faculty feel money being investing in technology should be redirected to hire and train more faculty. The largest proportion of faculty (41.4%) expresses some level of agreement. Being forced to make a choice, this group of faculty would choose to hire more faculty rather than invest money in educational technology. This should not necessarily be taken as a vote opposing educational technology. However, what is particularly interesting to note is that nearly one-third of the respondents (32.4%) would choose not to redirect money spent on technology to training and hiring more faculty. These data suggested a strong commitment to educational technology on the part of faculty. Further, nearly one-quarter of the respondents remain neutral in this regard. What these data suggested is that either the respondents cannot or will not make a choice between spending money on technology or people. A possible reason for this is that respondents see both as being important. Another implication derived from these data is that further hiring and training should not necessarily come at the cost of reduced spending in the area of educational technology.

The Training of Faculty

The literature, anecdotal comments by faculty and personal experience of the researcher in the Ontario community college system suggest that there is a need to train faculty to be able to use technology as a tool to promote learning (Gates, 1999; McGraw-Hill Ryerson; Anderson, Varnhagen and Campbell, 1998; Surendra).

The findings of this thesis clearly show that faculty feel more resources should be devoted to the training of faculty in the proper use of technology. In a seldom shown force of unanimity by faculty on any single issue, over one-half of the respondents (51.9%) indicate strong agreement with almost forty per-cent (39.5%) indicating agreement with regards to this issue. Such a strong level of support for training suggests a strong interest in and support for the use of educational technology.

As faculty move from being the autonomous experts in the classroom and/or web maestros, they will become the focal point or the creative force of moving away from the faculty-centred approaches to a more learner-centred and collaborative approach to both teaching and learning. Faculty will also be facing a more sophisticated and demanding learner who will be more knowledgeable about the available educational choices as more and more competitive providers enter into the higher education market.

To meet the challenges and opportunities of the increased use of technology to promote learning, faculty will require not only more in-depth training but more focussed, professional and precisely targeted training. Since faculty will be using technology not only for teaching but also for research and providing services to the learner which direct the learner to a multitude of online resources, they must develop a deep understanding of what the learner needs to learn and what the learner will do with what he/she has learned. Consequently, to be successful in using technology to promote learning, the faculty of the future must play a fully participatory role in designing

instruction that is delivered via technology. This does not mean that faculty will become the technological gurus mastering all the intricacies of how the material is designed, but rather on why it is designed in a particular way. They must be able to understand and appreciate the pedagogical implications for educational technology which includes the basics of designing, delivering and evaluating the instruction they are delivering. Without this understanding, faculty will not be able to take full advantage of the potential of educational technology to improve the learning process.

The literature suggests that among the training and skills that the faculty of the future will need are training in teaching methodology, an understanding of the assessment of the effectiveness of these new educational technology approaches, an understanding of adult learning theories, an awareness of asynchronous learning strategies, an appreciation of formal design of instruction and a solid grasp of computer literacy. Historically, faculty have been hired for expertise in a specific field. The ability to teach or deliver instruction was of secondary importance. With the growing importance and acceptance of the use of educational technology to promote learning, the ability to deliver instruction should be at least as important as content knowledge.

People who work in the field of training faculty say that the problem is not getting faculty to recognize that training is important, but getting the faculty to actually attend the training when it is provided. For this learning and training to take place successfully, there must be a reward or an incentive system in place for faculty. While there is little doubt that intrinsic rewards are critically important in the teaching profession, intrinsic rewards alone are not enough for the majority of

faculty. Why would faculty be innovative when there are few rewards for this innovation save more work? Without a system of equitable rewards for faculty to use educational technology, faculty members will not be enticed to acquire this new training. Without full and active participation by faculty, quality programmes taking full advantage of educational technology may not be developed. A new system of allocating workloads must be developed that will support this concept of learning and training. Where the Standard Workload Form was once the liberator, it has now become the jailor. The current SWF criteria must be restructured to give equitable weighting to the items mentioned above.

Fear of Job Loss

The advancement of technology in any field is often accompanied by the reduction or loss of a number of jobs in the field affected. Resistance to advances in the field is sometimes attributed to the fear of job loss or the loss of control over the traditional manner in which the job is done.

Respondents were asked whether they felt the further integration of technology would mean the loss of traditional teaching positions. The response was bimodal in its distribution. While almost forty-two percent (41.6%) of the respondents expressed some level of agreement, it is significant to note that an almost equal number (37.3%) disagreed. Just over fifteen percent (15.3%) remained neutral while just under six percent (5.7%) did not know. The implication is

that while faculty fear that technology will cause the displacement or restructuring of some jobs, they are prepared to accept this, given their level of support for educational technology expressed in a number of their responses. Perhaps the key is the word traditional. Rather than simply seeing technology as causing job losses, faculty are accepting that educational technology will result in a gradual transition of the kind and type of work they do. The transition, as the literature suggests, is from a faculty member who is the depository of all knowledge to a facilitator who develops and promotes learning in whatever manner is best suited for the learner.

There is another facet to the issue of the fear of job loss which did not surface in this study but which needs to be considered because it is such an integral part of the issue; the issue is that the adoption of educational technology may be seen as adding to the individual workloads of faculty. This could be perceived as happening in three ways. First, the faculty member needs to take time to learn the skills necessary to use and implement these instructional technologies. Second, the implementation of new educational technologies raises the possibility of the faculty providing more one-on-one or one-on-few instruction dictated by online courses and taking away from the one-on-many style inherent with the lecture style of teaching. Third, varying schedules of students with varying levels of maturity who access instruction from various locations will require more flexibility on the part of the faculty (Hanna, 2000, p.108). Unless a new and equitable type of Standard Workload Form is researched, developed and implemented, the benefits of implementing educational technology to promote learning may be overshadowed by a fear of additional, unrewarded work and the possible loss of jobs.

Control of Technology

The deployment of educational technology, and all its related implications, is a significant force in the field of education today. The literature suggested that there are concerns about the purpose of educational technology and who should have and may have the ultimate control of how it is used.

The data showed that faculty have mixed feelings on this issue. While almost half (47.7%) expressed some level of agreement that faculty should have control, more than twenty-two percent (22.6%) remained neutral in their view with an additional thirty percent (29.5%) expressing disagreement. This distribution would suggest that there is room for further discussion on this issue. The possibility exists for faculty and administration to collaborate. Olcott and Schmidt (Hanna, 2000, pp.278-279) suggest that higher education institutions are currently working to restructure the role of faculty and in doing so should engage both key faculty members and administrators in the process. In doing so they offer two caveats. One, faculty should "...ensure that technological convenience is not given precedence over pedagogy" (p.279). Two, in restructuring the role of faculty "...the institution must reallocate its budget to support this process or find new and significant sources of funding for faculty development" (p. 279). This will happen only if agreement is reached on how technology will be used to achieve the goal of promoting learning.

Efficient Use of Existing Resources

Respondents were probed about their perceptions of the impact educational technology might have on the efficient use of existing resources. This issue is particularly important in a time of budgetary constraints and diminished funding resources. The data collected in this thesis showed that the majority of faculty (56.3%) felt that educational technology allows for the efficient use of existing resources. The implication is that faculty view educational technology as a positive contribution to maximizing the use of existing resources. However, a full nineteen percent (19.2%) remain neutral in this regard and almost twenty-two percent (21.7%) express some level of disagreement. One can postulate again that faculty see educational technology as inherently good if it is used in a manner that promotes their goals. However, it might be beneficial to know why more than one in five respondents does not see technology as allowing them to make efficient use of their resources. Is it that faculty do not have the appropriate equipment or training or some other reasons? The findings of this survey do not provide us with an answer. Further research in this area is recommended. Knowing possible answers could lead to the removal of potential barriers to the further integration of educational technology in the learning process.

Efficiency and Productivity

While the majority of respondents view educational technology favourably in terms of allowing for the efficient use of existing resources, they are more likely to view educational technology in a positive light when it affects them more directly. The data suggested that the majority of faculty see technology improving their personal productivity as teachers (76.5%) while less than forty-five percent (44.9%) see administrative efficiency being improved. The response is not surprising. Faculty can see, first-hand, how educational technology improves their personal efficiency. They are directly affected and can appreciate the impact. However, viewing the improvement of administrative efficiency is seen from a distance or "ex parte". While faculty may not always acknowledge improvements or even realize that these improvements are affected as a result of some technological improvement, they will respond to any negative situations or "glitches" that may be part of the implementation of technological advancement. To avoid the potential of any such negative reaction and to improve faculty's appreciation for improved administrative efficiency resulting from technological innovation, faculty should be regularly advised of any improved efficiencies that will make their jobs easier.

Technology as a Means of Improving Communications

The results of the findings of this thesis suggested that faculty view technology as positively improving communications among the key stakeholders. Clearly, faculty perceived

technology as being most beneficial in making them more accessible to students (75.6%) and at the same time improve the level of communication among faculty (66.5%). While there is general agreement that technology has improved communications between administration and faculty (55.1%), the improvement is not as pronounced as it is in other areas. Nonetheless, the improvement is notable. This would suggest that faculty see technology improving communications mostly in channels where they see themselves as having a higher degree or potential degree of control. This being said, there is little doubt that faculty see educational technology as a positive element in improving communication.

Early Adopters

There is an abundance of literature on the basic characteristics of early adopters, some of which is discussed in the literature review of this thesis. While there is some research with respect to the early adopters of educational technology in higher education in Canada (Anderson, Vernhagen and Campbell, 1988; Lllyod,2001; Surendra, 2001), there appears to be little documented research in this field with respect to faculty in the Ontario college system. This researcher recommends that further research be conducted in this area within the system. This research could be conducted under the auspices of ACAATO and Doctoral candidates in the Community College Leadership Program at the Ontario Institute for Studies of Education of the University of Toronto.

The findings derived from the data indicated that, based on a self-reporting scale, the majority of faculty view themselves as early or late adopters as opposed to being laggards.

Rogers (1995) suggests that organizational policies are the key impediments stopping innovators and early adopters from adopting educational technologies. Such being the case, the implication is that organizational policies should be carefully monitored as educational policies are developed to ensure that institutionally created barriers do not hold back the innovators. Roger further suggests that it is the lack of skills and lack of knowledge that holds back the early majority and late majority. This is borne out by the data in this survey when faculty were asked to list factors that inhibit their use of educational technology in their teaching practices. Overall, what this suggests is that if faculty are provided with the suitable organizational culture, the hardware, software and the time and support necessary to learn, the majority of faculty will use educational technology to promote learning.

Level of Usage of Instructional Material

One of the key research questions was to determine the nature and extent of faculty's use of technology. In common community college parlance, the researcher wanted to know whether faculty "walk the talk".

The findings indicated that the vast majority of faculty use word processing (97.1%) and electronic mail (89.9%), computer projection to deliver their lectures and/or seminars (63.8%) and a presentation software package (59.5%), again to deliver their lectures and/or seminars.

What these data suggested is that word processing and email have become universal tools in the faculty's toolkit. Computer projection to deliver lectures and seminars and the use of presentation software, such as PowerPoint®, were also important and significant instruments in the faculty's toolkit. However, for whatever reason, the use of all the various educational technology has not become ubiquitous. While the data did not clearly suggest the reason for the lack of universal acceptance of the various educational technology tools, the researcher can postulate that this lack of total acceptance may not be based simply on a negative attitude towards educational technology but on other reasons including previous and current frustration on the part of faculty with receiving the necessary training, support and reward for efforts made in using educational technology.

The McGraw-Hill Ryerson third Technology and Student Success survey (McGraw-Hill Ryerson, 2001) gives some indication as to why there is not a greater acceptance of the various educational tools. The study indicated that, for three consecutive years, respondents have named course preparation, faculty training and professional development, and new technology as contributors for student success (p.1). The study further suggests that faculty members rank

training and professional development second in importance to course preparation, with time being the biggest obstacle in taking advantage of the opportunities that do exist.

However, the McGraw-Hill Ryerson report indicated that interest in the Internet and web-based technology is waning not for a lack of interest but rather because "...it becomes more a tool than a new attraction, but at the same time it is apparent that web-based technology is incorporated in more and more aspects of faculty work" (p.1). To underpin the importance of educational technology, faculty participating in the study deem access to computer technology to be by far the most effective institutional resource for encouraging student success outweighing such traditional and critical resources as the library and tutoring. The study further suggests that the major challenges or obstacles to faculty's ability to integrate technology into teaching and learning are access to relevant knowledge about technologies and access to technical support (p.1). These findings are consistent with the findings of this thesis. The McGraw-Hill Ryerson report also indicated that "...faculty may be experiencing diminishing returns for their efforts and need support in integrating technology more fully into students' learning so that its full potential can be realized (p.2)". Again, these findings are consistent with the findings of this thesis. Further study in this area is needed to better understand this resistance.

Future Use of Technology

The data clearly suggested that faculty intend to increase their use of educational technology in their instruction. A large majority of faculty (86.7%) anticipated that they would be using technology more. This data supports the fact that faculty are favourably disposed to the use of educational technology. Some faculty indicated that they did not expect to increase their use. No assumption should be made that this indicates a resistance to their actual use of educational technology. It is quite possible, as personal experience of the researcher shows, that many of these faculty are already using educational technology to a great extent and even at a very high level. The implication of this increased intent of usage is that additional hardware software and on-going training and support will be required to nurture faculty's desire to enhance learning by the use of educational technology.

Need for Upgraded/New Skills and How They Will be Acquired

The findings of this thesis clearly indicated that a large majority of faculty (85.7%) felt they would need to acquire new skills or to upgrade their existing skills while almost one in ten (9.0%) felt that the skills they currently possessed would be adequate for the increased use of technology to support instruction. These data clearly suggested that there is a strong need for further development of upgrading faculty skills in the area of usage of educational technology.

The data also suggested that faculty want and need training to help them support the integration of educational technology to promote learning. The literature and research experience tell us, however, expressing a desire for training does not mean that faculty will actually take the training. To increase the probability that faculty will actually take the training, it must be offered when , where and how faculty need it.

To ensure that this need was met, data was obtained to measure the preferred way for faculty to achieve the skills needed. The findings clearly suggested that the preferred method of acquiring or upgrading skills in technology is to learn on their own with support and assistance provided by the college when it is asked for. This implies that faculty are prepared to take responsibility for their training. The least preferred method is to learn these new skills on their own without support. The implication is that faculty not only have the desire but also feel they have the ability to upgrade their skills but with support. A further implication of this skills upgrading preference is that faculty will need the time to be able to acquire new or upgrade existing skills. This time should be formally recognized in some manner on the Standard Workload Form (SWF). This is further supported by data which suggested that faculty find the lack of time as a key inhibiting factor to learning the use of new technologies.

Factors Inhibiting Use of Educational Technology in Instructional Practices

The data collected suggested that faculty are using educational technology to support their instructional practices, will continue to do so and will actually increase its level of usage. Further, the data suggested that faculty feel they need to acquire new skills and upgrade existing skills to be able to do so. The question that needs to be asked, then, is why faculty simply do not do this.

The data collected indicated that the top five key inhibitors for further adoption of educational technology are the following:

1. Lack of time to learn how to use educational technology
2. Inadequate technical support from their college
3. Inadequate access to necessary software tools at work
4. Inadequate release time provided on the SWF
5. Inadequate availability of software at work

What faculty are saying is: “Give me the time, tools and technical support and I will do what is necessary to learn what I need to learn to further use educational technology to support learning. Lastly, recognize me formally for my efforts and show this on my SWF”.

Access to a Computer at Work

The vast majority of respondents (94.8%) reported having access to a computer at work which is connected to the campus computing network (99.5%). Most of the respondents have their own computer (83.8%) with less than sixteen percent (15.7%) sharing a computer. The goal should be to have one hundred percent of the faculty connected to their own computer at work. The data suggested that faculty want to use technology to promote learning, they can see the advantages and they are also receptive to learning how to do this. To accomplish this, they will need the proper tools and equipment. The sharing of hardware and software will impede the learning process and quite possibly stifle the faculty's enthusiasm. Since the college system is promoting learning for its students that is not time or place bound, it would seem logical that the same principle apply to faculty.

Computer Usage for College Related Work

One possible way of measuring the level of commitment that faculty have to educational technology can be gauged by determining the amount of time they spend using it. The results of the findings suggested that the majority of faculty (53.6%) spend between one and three hours a day on the computer doing college related work with more than one in five respondents (22.5%) claiming to spend more than five hours a day doing similar work. This high level of usage is confirmed with similar results obtained by Anderson (1998). What the data suggested is that the

computer has become an integral part of the faculty's educational toolbox, and as such faculty will need adequate equipment to use this toolbox appropriately and the continuous training to maintain and upgrade their skills.

Satisfaction With Technology Equipment

While the old adage suggests that a person should never blame the tools for a poor job, the more sophisticated a task becomes the more important the adequacy of the tool is.

The data indicated that while two in five (39.5%) of the respondents were either very or somewhat satisfied with the equipment, almost one in two respondents (47.4%) were dissatisfied or very dissatisfied. This suggests that the largest proportion of faculty feel that they do not have the proper equipment in the classroom to utilize fully the potential of educational technology. If the proper equipment is not available, there is not a great deal of incentive to devote time and effort to learning the use of educational technology. Further, the implication is that, if the equipment is not available, not only will faculty not be motivated to use educational technology, but they will feel a level of frustration that may discourage their current level of usage. Once this frustration is imbued in the faculty, there is no reason to believe that the learner will not sense this frustration within the faculty. Anything that creates tension or establishes potential barriers can impede learning and should be removed.

RECOMMENDATION ONE

It is recommended that the faculty and administration of Ontario community colleges collaboratively and jointly invest in, develop, prepare and implement strategies to integrate educational technologies more fully both in the learning and teaching cycle.

RECOMMENDATION TWO

It is recommended that Ontario community colleges provide the research-supported training and resources necessary to develop, market and deliver online courses that are credible and equivalent in substance to courses delivered in the traditional mode, taking individual learner styles into account.

RECOMMENDATION THREE

It is recommended that Ontario community colleges set up costing models with clear guidelines to determine the Return on Investment (ROI) - both financially and in learning effectiveness - for projects designed to implement the use of educational technology to promote learning.

RECOMMENDATION FOUR

It is recommended that Ontario community colleges research, design, develop, implement and support a strategic professional development plan which will help faculty accept, adopt and integrate educational technologies into instructional processes to help promote learning. Such a programme will include the following key elements:

1. A recognition in the Standard Workload Form that time is required to learn the use of the software and hardware necessary to adopt educational technology as a tool to promote learning.
2. A recognition that rigorous training is required to implement education technology successfully in the learning process
3. A recognition that faculty need to know how to design, create and use various educational technology resources
4. A recognition that adequate technical support will be required to help faculty implement educational technology strategies into their instructional practices successfully.
5. A recognition that a reward system (of time and/or compensation and/or recognition) must be provided for those faculty members who do a conscientious job in implementing educational technologies in the learning cycle.

6. A recognition that faculty will need proper software at home and at school, to implement educational technology strategies
7. A recognition that each faculty member should have exclusive access to a computer terminal at work.
8. A recognition that no faculty member will be laid off or demoted as a result of efficiencies or effectiveness gained through the adoption of educational technology.

RECOMMENDATION FIVE

It is recommended that Ontario community colleges provide the necessary infrastructure - hardware, software, networks, technicians - to allow faculty to successfully integrate educational technology.

RECOMMENDATION SIX

It is recommended that Ontario community colleges encourage and reward faculty and others who do continuing research in the field of the development and application of educational technology.

Future Research

The results of this study suggest that there are a number of areas that would invite or warrant further research which could possibly help enhance the understanding of the use of educational technology to promote learning in the Ontario community college forum.

Possible areas of further research include the following:

1. The data suggest that there are differences in views in a number of areas related to college size. It would be useful and interesting to know if these differences exist because of the inherent differences in culture and attitudes in different colleges or if these differences are related to economic and possibly other factors.

2. There was a bimodal distribution with respect to who should control technology. In an ideal situation one would think that the control of technology would not be an issue but rather that there would be a degree of collaboration between administration, faculty and support staff. Yet the data suggests that almost forty-seven percent (46.7%) of respondents express some level of agreement that faculty should have total control, twenty-two percent (22.4%) remain neutral in their view with an additional thirty percent (29.5%) expressing disagreement. Why does such a divergence of opinion exist? Is it based on past

experiences? Is there a lack of trust with respect to how technology would be implemented and used? Does the culture of a college have an impact on such views?

3. The data also showed that there was another area where a bimodal distribution of views existed. The issue revolves around whether money being invested in technology should be redirected to hire and train more faculty. While the largest proportion of faculty (41.1%) express some level of agreement slightly more than thirty-two percent (32.4%) expressed some level of disagreement, with another twenty-four percent (24.2%) remaining neutral. Why does such a divergent of views exist? Further research into this area might yield further insights with respect to faculty's attitudes regarding the use of educational technology to promote learning.

4. The return rate on this survey was lower than one would have hoped for. The consequence is that the results of this study cannot be generalized. However, feedback from ACAATO would suggest that such a return rate is the norm for province wide surveys conducted in the community college domain. An important area of further research would be to carefully review the structure, timing and distribution methods of this research instrument to see if it would be possible to promote the annual administration of this or similar surveys to establish a longitudinal perspective. Consideration should be given to conducting such research in conjunction with a qualitative study involving focus groups.

Concluding Remarks

The primary purpose of this thesis is to investigate the perceptions of Ontario community college faculty about the use of educational technology to promote student learning and the factors that encourage or discourage their use of it. Further, it investigated which faculty are the most likely to use educational technology as well as the extent and nature of its use. From this investigation, implications were drawn and recommendations were made to advance the appropriate implementation and use of educational technology in Ontario community colleges.

The foundation for this research was the review of the literature. The literature review dealt with the cultural and societal context of technology and the debate about educational technology in the postsecondary milieu, the central issues relating specifically to the faculty adoption of educational technology and how faculty can and do use this educational technology.

More specifically the literature reviewed four key areas:

1. The cultural and societal context and debate about educational technology in the postsecondary milieu;
2. Central issues relating specifically to the faculty adoption of educational technology;
3. How faculty can and do use educational technology; and

4. Studies conducted in the Ontario community college domain.

The literature review portrayed an economy which is clearly seen as a knowledge economy, one in which everything we do and produce is based on the application of human knowledge. This shift has been so rapid, so intense that the process of intellectual change has often exceeded our ability to reasonably cope with it, placing a great deal of stress on us all. Along with this stress comes an equally high degree of fear about our ability to cope and survive.

The literature suggests that such intense and rapid change has had dramatic impact on postsecondary institutions. Not only have postsecondary institutions had to cope with how technology and e-learning have changed the how and where students learn, but also they have had to face a more demanding and discriminating learner and consumer who has many options and choices to make, options and choices that are offered by competitive higher education institutions.

These increasing pressures ultimately place a strain on faculty as they try to cope with an increasing workload, enhance their courses and stay up-to-date. Educational technology is seen by many as a tool to respond to some of these demands. Different methods of educational technology can be seen as viable ways of addressing the issues of increasing costs, increasing number of students, increasing demand for access and responding to increasing demands for technical infrastructures. At the same time, there is a risk in using educational technology. It takes more time to prepare and learn the software, provided the expensive infrastructure is in place to begin with. In addition, the faculty must do the research on how the delivery method may affect the

instructional process and impact on the learner. Often, this needs to be done without commensurate rewards, risking further stress and frustration being placed on the faculty. Ultimately, educational technology must be a thoughtful, considered choice in a learning environment, which is both inclusive and accessible for the learners and the faculty.

The data from this study drew a picture of a faculty who are favourably disposed to the adoption of educational technology to promote learning in the Ontario community college system, depending upon how it is used. Further, the data revealed a faculty who believes that educational technology is important in improving both quality and accessibility, a faculty who believes that educational technology will help meet the needs of the various learning styles of their learners, a faculty who believes educational technology makes them more accessible to their students and improves communication amongst all parties - learners, faculty and administrators. To ensure that educational technology achieves its ultimate potential, the data revealed that faculty are receptive to taking the necessary training and are prepared to increase its usage, recognizing that due investments must be made, as described above.

There is little doubt that educational technology will continue to have a significant impact on how successful learners will be in the Ontario community college system. The contribution of this study to scholarship was the creation of an objective database from which future decisions can be made to enhance the adoption and effectiveness of educational technology in the classrooms in Ontario's colleges.

References

Alfred, R. (1995). Transforming community colleges to compete for the future. Toronto: ACAATO.

American Federation of Teachers. (1996). *Teaming up with technology: how unions can harness the technology revolution on campus* [Online]. Available: http://www.aft.org/higher_ed/downloadable/ttf4.pdf

American Federation of Teachers. (1966). *Technology issues: a survey of negotiations - an appendix to the report of the AFT higher education program and policy council's task force on technology and higher education* [Online]. Available: http://www.aft.org/higher_ed/downloadable/newcb.pdf

Anderson, T., Varnhagen, S., & Campbell, K. (1998). Faculty adoption of teaching and learning technologies: contrasting earlier adopters and mainstream faculty. The Canadian Journal of Higher Education, XXVIII(2,3). 71-98.

Armstrong, A. & Casement, C. (1998). The child and the machine: why computers may put our children's education at risk. Toronto: Key Porter Books.

Association for Canadian Community Colleges. (1998). Technology - mobilizing for the future task group association of Canadian colleges final report [Online]. Available: http://www.accc.ca/english/forum/publications/tech-report.htm .

Association of Colleges of Applied Arts and Technology of Ontario. (2000). 2000 Environmental scan [Online]. Available: http://www.acaato.on.ca/scan2000/environ2.html .

Association of Colleges of Applied Arts and Technology of Ontario. (1998). *1998-99 Environmental scan* [Online]. Available: http://www.acaato.on.ca.

Association of Canadian Community Colleges. (1997). *Mobilizing for the future: educational technology in Canada's community colleges and technical institute* [Online]. Available: http://www.accc.ca/english/forum/publications/Technology.htm .

Association of Canadian Community Colleges. (1995). *Learning-centered education in Ontario's colleges: a discussion paper* [Online]. Available: http://www.acaato.on.ca/white.html .

Bandura, A. (1986). *Social foundations of thought and action: A social-cognitive theory*. Englewood Cliffs, N.J: Prentice-Hall.

Bass, R. (1999). Discipline and publish: faculty work, technology, and accountability. [Online]. Available: http://www.georgetwon.edu/bassr/disc$pub.html.

Bates, A. (2000). Managing technological change: strategies for college and university leaders. San Francisco: Jossey-Bass.

Bates, A. (No date). *Educational multi-media in a networked society* [Online]. Available: http://bates.cstudies.ubc.ca/edmedia.html.

Bates, A. (No date). *Strategies for the future* [Online]. Available: http://bates.cstudies.ubc.ca/paper2.html.

Bates, A. (1997). *Restructuring the university for technological change* [Online]. Available: http://bates.cstudies.ubc.ca/carnegie/carnegie.html.

Bates, A. (1997). *Technology, distance education and national development* [Online]. Available: http://bates.cstudies.ubc.ca/icde/icde.html.

Bates, A. (1996). *The impact of technological change on open and distance learning* [Online]. Available: http://bates.cstudies.ubc.ca/brisbane.html.

Bates, A. (1995). *The future of learning* [Online]. Available: http://bates.cstudies.ubc.ca/paper.html .

Becker, H. (1999). *Internet use by teachers: conditions of professional use and teacher directed student use* [Online]. Available: http://www.nap.edu/readingroom/enter2cgi?ed.html.

Benton Foundation.(2002).Great expectations: leveraging america's investment in educational technology. [Online]. Available: http://www.benton.org/e-rate/greatexpectations.pdf

Bereiter, C. (in progress). Education and mind in the knowledge age [Online]. Available: http://csile.oise.utoronto.ca/edmind/edmind.html .

Boettcher, J. & Conrad, R. (1999). Faculty guide for moving teaching and learning to the web. Mission Viejo: League for Innovation in the Community College.

Bollentin, W. (1998). *Can information technology improve education?* [Online]. Available: http://ivory.educom.edu/web/pubs/review/reviewArticles/33150.html .

Cameron, S. & Heckman, J. (1993). *The nonequivalence of high school equivalents.* Journal of Labor Economics II (I):1-47

Campbell, K. & Varnhagen, S. (2002). When faculty use instructional technologies: using Clark's delivery model to understand gender differences. *Canadian Journal of Higher Education*, 32(1), 31-56.

Chronicles of Higher Education. editors (1999). Community colleges and technology. Washington: The Chronicles of Higher Education.

Clark, R.E. (1994). Media will never influence learning. *Educational Technology Research and Development*, 42(2), 21-29.

Committee on Information Technology. (1999). *Being fluent with information technology* [Online]. Available: http://www.nap.edu/readingroom/books.befit/

Cooper, T. (2003, May 8). *Welcome*.[Letter to participants]. The Nexus Conference: Connecting Teaching, Technology and Inclusive Learning. University of Toronto

Cravener, P. (1999). *Faculty experiences with providing online courses: thorns among the roses* [Online]. Available: http://www.cravener.net/articles/facexp.htm .

Cravener, P. (1999). *Piloting the psychosocial model of faculty development: a systems approach to promoting technology use for distance education* [Online]. Available: http://www.cravener.net/articles/fdppilot.htm .

Cravener, P. & Michael, W. (1999). *Students use of adjunctive cmc* [Online]. Available: http://www.cravener.net/articles/austin1.html .

Cusumano, M. and Yoffie, D. (1998). Competing on internet time: lessons from Netscape and its battle with Microsoft. New York: Free Press.

Daggett. W. (1998). *Technology in education: striving for excellence and equity* [Online]. Available: http://www.league.org/labs02908.html .

Deegan, W. & Tillery, D. (1991). Renewing the American community college: priorities and strategies for effective leadership. San Francisco: Jossey-Bass.

Dewar, T. (1966). *Adult learning Online*. [Online]. Available: http://cybercorp.net/~tammy/lo/oned2.html.

Dillman, D. Mail and internet surveys: the tailored design method (2nd . Ed.). . New York: Wiley & Sons.

Dolence, M. & Norris, D. (19945). Transforming higher education: a vision for learning in the 21st century. Ann Arbor, MI.: The Society for College and University Planning.

Donovan, M. and Macklin, S. (1999). The Catalyst project: Support faculty uses of the web...with the web. Cause/Effect (Vol.22/No.3).

Downes, L. & Mui, C. (1998). Unleashing the killer app: digital strategies for market dominance. Boston: Harvard Business School Press.

Drucker, P. (1999). Beyond the information revolution. Atlantic Monthly, October 1999, [Online]. Available: http://www.theatlantic.com/issues/99oct/9910drucker.htm

Drucker, P. (1999). Management challenges for the 21st century. New York: HarperCollins.

Dunlop, T. (1997). *Expanding horizons for learning and technology: strategies for moving into the mainstream* [Online]. Available: http://www.accc.ca/english/forum/publications/CollegeCanada/9697-2-3/future.htm .

Foot, D. (2000). Boom, bust & echo: profiting from the demographic shift in the new millennium. Toronto: Macfarlane Walter & Ross.

Gardner, H. (1993). Multiple intelligences: the theory in practice. Toronto: HaperCollins,

Dunlop, T. (1997). *Developmental issues for telecourse delivery: an instructional perspective* The College Quarterly [Online], Fall, 1997. Available: http://collegequarter.org/CQ.html/HHH.075.CQ.F97.Dunlop.html.

Gates, B. (1999). Business @ the speed of thought: using a digital nervous system. New York: Warner Books.

Gates, B. (1995). The road ahead. New York: Viking.

Glick. M. & Kupiec, J. (2001). The answer is still technology: strategic technology. [Online]. Available: http://www.educause.edu/ir/library/pdf/ERM0162.pdf.

Geoghegan, W.H. (1994). *Whatever happened to instructional technology? IBM Academic Consulting.* Paper presented at the 22nd Annual Conference of the International Business Schools Computing Association. Balitmore, Maryland (July 17-20). [Online]. Available on line: http://www.hied.ibm.com/news/whitep/shg/wpi.htm

Goodmurphy, M., Branton, B. et al. (2000). Andragogical and pedagogical differences relative to their interfacing with internet resources. [Online]. Available: http://admserver.fanshawec.on.ca/users/TGedies/index.htm.

Graves. W. (2002). New educational wealth as a return on investment in technology. [Online]. Available: http://www.educause.edu/ir/library/pdf/ERM0242.pdf

Green, K. (1996). *Technology as a metaphor for change* [Online]. Available http://www.league.org/labs0796.html .

Hanna, E. and Associates (2000). *Higher education in an era of digital competition: choices and challenges.* Madison, WI.: Atwood Publishing.

Harvard Policy Group (2000). Eight imperatives for leaders in a networked world: Guidelines for the 2000 election and beyond. Available: www.ksg.harvard.edu/stratcom/hpg

Hartman, V. (1995). Teaching and learning style preferences: transitions through technology. VCCA Journal 9, no. 2 Summer: 18-20. [Online]. Available: http://www.so.cc.va.us/vcca/hart1.htm.

Heterick, Jr. & Twigg, C. (1997). *Interpolating the future* [Online]. Available: http://ivory.educom.edu/web/pubs/review/reviewArticles/32160.html .

Hewitt, J., Brett, C. & Scardamalia, M. (1995). Schools for thought: transforming classrooms into learning communities [Online]. Available: http://csile.oise.utoronto.ca/abstracts/kn_build/

Harvard Policy Group (2000). Eight imperatives for leaders in a networked world: Guidelines for the 2000 election and beyond. Available: www.ksg.harvard.edu/stratcom/hpg

Hartman, V. (1995). Teaching and learning style preferences: transitions through technology. VCCA Journal 9, no. 2 Summer: 18-20. [Online]. Available: http://www.so.cc.va.us/vcca/hart1.htm.

Hoffert, J. (1998). The bagel effect: a compass to navigate our wired world. Toronto: McGraw-Hill Ryerson.

Homer, J. (Personal communication, February 26, 2003)

IBM *Living in the Information Society Series* (1997). Transforming higher education. Available: http://www.ibm.com/ibm/publicaffairs.

Jacobsen, D. *Adoption patterns of faculty who integrate computer technology for teaching and learning in higher education* [Online]. Available: http://www.acs.ucalgary.ca/~dmjacobs/phd/phd-results.html .

Johnson, S. (1997). *Community college leadership in the age of technology* [Online]. Available: http://www.league.org/labs0597.html .

Kolb, D. (1985). Learning style inventory. Boston: McBer and Company.

Knowledge Forum (2000). Supports knowledge-building communities.... [Online]. Available: http://www.learn.motion.com/lim/kf/KFcommunity.html

Knowles, M. (1975). Self-directed learning. Chicago: Follet.

Knowles, M. (1980). The modern practice of adult education. Chicago, IL: Association/Follett Press.

Knowles, M. (1984). The adult learner: a neglected species (3rd. Ed.). Houston, TX: Gulf Publishing.

Knowles, M. (1984). Andragogy in action. San Francisco: Jossey-Bass.

Litzinger, M. & Osif, B. (1993) Accommodating diverse learning styles: designing instruction for electronic information sources. In *What is good instruction now? Library instruction for the 90s.* ed. L. Shirato. Ann Arbor, MI: Pierian Press.

Llyod, D.G. (2001). *Teaching styles and faculty attitudes towards computer technology in teaching and learning at a college in Ontario.* Unpublished doctoral dissertation, Ontario Institute for Studies in Education of the University of Toronto, Toronto.

Machiavelli, N. (1977). The prince : a new translation, backgrounds, interpretations / Niccolo Machiavelli ; translated and edited by Robert M.. Adams. New York: Norton.

Mager, F. (1984). Preparing instruction objectives. Belmont, California: Lake Publishing Company.

Malinski, R.M. (2000). *An examination of the experiences which university teachers have in the process of incorporating computer mediated instruction techniques in their courses.* Unpublished doctoral dissertation, Ontario Institute for Studies in Education of the University of Toronto, Toronto.

Marcinkiewiz, M. (2000). Implementation strategies: will teachers use educational computer? [Online]. Available: http://itech1.coe.uga.edu/itforum/paper42.html.

McCandless, C. (1997). *Galloping off in all directions: good reasons for strategic planning for educational technology in our institutions* [Online]. Available: http://www.accc.ca/english/forum/publications/CollegeCanada/9697-2-3/features2.htm.

McGraw-Hill Ryerson (2002). Technology and student success in higher education: a research study on faculty perceptions of technology and student success (3rd. Ed). Toronto:McFraw-Hill Ryerson.

McKensie, J. (1999) How teachers learn technology best. Bellingham, Washington: FNO Press.

McKensie, J. (1999). *Reaching the reluctant teacher* [Online]. Available: http://fno.org/sum99/reluctant.html.

McKenzie, J. (1998). *Adult technology learning: creating learning cultures with just-in-time support* [Online]. Available: http://fno.org/eschool/adult.html.

McKenzie, J. (1998). *Creating the vanguard: identifying and grooming the pioneers* [Online]. Available: http://fno.org/eschool/cadre.html.

McKenzie, J. (1994). *From technology refusal to technology acceptance: a reprise* [Online]. Available: http://fno.org/may94fno.html.

McKenzie, J. (1993). *Assessing staff technology competence* [Online]. Available: http://fno.org/FNOFeb93.html.

McKenzie, J. (1993). *Creating flexible district technology plans* [Online]. Available: http://fno.org/FNOMay93.html.

Meaghan, D.E. & Casas, F.R. (1994). Setting the wrong challenge for Canadian education. The College Quarterly [Online], Spring 1994. Available: http://collegequarterly.org/CQ.html/HHH.014.Spr94.Meagham.htm.

Mior, J. (1999). *Supporting the leapers*. [CD-ROM]. Available: jmior@flemingc.on.ca.

Milliron, M. Interprise Vision: Unleashing the power of the internet in your higher education enterprise. Redwood Shores, Ca.: Oracle Corporation.

Milliron, M. & Leach, R. *Community college winning through innovation: taking on changes and choices of leadership in the twenty-first century* [Online]. Available: http://www.league.org/leadabccwi.html .

Moore, .G.A. (1991). *Crossing the chasm: Marketing and selling technology products to mainstream customers.*

Noble, D. (1998). *Digital diploma mills (part II)* [Online]. Available: http://communication.uscd.edu/dl/ddm2.html.

Noble, D. (1998). *Digital diploma mills (part III)* [Online]. Available: http://communication.uscd.edu/dl/ddm2.html .

Noble, D. (1998). The religion of technology: the divinity of man and the spirit of invention. New York: Alfred A. Knopf.

Noble, D. (1997). *Digital diploma mills* [Online]. Available: http://home.istar.ca/~acjames/noble.html.

Noble, D. (1977). American by design: science, technology and the rise of corporate capitalism. New York: Oxford University Press.

Noble, D. (1995). Progress without people: new technology, unemployment and the message of resistance. Toronto: Between the Lines.

Noblitt. J. (1997). *Making ends meet: a faculty perspective on computing & scholarship: top-downtop-down meets bottom-up* [Online]. Available: http://ivory.educom.edu/web/pubs/review/reviewArticles/32338.html .

Norman,, D. (1999). The invisible computer. Cambridge, Massachusetts: MIT Press.

Oas, R. (2000, September). Have it your way: adaptive learning puts student in charge. OnLine Learning Magazine.

O'Banion, T. (1997). A learning college for the 21st century. Phoenix: Oryx Press.

O'Banion, T. (1997). Creating more learning-centered community colleages. Mission Viejo, CA.: League for Innovation.

Olinger, D. (1999). Putting students at the center: a planning guide to distributed learning. Boulder, CO: Educause.

Ontario Jobs and Investment Board. (1999). A road map to prosperity: an economic plan for jobs in the 21st century. Toronto: OJIB.

Ontario Ministry of Education and Training. (1996). Excellence, accessibility, responsibility: Report of the advisor panel on future directions for postsecondary education Online]. Available: http://www.edu.gov.on.ca./eng/document/reports/future.html.

Oppenheimer, T. (1997). The computer delusion. [Online]. Available: http://theatlantic.com/issues/97jul/computer.htm

Oshler, J. (1999). Taming the beast: why technology evokes anxiety. [Online]. Available: http://www.aft.org/publications/on_campus/dec99jan00/technology.html

Panitz, D. (1999). Will you still be teaching in the twenty first century? [In press].

President's Information Technology Advisory Committee (1999). Information technology research: investing in our future. [Online]. Available: http://www.ccic.gov/ac/report/.

Phipps, R. & Merisotis, J. (1999). What's the difference? A review of contemporary research on the effectiveness of distance learning in higher education. Institute for Higher Education Policy: Washington.

Pocklington, T & Tupper, A. (2002). *No place to learn.* Vancouver: UBC Press.

Postman, N. (1995). The end of education: redefining the value of school. New York: Alfred A. Knopf.

Postman, N. (1993). Technopoly: the surrender of culture to technology. New York: Alfred A. Knopf.

Privateer, P. (1999). *Academic technology and the future of higher education: strategic paths taken and not taken.* The Journal of Higher Education, Vol. 70, No. 1 (January/February 1999)

Richardson, B. (1998). *Seven practices to prepare our students for success in the digital age* [Online]. Available: http://www.league.org/labs1298.html .

Ringstaff, C. & Kelley, L. (2002). The learning return on our educational technology investment: A review of findings from research. San Francisco: WestEd RTEC. Available:http://www.wested.org/cs/wew/view/rs/619.

RML Research. (2003). McGraw-Hill Ryerson survey summary: the role of e-learning in student success - wave 4. PowerPoint Presentation sent to participants.

Roberts, J. & Keough, E. (eds). (1995). Why the information highway? Lessons from open and distance learning. Toronto: Trifolium Books.

Robertson, H. (1998). No more teachers, no more books: the commercialization of Canada's schools. Toronto: McClelland and Stewart.

Rogers, E.M. (1995). Diffusion of innovations. 4th ed. New York: Free Press.

Rosenberg, M. (2001). E-Learning: strategies for delivering knowledge in the digital age. New York: McGraw-Hill.

Scardamalia, M. & Bereiter, C. (1996). Schools as knowledge building organizations [Online]. Available: http://csile.oise.utoronto.ca/abstracts/ciar-understanding.html.

Scardamalia, M. & Bereiter, C. (1994). Computer support for knowledge-building communities [Online]. Available: http://carbon.cudenver.edu/~bwilson/building.html.

Schroeder, C. (1996). *New students - new learning styles.* [Online]. Available:http://www.virtualschool.edu/mon/Academia/KierseyLearningStyles.html.

Seely, J. & Brown, P. (2000). The social life of information. Boston: Harvard Business School Press.

Skolnik, M. (1998). Higher education in the 21st. century. Futures 30 (7) 635-50.

Skolnik, M. (1998). The university in transformation: global perspectives on the future of the university. Greenwood [In press].

Skolnik, M. (2000). In praise of polarities in postsecondary education. [Online]. Available: http://gaia.flemingc.on.ca/~jmior/oise/Jackson_lecture.html.

Smith, F. (1988). Insult to intelligence: the bureaucratic invasion of our classrooms. New York: General Publishing.

Stoll. C. (1995). Silicon snake oil: second thoughts on the information highway. New York: Anchor Books.

Stoll, C. (1999). High tech heretic: why computers don't belong in the classroom and other reflections by a computer contrarian. New York: Doubleday.

Surendra, S. (2001). *Acceptance of web technology based education by professors and administrators of a college of applied arts and technology in Ontario.* Unpublished doctoral dissertation, Ontario Institute for Studies in Education of the University of Toronto, Toronto.

Tapscott, D. (1996). The digital economy: promise and peril in the age of networked intelligence. New York: McGraw-Hill.

Tapscott, D., Lowy, A. & Ticoll, D. (eds). (1998). Blueprint to the digital economy: creating wealth in the era of e-business. New York: McGraw-Hill.

Tapscott, D. (1998) Growing up digital: the rise of the net generation. New York: McGraw-Hill.

Technology 2000 (editors). Six for the century: Six visionaries share their thoughts on technology and learning, Vo. 4 No. 1: January 2000.

Tissue, B (1997). The cost of incorporating information technology in education. [Online]. Available: http://www.chem.vt.edu/archive/chemconf97/paper04.html#IT.

Twigg, C. (1995). *The one percent solution* [Online]. Available: http://ivory.educom.edu/web/pubs/review/review/Articles/30616.html.

University of Phoenix Catalog. (2000). Available: http://www.uophx.edu/catalog/uop.html

U.S. Department of Education (1983). *A nation at risk* [Online]. Http://www.ed.gov.pubs/NatAtRisk/risk.html .

Valdare, A. (2000, July). [Letter to the editor]. Time Magazine, p.5

Wiersma, W. (1969). Research methods in education: an introduction. New York: J.B. Lipppincott.

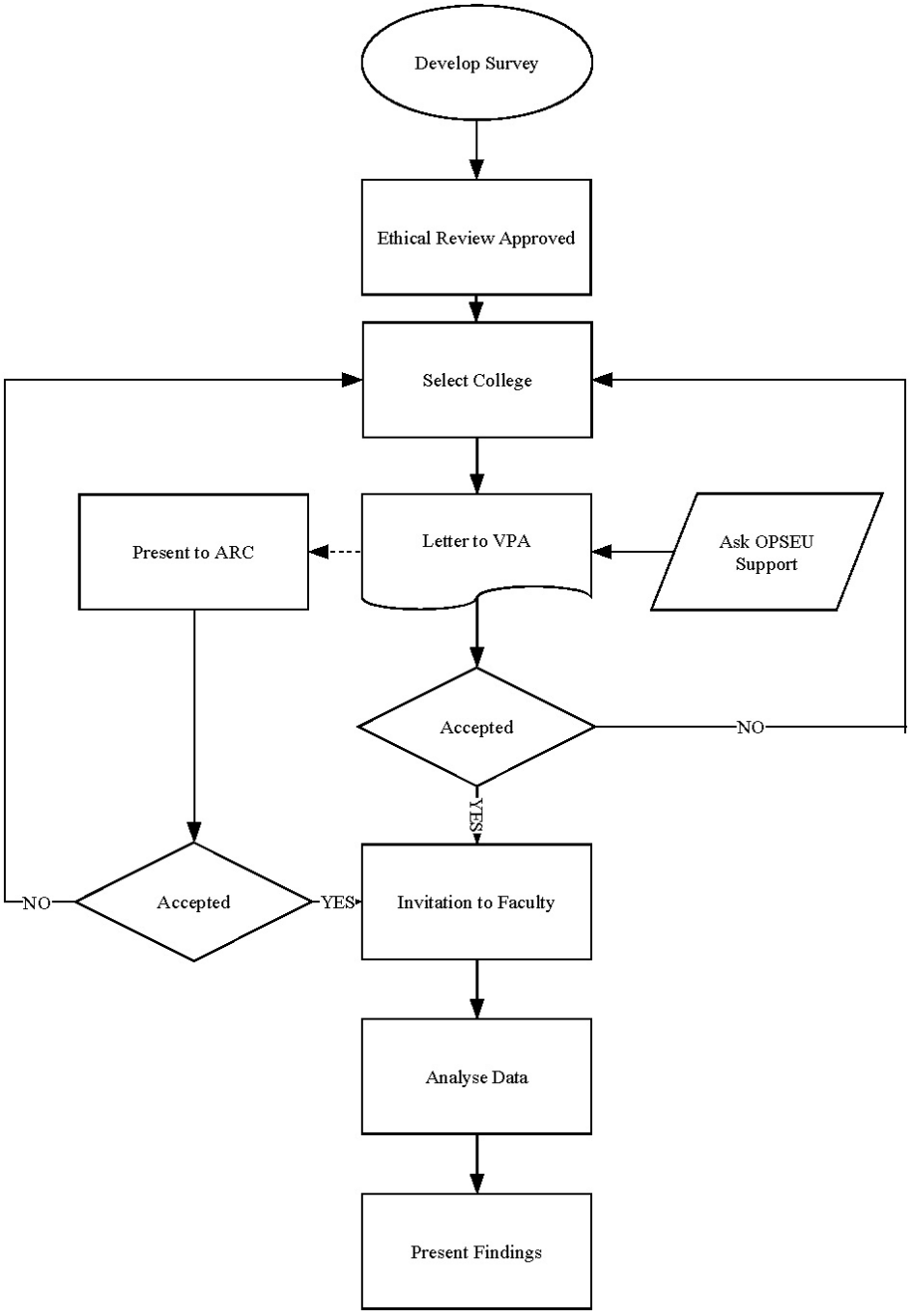
White, B. (2001). *Ancient models, modern teachers, and moral education: choosing a peaceful pedagogy* [Online]. Available: http://www.tcrecord.org/content.asp?ContentID=10734

Williams, B. (1993). *Barriers to new technology: staff balkanization* [Online]. Available: http://fno.org/FNOSept93.html.

Williams, B. (1993). *Barriers to new technology: skill fixation in staff development* [Online]. Available: http://fno.org/FNOOct93.html.

Wright, C. & Stammer, I. (1996). Overcoming resistance to educational technology innovation. The College Quarterly [Online], Spring, 1996. Available: http://collegequarterly.org/CQ.html/HHH.057.CQSpr96.Wright.html.

Appendix A - Survey Protocol Flowchart



Appendix B - Questionnaire

Technology Survey: Response by Question (N=210)

A This section is intended to elicit both your views about the educational technology and its importance as a tool to promote learning.

1. Please indicate the extent to which you agree or disagree with each statement on the scale provided.

	Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %	Don't Know %	No Response N
1. Technology is essential for improving the quality of education in the Ontario community college system.	46	42	7	2	3	0	1
2. Technology is essential for making a community college education more accessible to learners.	47	38	9	5	1	0	1
3. Technology is essential for meeting the diverse learning styles of today's community college students.	41	39	12	8	1	0	1
4. Technology is essential for reducing the costs per student of delivering a community college education.	10	19	26	22	15	9	1
5. Increased use of technology is promoted by administrators to reduce faculty salary costs.	20	23	20	24	7	7	1
6. Money invested in technology should be spent to hire and train more faculty.	15	26	24	29	3	2	3
7. More resources should be devoted to training faculty in the proper use of technology.	52	40	5	1	1	0	2
8. Faculty should have total control of how technology is used.	14	33	23	26	4	1	2
9. The use of technology allows the efficient use of existing resources.	13	43	19	18	3	3	2
10. Technology has improved administrative efficiency.	9	36	15	24	12	5	2
11. Technology has improved my productivity as an instructor.	34	42	11	11	2	0	1
12. Technology has made me more accessible to my students.	39	36	9	12	3	0	1
13. Technology has improved the level of communication amongst faculty.	22	45	12	16	5	0	1

	Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %	Don't Know %	No Response N
14. Technology has improved the level of communication between administration and faculty.	14	41	15	21	7	2	1
15. I believe that technology is inherently good.	15	35	30	13	5	1	2
16. I believe that technology is inherently bad.	1	1	27	31	36	4	0
17. I believe that technology is neither inherently good or bad. It depends on how it is used.	45	32	20	1	1	1	2
18. I believe that credits achieved through online delivery are equal to credits achieved in the traditional in-classroom fashion.	11	32	12	26	13	7	1
19. The further integration of technology will mean a loss of traditional teaching positions.	11	31	15	32	6	6	1
20. I will try out new software and/or hardware as soon as it becomes available.	12	41	23	19	3	2	1
21. I will try out new software and/or hardware after it has been on the market for a while. This way, **many** of the bugs will have been worked out.	7	46	27	14	4	1	0
22. I will try out new software and/or hardware after **all** the bugs have been worked out.	4	25	32	25	12	2	4

You have completed Section A. Please continue to Section B.

B This section is designed to determine your current level of usage of technology in promoting learning, your possible interest in using technology in the future and the support you would require to do so.

3. Thinking of your teaching practices, which of the following instructional materials, equipment or facilities do you use or plan to use? Check all that apply.

	Currently use %	Within next 3 months %	Within next 3.1–5.9 months %	Within next 6.0–12.0 months %	Within 12.1 months or more %	Do not plan to use %	No Response N
a. I use/will use computer projection to deliver my lectures/seminars.	65	4	4	6	7	14	5
b. I use/will use presentation software (such as MS PowerPoint or Corel Presentation) to delivery my lectures/seminars.	60	4	5	7	7	17	2
c. I use/will use a word processor to prepare handouts and lecture notes for my students.	97	1	1	1	0	1	0
d. I use/will use electronic mail/E-Mail to communicate with my students.	90	1	2	1	1	5	1
e. I use authoring software (such as Macromedia Authorware or Asymetrix Toolbook) to personally create my instructional material.	9	3	5	7	13	64	6
f. I personally create/will create Web pages to deliver or supplement instructional material for my students.	37	6	3	9	15	29	4
g. I use/will use Web pages created for me through college resources to deliver or supplement instructional material for my students.	28	10	6	10	13	33	5
h. I create/will create Web pages using online resources supplied by a publisher to deliver or supplement instructional material for my students.	28	7	3	8	13	42	5
i. I use/will use WebCT or Blackboard to create and deliver instructional material for my students.	25	9	4	11	15	36	5
j. I use/will use E-Books to make instructional material available to my students.	10	7	4	4	13	62	9

	Currently use %	Within next 3 months %	Within next 3.1–5.9 months %	Within next 6.0–12.0 months %	Within 12.1 months or more %	Do not plan to use %	No Response N
k. Other	33	6	3	1	4	53	140

5. If you selected 'Other' in the previous question, please specify.

4. To what extent do you anticipate that you will be using technology in your instruction over the next three years? (N=210)

34% = Much more
53% = Some more
1% = Some less
1% = Much less
12% = No change

5. If you indicated that you anticipate using technology more in the next three years, in what ways do you anticipate this happening? (N=164)

Expanding on complementary course materials; using PowerPoint (if college has the equipment available for us)

6. If you anticipate or intend using new technology to support your instruction, do you feel you will need to acquire new skills or upgrade existing skills to work with this technology? (N=205)

88% = Yes
9% = No
3% = Don't know

8. There are a number of ways of acquiring or upgrading your skills in technology. Using the following scale (from Most Preferred to Do Not Like at all), please indicate your preference for each option.

	Most Preferred %	Less Preferred %	Least Preferred %	Do Not Like at all %	Don't Know %	No Response N
a. Learn on my own when I need to without any formal instruction or support.	21	49	24	7	1	6
b. Learn on my own when I need to with access to formal instruction or support when I ask for it.	62	30	5	2	0	5
c. Attend scheduled professional development workshops covering skills areas that I need. These Workshops are provided by college personnel.	49	34	9	7	1	1
d. Attend scheduled professional development workshops covering skill areas that I need. These workshops are provided by external training centres but paid for by the college.	46	26	8	12	8	3
e. Work in a team situation with other colleagues, supporting each other.	47	29	12	6	6	3
f. Purchase educational technology material from publishers or other sources that are already packaged for use.	27	32	18	13	9	4

8. There are a number of factors that may prevent or inhibit you from fully using educational technology in your instructional practices. Based on the scale provided, indicate to what extent this factor would prevent or inhibit you from fully using technology in your instructional practices.

	Inhibit Greatly %	Inhibit Somewhat %	Neither Inhibit nor Encourage %	Encourage Somewhat %	Encourage Greatly %	No Response N
a. Lack of time to learn how to use educational technologies.	47	39	13	1	0	0
b. Inadequate release time provided on your Standard Workload Form (SWF)	38	24	27	1	1	1
c. No formal college policy supporting the use of educational technology.	22	26	46	5	1	1
d. Lack of interest on the part of administrators.	18	26	43	10	4	3
e. Proper and sufficient training not provided by the college.	26	34	32	7	2	1
f. Inadequate technical support from college.	41	32	19	7	1	0
g. Lack of interest or support from the Union.	10	15	70	3	1	2
h. Lack of interest on the part of my students.	12	27	46	10	6	2
i. Lack of financial incentives.	13	27	57	2	0	2
j. Lack of personal interest or commitment.	16	14	49	9	12	13
k. Inadequate availability of computer hardware or connectivity at work.	40	26	26	5	4	3
l. Inadequate access to necessary software tools at work.	36	37	19	5	4	5
m. Inadequate availability of computer hardware and connectivity at home.	24	36	28	8	4	3
n. Inadequate availability of software tools at home.	27	38	27	5	3	8
o. Lack of knowledge about applying technology in my instruction.	19	38	33	6	4	5
p. Belief that the potential of technology is grossly exaggerated and is not worth time and effort.	10	19	55	8	8	7
q. Lack of an equitable policy ensuring the benefits of intellectual property (e.g. ownership)	17	23	56	2	2	4

9. The implementation and adoption of new educational technologies often benefits from the support of a leader. This leadership can come from a variety of sources. Please indicate how important leadership from each of the sources is to you.

	Very Important %	Somewhat Important %	Not Important at all %	Don't Know %	No Response N
a. The President	44	27	24	5	3
b. Vice-President Academic	51	27	18	3	2
c. Other Vice-Presidents	26	35	32	7	9
d. Deans/Department Chairs	69	21	9	1	2
e. Co-ordinators	56	26	15	3	6
f. Colleagues	57	33	9	2	5

10a. Your computing skills will be an important factor in determining institutional training needs for the adaption and use of technology to promote learning. How would you rate your skill level in each of the following categories?

	Excellent %	Good %	Fair %	Beginner %	None %	No Response %
a. Word Processing	53	39	8	1	0	1
b. Presentation Software (eg. PowerPoint)	34	29	21	11	5	1
c. Spreadsheets (eg. Excel, Quattro)	25	25	14	23	13	2
d. Databases (eg. Access, Paradox)	12	19	14	18	38	2
e. Course authoring software	10	13	12	18	46	1
f. Internet Listservs and/or Newsgroups	18	20	22	26	14	2
g. Word Wide Web (WWW) browsing, searching	51	33	14	1	1	3
h. Web Page Creation & Editing	18	19	14	22	27	2
i. Other (Please specify)	42	8	7	4	40	119

10b. If you selected 'Other' in question 10a, please specify.

11a. Do you have access to a computer on campus? (N=209)

95% = Yes
4% = No
1% = Don't know

11b. If yes to Question 11a, is this computer connected to the campus computing network? (N=199)

99% = Yes
1% = No
0% = Don't know

11c. If you answered 'Yes' in question 11a, do you have your own computer or do you share a computer with one or more colleagues? (N=197)

84% = Have my own computer
16% = Share a computer with one or more colleagues
1% = Don't know

12a. Do you have access to a computer at home? (N=209)

98% = Yes
2% = No [go to question 13]

12b. Is this computer connected to the Word Wide Web?(N=203)

95% = Yes
5% = No
0% = Don't Know

12c. Is this computer adequate for your current needs? (N=203)

76% = Yes
23% = No
1% = Don't Know

13. On average, how many hours a day do you spend on the computer for College related work? (N=209)

4% = Less than 1 hour
25% = 1 – 2 hours
25% = 2.1 – 3 hours
15% = 3.1 – 4 hours
9% = 4.1 – 5 hours
23% = More than 5 hours

14. Thinking about the technology equipment in the classrooms at your college, how satisfied are you with this equipment? (N=208)

11% = Very satisfied
28% = Satisfied
14% = Neutral
31% = Dissatisfied
16% = Very dissatisfied

15. If budgetary concerns did not come into play, please rate the following classroom enhancements that you would like to see.

	Must have %	Would be nice %	Not Important %	No Response N
a. Networked computer with projection	74	24	2	4
b. Film and slide projectors	28	26	46	6
c. VCR/TV monitor for video playback	57	29	15	3
d. Satellite receiving links	15	43	42	8
e. Electronic Blackboard/Smartboard	21	49	30	8
f. Two-way video conference capability	10	44	46	6
g. Student computer connectivity at all seats	45	39	16	5
h. Telephone access to IT Help Desk	53	34	13	4

You have completed Section B. Please continue to Section C.

C This section is designed to obtain some information to help describe the characteristics of those responding to this survey. Please remember that this information will be treated as confidential and your identify will never be revealed.

17. Gender: (N=207)

49% = Male
51% = Female

17. What is your age? (N=209)

1% = Under 26
4% = 26 to 30
6% = 31 to 35
8% = 36 to 40
16% = 41 to 45
24% = 46 to 50
29% = 51 to 55
9% = 56 to 60
3% = 61 or over

18. How long have you been teaching in the community college system in Ontario? (N=210)

25% = Less than 5 years
14% = 5 – 10 years
17% = 11 – 15 years
22% = 16 – 20 years
11% = 21 – 25 years
10% = 26 – 30 years
1% = 31 years or more

19. What School/Department/Centre are you generally affiliated with? (N=204)

5% = Applied Sciences
14% = Applied Technology
22% = Business
14% = Health Sciences
12% = Information Technology
3% = Law/Legal
18% = Liberal Arts and Science
13% = Social and Community Services

21. For statistical purposes we would like to categorize the responses received by the size of the college in our sample. Please indicate which group you fall into (In answering this question, your identity will not be revealed in any way). (N=209)

36% = Large sized college (e.g. George Brown, Sheridan)
41% = Medium sized college (e.g. Durham, Georgian, Niagara)
23% = Small sized college (e.g. Canadore, Sault, Lambton)

Appendix C - Letter of Approval Ethics Review Office

University of Toronto

OFFICE OF RESEARCH SERVICES

PROTOCOL REFERENCE #7852

November 26, 2001

Prof. A. Hildyard
V.P. Human Resources
Simcoe Hall
27 King's College Circle
University of Toronto

Mr. J. Mior
Sir Sanford Fleming College
Box 8000
Lindsay, ON
K0M 1A0

Dear Prof. Hildyard and Mr. Mior:

Re: Your research protocol entitled, "The Human Face of Technology: An Examination of the Perceptions of Ontario Community College Faculty About the Use of Educational Technology"

We are writing to advise you that a member of the Education Ethics Review Committee (EERC) has granted approval to the above-named research study under the Committee's expedited review process.

The approved consent documents are attached. Subjects should receive a copy of their consent form.

During the course of the research, any significant deviations from the approved protocol **(that is, any deviation which would lead to an increase in risk or a decrease in benefit to human subjects**) and/or any unanticipated developments within the research should be brought to the attention of the Office of Research Services.

Best wishes for the successful completion of your project.

Yours sincerely,

Bridgette Murphy
Assistant Ethics Review Officer

Enclosure

cc: Ms. A. Chung (Dept. Coordinator)

Simcoe Hall, 27 King's College Circle, Room 10A, Toronto Ontario M5S 1A1
TEL: 416/ 946-5606 FAX: 416/ 946-5763 EMAIL: bridgette.murphy@utoronto.ca

Appendix D - Sample Letter Requesting Administrative Consent

September 24, 2001

Selected College
College Address
City, Ontario

Attention: Name, Vice- President Academic

Dear Vice-President Academic,

I am a graduate student in the Theory & Policy Studies in Education Department at OISE/UT and am currently planning a research project that will involve the full-time faculty of your college. In order to begin the project, I require your consent.

The primary purpose of this study is to investigate the perceptions of Ontario community college faculty about the use of educational technology and the factors that encourage or discourage their use of it. Further, it will investigate the extent and nature of faculty use of educational technology. It is hoped that this investigation will yield implications for the appropriate implementation and use of educational technology in Ontario community colleges.

The study involves the use of a web-based questionnaire that all full-time faculty at your college will be asked to complete. To facilitate the process and to minimize the amount of work and involvement of your staff, I would supply you with an electronic link to the survey. I would then ask you to provide this electronic link along with a brief memo indicating your support for the project. Once the faculty reach the link, they will receive a detailed description of the project and instructions on how to complete the survey.

There is absolutely no risk of any respondent being identified. A system has been set up so that the identity of the respondent is never revealed. Once the respondent clicks on the submit button, the survey will be sent back via the web to an electronic mailbox. It will come back to this mailbox without identifying the respondent's email account. The respondent's email address will simply be identified as "nobody". Therefore neither I nor the managers of the server will be able to identify any individual completing the survey. The responses will be included only in aggregate summaries and tabulations.

The information gathered from the questionnaires will be kept in strict confidence and stored in a secure location. All information will be reported in such a way that individual respondents or college cannot be identified. All data collected will be used for the purposes of a EdD thesis and

perhaps for subsequent research articles. All raw data will be destroyed five years after the completion of the study.

If you agree to have your college participate in this study, please sign the letter below and return it to me in the envelope provided. If you have any questions, please feel free to contact me at (705) 324-9144 Ext. 3428 or at jmior@flemingc.on.ca . You may also contact my supervisor, Dr. Angela Hildyard at (416) 978-4865. Thank you in advance for your cooperation and support.

Sincerely,

Joseph Mior

_____

Administrator's signature

_____

Date

Appendix E - Letter of Consent (Brief Version)

Dear Colleague:

I am a full-time faculty member at Sir Sandford Fleming College and a Doctoral student in the Community College Leadership Program at the Ontario Institute for Studies in Education of the University of Toronto. I am conducting research on the perception of Ontario community college faculty of the use of educational technology to promote learning. I hope that the data collected will help me achieve a better understanding about faculty use of educational technology and the factors that encourage or discourage their use of it.

Your college is one of the six randomly selected colleges chosen to participate in this study. All full-time faculty at your college are receiving this e-mail. Your experience and views as a faculty member dealing with these issues on a day to day basis are very important to this study. I would ask you to help by completing this attached questionnaire as soon as possible. Based on the experience of faculty who have field-tested this survey, I expect that it will take you between twenty minutes and one-half hour to complete this survey.

A system has been set up so that your identity is never revealed. There is no risk involved in completing this survey. Your responses will be included only in aggregate summaries and tabulations. My thesis supervisor, Professor Angela Hildyard, and I will be the only people who will have access to the data.

When the research project is completed, I will share the results with you by posting a summary on the World Wide Web.

If you would like to participate, please **click here** and you will be taken to the survey page. If you would like additional information about this project, please **click here**.

Thank you in advance for completing this survey. With your help, I hope that the data collected will yield implications for the appropriate implementation and use of educational technology in our college system.

Sincerely,

Joe Mior
Sir Sandford Fleming College
Doctoral Candidate – OISE/UT
jmior@flemingc.on.ca (705) 324-9144 Ext. 3428

Appendix F - Letter of Consent (Complete Version)

Dear Colleague:

I am a full-time faculty member at Sir Sandford Fleming College and a Doctoral student in the Community College Leadership Program at the Ontario Institute for Studies in Education of the University of Toronto. I am conducting research on the perception of Ontario community college faculty of the use of educational technology to promote learning. I hope that the data collected will help me achieve a better understanding about faculty use of educational technology and the factors that encourage or discourage their use of it. Further, I hope that the data collected will help me investigate the extent and nature of its use. It is hoped that this investigation will yield implications for the appropriate implementation and use of educational technology in our college system. (For the purposes of this survey educational technology will be defined as the use of computing and information technology to enhance and promote instruction). Colleges were randomly selected to participate in this study. All full-time faculty in the selected colleges are receiving this email.

Your experience and views as a faculty member dealing with these issues on a day to day basis are very important to this study. Please complete and return this questionnaire as soon as conveniently possible. Based on the experience of faculty who have field-tested this survey, I expect that it will take you between twenty minutes and one-half hour to complete the survey.

A system has been set up so that your identity is never revealed. Once you click the submit button, the survey will be sent back via the web to an electronic mailbox. It will comeback to this mailbox without identifying your email account. Your email address will be simply identified as "nobody". Therefore, neither I nor the managers of the server will be able to identify any individual completing the survey. Your responses will be included only in aggregate summaries and tabulations. There is no risk involved in completing this survey.

My supervisor, Professor Angela Hildyard, and I will be the only people who will have access to the data. The raw data will be kept securely locked in a safe location for a period of five years after which time it will be destroyed.

When this research project is completed, I expect to be able to post a summary on the World Wide Web so all the participants will have the opportunity to view the results. If you would like to be notified when the results are available, signify your interest by following the instructions at the end of this questionnaire.

This project is being supervised by Professor Angela Hildyard, Vice-President (Human Resources) at the University of Toronto. Professor Hildyard may be reached by telephone at (416) 978-4865 or by email at angela.hildyard@utoronto.ca .

Your completion of this questionnaire will be deemed to indicate your consent to participate in this study.

Thank you for completing this questionnaire. Your participation is truly appreciated. If you have any questions that may help you to complete the questionnaire, please feel free to e-mail me directly.

Joe Mior
Sir Sandford Fleming College
Doctoral Candidate – OISE/UT
jmior@flemingc.on.ca (705) 324-9144 Ext. 3428 Fax: (705) 878-9312