THE ACADEMY IN 2005 – 2015: A WEB-BASED DELPHI STUDY

by

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Abstract

In just over a decade the growing use of information and communication technologies (ICT) has caused systemic change in business, communication and financial enterprises. National boundaries have become increasingly transparent and now ICT have the potential to alter higher education institutions dramatically. The purpose of this study was to solicit views from an international panel of experts who provide a broad look at the North American academy as it may be during 2005 to 2015. A distinguished panel forecasts the impact due to internal and external influences of ICT. The research is carried out using web-based Delphi procedures designed to solicit the opinions of three types of experts and determine the level of consensus among them on issues panelists raise about likely influences of ICT. Based on these data the study arrives at the panel's perspective of how higher education might be transformed because of these technologies and some conclusions are drawn.

Scholars, educational administrators and ICT professionals, recruited globally, took part in three iterations of web-based Delphi questionnaires. Online feedback from Rounds 2 and 3 gives histograms showing the three subgroups' interquartiles, means, SDs and commentary. The analysis of Round 3 (N=54) is used in reporting results. Ninety-eight percent of the 85 items achieve consensus on importance and that outcomes are likely to occur before 2010 in North America. Consensus is achieved on the probability of 64 items (75 percent of total number of items); 9 of these items rate a low probability of occurrence. Areas of non-consensus are identified for further research. Fourteen themes emerge under three broad issues: Institutional, Faculty and Staff, and Educational. Web-based instruments were innovated for the research and are on the CD-ROM.

According to this panel the academy will be markedly different during 2005 to 2015. Student populations will have expanded and changed, as will the faculty culture and professorial roles. Universities and colleges will reorganize in response to ICT as high quality, online education moves to the core of on-campus learning. A mixed-mode of face-to-face and online education is predicted as the distinctions between on- and off-campus education blur. Well-financed consortia of universities/corporations operating globally are forecast and will grow to dominate large sections of online education. By 2005 to 2015 the reputation of a university will have as much to do with the activities of its professors on the web as with scholarship, research and service on-campus.

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CD-ROM INSTRUCTIONS

Contains 22,804 files, 1,592 Folders

Size: 24.9 MB (26,133,107 bytes)

Size on disk: 101 MB (106,356,736 bytes)

Production date: May 16, 2002

To start 'click on' INDEX.HTM in Internet explorer 6.x or higher (newer) in Windows 2000 or Windows XP (not Netscape). It requires no other special software other than your web browser as it operates using JavaScript and HTML only. If, for any reason, it ever freezes or stops working, 'click on button - refresh page'. Use a screen resolution of at least 1024 x 768 with regular sized fonts (not large fonts). This is recommended to fit everything on the screen. Usually, most laptops and desktops are set to this by default. This CD-ROM documents all the online instruments used in this web-based research at URL ubcdelphi.net along with the data results for two rounds of questionnaires. A navigational tool has been added to the left side of the screen. Due to the inherent limitations of a 'static' webpage, the CD has less interactivity than the original site, and navigation is more cumbersome.

Hyperlinks found on the main area of the screen (where the data appears) often link back to the original site. If no active Internet connection is present, these links will not work. Rely on the navigation toolbar on the left to move through the site. 'Click on' the desired questionnaire (1 to 3) or Results (2 to 3) and 'click on >> button' to proceed forward (<< to go backwards). A specific question can be viewed by use of the 'click on' tab labeled "Jump to Questions". The first column of numbers pertains to Round 2 while the second column of question numbers (in parentheses) pertain to Round 3. Use the directional arrows (<<) and (>>) to link to the next desired screen page.

The main page gives choice of:

- Viewing instructions for questionnaires 1 to 3
- Viewing "Panel Profile"
- Round 1 Questionnaire
- Round 2 Questionnaire
- Round 2 Results
- Round 3 Questionnaire
- Round 3 Results
- Jump to specific Question number
- View subgroup Results (Round 2 or 3)
- View Panel Results (Round 3 only)
- View panelists' comments (Round 2 and 3 Results)

Acknowledgements

I am grateful to all panelists for their generosity in giving their time and engaging so thoroughly in this web-based Delphi process. Much appreciated were their insightful ratings and commentary. I am grateful for the encouragement and advice they gave. Many thanks for the wise counsel, painstaking attention, patience and support of my research Committee—Dr. Tom Sork, Dr. Kjell Rubenson, Dr. Tony Bates, and Dr. Bill Richards. As well thanks to Bill Richards for his introduction to the technical support needed to execute online instruments. My thanks to Dr. Gordon Selman, always a respected mentor. I am grateful to Pat Hindley for her encouragement and guidance, to Amanda Hunt and Anita Bronson for their careful editing. As well gratitude to Dr. Bronwen Wilson who came to the rescue when my hardware and software failed. My appreciation to Andrew Seary, the webmaster for Round 1 and to Alexei White, the webmaster for Rounds 2 and 3; to both, thanks for your tolerance with a "non-techie." Grateful appreciation to my advisory committee—Gordon and Mary Selman, Mark Bullen, and Cynthia Andruske. Also my thanks to panel pilot testers, Dean Sutphin, Randy Bruce, Dennis Macknak, Janet Atkinson-Grosjean, and then the Round 3 pilot testing by Applied Research and Evaluation Services, Faculty of Education, of the University of British Columbia. My appreciation goes to Margaret Hope for her stimulating advice on presentation and instruction on the use of Power Point software.

Dedication

I dedicate this dissertation to my husband, Gilbert James Hardman, for his unwavering support, care, encouragement, friendship, understanding, wisdom and love. Without him I would not have had the opportunity and confidence to complete this dissertation.

Section 1

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CHAPTER ONE

ICT IN ACADEMIA

Introduction

It is moral to know what you are doing—and that includes 'knowing' in advance of your acts the probable future that you will create by your acts (Wendell Bell). The Delphi methodology has evolved to include approaches to forecasting aimed at getting an informed understanding of some aspect of the future.

There is considerable debate among scholars regarding the role Information Communications Technologies (ICT)[1] or Information Technologies (IT) can play in higher education. Some are convinced that ICT will cause fundamental change throughout the entire structure of higher education. Others are resistant to change in an academic culture that has served universities well for centuries; these scholars reject the inevitability of ICT global impact on higher education. The academic debate concerning ICT is an interesting one and ideas of both supporters and critics are invaluable (some aspects of this debate are explored in Chapter Two). By examining issues thoroughly we can evaluate the consequences of choices. No university can afford to adopt an ICT infrastructure without a full awareness of the implications for academic freedom and of the financial, regulatory, pedagogical, market and student needs which its adoption infers.

Business, worldwide, is shifting from nation-based to networked global operations and more and more countries are adopting a form of market-driven economy. One consequence of this change is that job-intensive industrial production is gravitating to countries that offer cheap labour. Canada, for instance, has and will continue to have difficulty in creating jobs in some of its traditional task-oriented organizations and industries. Ideas and information will drive growth; jobs increasingly will become dependent on a knowledge-based economy (Rowley, Lujen, and Dolence, 1998). There will be a need for new competencies, new skills and the capability to learn; information and communication technologies will spur intellectual development. A knowledge-intensive North American economy dictates the periodic re-education of workers, which will result in a heavy demand on colleges, polytechnics, and universities. The Internet will be an important source of information and communication in these educational efforts. Rubenson and Schuetze (2000) contend that the significance of ICT in driving the knowledge market lies in its ability to codify information and knowledge.

At the core of this dissertation is my interest in the mid- to long-term effects and significance of ICT in higher education. A web-based Delphi survey of expert opinion was undertaken to discover where consensus exists in forecasting change that may occur during the period 2005 to 2015. Though some aspects of this study may be generalisable to the University of British Columbia, that university is not an intended focus of this investigation. The context of this research is global and draws on the opinion of experts from several countries. However, the data collected is viewed from a North American perspective and examines the broad influences which ICT may have on colleges, polytechnics, and universities. There is an accelerating demand for ICT services in North American higher education. The demand is occurring at a juncture when there is an increased capacity to disseminate knowledge through ICT. Unfortunately, these technological advances and a growth in demand for ICT services are occurring during a period of budget stringency for higher education.

A purpose of this research is to identify issues, events, innovations, opportunities, threats, process changes, and risks that are important and probable on how ICT use will influence higher education institutions during the years 2005 to 2015. There is considerable literature on IT but a lack of well-researched material. This is especially true of literature about the Internet, the challenging upstart in a centuries-old educational tradition. The Internet has been in general use in higher education for just over 10 years; therefore, literature about the influences of IT has to be considered with some caution.

In a review presented to the Australian government, Cunningham, Tapsall, Ryan, Stedman, Bagdon, and Flew (1998) describe some globalising trends and countervailing localising forces that may have direct relevance to the ability of global networks to carry higher education across national borders. They discuss the partnering of a globally-branded university with a global media network, offering a high quality prestigious set of degree programs, as a possible threat to the stability of educational structures in countries like Australia. Some institutions of higher education in North America may face similar threats. Cunningham, et al. (1998) comment:

> There is no shortage of scholarly, journalistic, governmental or institution-specific material on the impact of communications and information technologies, media influence, the globalised economy, or the future of higher education. There is, however, an acute shortage of thorough and realistic analyses of the intersection of these areas. (Executive Summary, 3rd para.)

For the purposes of this Delphi investigation the opinions of an international panel of experts were solicited from three walks of life--scholars/professors; educational administrators; and IT professionals--all of which will have influence in changing the educative process. The intersection of ideas from these three disparate group of experts results in a more convincing analysis of the influences of the diffusion of ICT in higher education than would an examination of expert opinion from academics alone.

An inevitable degree of uncertainty exists as a feature in forecasting mid- to long-term developments since all forecasts are necessarily speculative. This dissertation reviews the literature on ICT and its implications for change in higher education institutions from 2005 to 2015. In addition, by analysing experts' forecast on likely effects of these technologies, the study seeks to fill the current research gap on mid-term influences of ICT. The research thus may help reduce uncertainty in strategic planning for higher education. The period 2005 to 2015 is selected for three reasons. (1) The study draws attention to long-term issues, events, and probabilities through the opinions of a panel of experts. (2) The start date of 2005 provides a separation between change that is currently taking place and change of the future. By 2005 technology will have increased in sophistication and university, college administrators, and professors will have made important choices between competing Internet systems and technologies. The study looks beyond the immediate future and considers what changes may occur in higher education institutions in response to further development in ICT. (3) Technologies used in ICT will change at such a rapid pace that experts in the field of higher education or the development of technology are reluctant to forecast beyond 2015.

Context of the Study

This study was carried out in the context of rapid and large-scale technological change worldwide with a view to providing an understanding of how such technological change will drive long-term economic growth. It is foreseen that educational methods and practices will be subject to revision, and notions about work and jobs will shift dramatically, throwing into question current methods of professional education and job training. Management, cognitive, and communication skills will be highly valued. There will be major issues around social concerns and the pursuit of lifelong learning.

Government, businesses and students alike are questioning the relevance of colleges and universities in preparing learners for employment in a much-changed 21st century (Tjeldvoll, 1999). How do we train, teach and educate a population to become individually diversified, self-sufficient and capable of responding in a rapidly changing world? Although vocational training is not the traditional role of a research university, will a failure by universities to take an active responsibility in preparing students for employment imply the surrender of an important part of education to commercial interests? Perhaps so, but proposals for the adoption of online[2] education have caused anxiety within the educational system. As innovations in ICT are successfully tested in other countries, for example the USA or Europe, the pressures for their adoption in Canada can be expected to mount. Currently 25 percent of higher education institutions offer courses delivered via the Internet (netLearning, 2002).

A university plays a crucial role in technology transfer at two levels and is a site that can combine basic research needed for the advancement of industry with the training of its management (Carnoy, 1996). Duderstadt (2000) explains that the ICT relationship between people and knowledge is one of many issues that force post-secondary institutions to think and plan differently about their existing student populations.

Information technologies and the Internet are developing rapidly, yet uncertainty exists among educational theorists and policy and decision-makers concerning funding for their use. As well, some educators are doubtful about the wisdom of allocating large amounts of attention, capital and personnel to a broadening of ICT use in higher education. They are concerned that there is not sufficient research available about likely long-term effects, influences, directions and potentials for the use of ICT in higher education to effectively inform policy planning and decision-making. Richard Lipsey (2000) speaks of uncertainty in this area:

> Uncertainty is involved in more than just making initial technological breakthroughs. There is uncertainty with respect to the range of applications that a new technology may have. As new technologies diffuse, their specifications are improved and sometimes altered beyond recognition. (p. 42)

Not only may educators unfamiliar with the capabilities of ICT be non-supportive, but also others who fully recognise their value may not understand how the educational system can afford to allocate extra resources to these technologies. As well, decision-makers, both administrative and academic, may differ about which technologies will be of advantage when preparing strategies. Although most recognise the probability that ICT will change educational institutions in profound ways, they hold widely differing views as to how and when such changes will occur and to what investment should be made. The matters stated here are not unique to North America, as many in other countries are expressing concerns and solutions that are of keen interest to educators in Canada and the USA. For example, Rubenson and Schuetze (2000) say that lifelong learning is a popular and important topic of policy papers not only in North America but also in Europe and among international organizations. However, they contend a master concept or a cohesive strategy for its implementation is lacking. The authors stress that the meaning of lifelong learning, which is often interpreted vaguely and too broadly, now needs strong policy determinants in an Internet Age.

Land (1994) from the UK draws attention to the challenge universities face in operating within a global communication network, and comments that the communications network with which an individual or institution is affiliated will become increasingly important. He suggests that researchers often have better connections with the work of others thousands of miles away than they do with colleagues three doors down the corridor. As an integral part of the convergence of technologies, the Internet has, in one decade, caused a paradigmatic change in the world's communication networks.

ICT are altering how the world conducts its affairs and present an urgent challenge to higher education institutions as the technologies continue to diffuse deeply into institutional infrastructure. Inexorably, ICT dominance in the area of communication will cause higher education to extend their use ever more widely. It is commonly predicted by scholars, technologists, and policy specialists alike that well within the first decade of the 21st century, ICT will have come into general use in developed countries, creating a mesh of global interchanges which will show little respect for political or geographical boundaries. As they diffuse into public networks, ICT will become culture transforming, changing the way we do business, make international transactions, make personal and political decisions, and, of significance here, approach higher education.

In a fledgling state ICT have played a part in higher education, but how important their use is likely to become is unknown. Organizational change through ICT has not reached as deeply into the culture of universities as it has in the business community. For instance, ICT has revolutionized the operation of the world's stock markets. Each week, billions of dollars worth of commerce is transacted electronically via the Internet. The methods, staffing and modes of operation in the world's banking industry have been transformed through the use of ICT. Because of the technologies, many public and private business concerns have eliminated entire levels of middle management and staff. Notable is a convergence of communication businesses in the ICT marketplace. Strategic alliance building, innovative production and marketing, communication network expansion, rapid distribution and client-centred services using ICT have gained not only a competitive edge for such businesses and industries, but also unprecedented access into markets worldwide. These markets include the previously sacred territory of higher education.

Before the Internet, early experiments in the use of computer technology in schools produced quite disappointing results (Williams & Brown, 1990). Partly because of these poor outcomes, some educators take a guarded position with respect to extensive use of ICT. Educators are concerned that an increased reliance on technology presents little opportunity to enhance their teaching and might damage the relationship between an educator and learner. Other educators believe that ICT can offer an opportunity for enhanced communication, personalised instruction and greater learner autonomy. The views of the latter are reinforced by the fact that the Internet and other ICT have developed rapidly and are continuing to evolve at an accelerating rate. Not only do students from geographically remote areas now take advantage of ICT, so do others who are balancing their education against full- or part-time work and family obligations. As well full-time, on-campus students use ICT to access or enrich course material and to conduct research.

Bold steps taken now towards the use of ICT may lead to significantly different higher education institutions. Within a decade synchronous and asynchronous education, once the marginalized function of distance education, may, via the Internet, become a core activity of higher education institutions. One can anticipate further and continuous change as new techniques and equipment are developed and merged into communication and computer domains. The convergence of communication networks with computer technologies has allowed the digital record keeping power of the computer to be applied to non-written, multimedia forms of communication. The use of ICT as part of the educational method involves a recognition of two underlying currents in the growth of multimedia: "[1]...the return to nonliterate forms of documents and [2] ...the development of simulation and visualization as fundamental forms of expression..."(Hodges & Sasnett, 1993, p.8). These authors comment on the shift from an analog domain in IT to the use of digitized information aiming towards all-digital video. Sound, video, graphics, three-dimensional imagery and other non-written forms of presentation can be recorded in a digital format and transmitted via the Internet. Hodges and Sasnett (1993) identify inadequate bandwidth and limited modem speed currently as a constraint on the transmission and reception of video and other formats where these involve an intense use of digital imagery, but see rapidly developing technology as a solution. For instance, the US government in concert with a selection of universities, colleges and businesses is developing Internet2, which is expected to be 100 to 1000 times faster than the existing Internet. Canada's Advanced Internet Development Organization (CANARIE, Inc.) claims to have the first national optical Internet; it will deliver up to 40-gigabit capability, faster than any other existing commercial Internet in the world. Changes in technology make it reasonable to expect that powerful Internet tools and networks will remove most technical constraints within a decade. The changing capacities of ICT foreshadow the production of new powerful teaching and learning tools. Hodges and Sasnett (1993) describe a symbiotic relationship between IT learning methods and outcomes. They comment that ICT projects are seeking to give students a creative role, so that they do not simply react to prepared materials, but learn to create new materials. The basic concept is that the enactive role is central to the learning process. Educators have long combined theory and experience in pedagogy; what is new, according to Hodges and Sasnett, is the packaging, "...which holds the potential for major advances in students' interaction with ideas" (p. 32).

According to Land (1994), the global knowledge base can be expected to grow rapidly in complexity and size. Ortner (1992), commenting on this growth and rapid change, describes 'a fundamental problem' faced by scholars in their search for knowledge:

> ...the phenomenon of accelerated obsolescence of knowledge, as a result of the multiplication of scientific and technological information. It can only be matched by steadily increasing knowledge, which enables future users to operate constantly and continuously accumulating data-bases. (p. 166)

A partial resolution of the problem posed by Ortner (1992) may be found in the Internet, which may provide continuously improving methods and systems for the identification, selection and acquisition of required knowledge from a mass of available information.

I became interested in the potential for change through ICT during my business career in the USA, before coming to Canada to study. I was reasonably successful, having a senior position in a traditionally male-dominated industry, and earned a salary that was then among the top five to ten percent of US working women. One aspect of my professional responsibilities at headquarters was working with IT staff to define databases and implement user requirements for the introduction of computers within a specific division of an international transportation corporation. This work affected accounting, budgeting, marketing, performance, and capacity planning. Thirty-three US branch offices were to become computerized, so information and staff training were crucial. The organization established its own intranet electronic mail via telephone lines, long before 'email' became popular, public, inexpensive and readily accessible. I recall astonishment at being able to notify our offices electronically and instantaneously, world wide, about specific changes in US government regulations that would immediately affect our paper procedures. During those early days when computerization had already caused radical change which would forever alter the organization's long-standing operational methods, I wondered if this change could have been forecasted and also what, why, where, when, and how deeply would other changes affect the corporation? Later, during my studies in Canada, when I observed that the Internet and its convergence with computer systems had caused radical changes in business, I became interested the possibility that ICT might also alter in higher education.

In the 90s there was uncertainty about the value of ICT use in academia just as there was, earlier, in business. The academic debate was unfolding: what were the issues, how would change be implemented, who would cause the change and would change be reactive or proactive? 'Knowing' in advance the probable results of one's acts would be crucial. At the core of this research lies the question: "What changes will result in higher education institutions through the technical, cultural and globalising influences of ICT?" This is the context in which this investigation is set.

Assumptions

A Delphi forecaster faces threats to validity, as do all scholars and scientists who make forecasts central to their work. Scientific theories about the future are impossible, but it is assumed that plausible forecasts can be made. In stating assumptions a forecaster is forced to confront individual biases and hidden assumptions that can damage a perfectly reasonable forecast. However, this broadly based investigation relies on expert panelists to provide relevant items for review, so my own bias is lessened. Moreover, when a consensus is achieved among several panel subgroups, then the findings have an advantage of improved reproducibility. McNamara (1974) comments on a Lindquist study, contending that reproducibility can also be improved when two distinct groups independently forecast the same events. This was the case in a study by Lindquist dealing with critical tasks for the secondary school principal of the future [Lindquist, 1972].

> Two separate Delphi exercises were used, one for secondary school principals and the other for professors of education. When the responses of the studies were compared with each other, it was found that they agreed fairly closely (p.380).

Dator[3] (1998) and Hines (1995)[4] state that assumptions are central in establishing validity for 'futures studies;' such assumptions have to be clearly stated and discussed up front. Therefore, I made three assumptions. I assumed ICT will continue to change at an accelerating rate, increase in speed, sophistication, quality, utility and power during 2005 to 2015 and that there will be a widespread, broader use of ICT in higher education. Also mergers of businesses in the communications/multimedia sector continue to proliferate.

While I recognize that other stakeholders will be involved in the educative process, this research is limited to examining the opinions of experts well qualified by experience in forecasting influences that ICT might have in higher education. This study does not examine potential advantages of competing ICT systems.

Problem Statement

Bearing in mind the differences in opinion that exist within academia over the use of ICT in higher education, I address the following problem. The cultural and educational traditions of the world's great universities have been built upon stable foundations formed through centuries of research, teaching, and service. During the first half of the 20th century a paradigm shift took place as universities directed their missions away from educating an elite to mass education. Systemic changes occurred in universities and colleges as democratic influences increased and as ideas about equality of access to higher education took root. Though now serving a greatly expanded student population (NEC, 2000)[5] universities have retained their traditions of academic freedom, research, teaching and service. Rigourous standards for education have been maintained in all prestigious universities. There is, however, another paradigm shift, caused by influences of ICT, occurring in the world, that is altering the way nations operate economically, socially, and politically. This shift may call for major changes in the way universities carry out their functions of teaching, research and service. For instance, universities and colleges in developed countries may be called upon to expand their missions and provide higher education, through ICT, to large under-served populations at home, or in developing countries.

A global approach to online education will, if taken, necessitate a review of both our North American methods and practices by faculty and administrators and reconsideration of national missions and priorities by government and institutions. Bates (1995) discusses a framework for decision-making within the context of distributed learning. He asserts that the first decision is to set up a system of teaching based on technological delivery. He comments that, in the past, technology decisions have not been based on theories and models but have been made intuitively, but by senior decision-makers, professors and professional media producers according to their personal experience. There is not so much fear of, or resistance to, the technology itself but rather a lack of knowledge or understanding regarding the online teaching and learning process. Some universities and colleges have taken steps towards resolving this situation. These institutions have centralised management at a senior level for ICT equipment and infrastructures, and their acquisition and maintenance. This staff person has responsibility for training and providing technical support to staff and faculty. Centralised control may foreshadow the use of ICT in most departments, faculties and on-campus education generally. Difficulties might lie in overcoming prejudices in the present university culture, its territorial imperatives and concerns over how ICT costs might be allocated.

Long-term strategic thinking about the influences of ICT will be necessary when setting revised directions for higher education. In a situation where IT is changing rapidly educators and decision makers will have to determine what is essential, what is affordable, and when to make choices between competing ideas and technologies. What, if any, current methods and practices will become obsolete? Uncertainty can create a problem in the allocation of resources to ICT and in the training of educators in their effective use. Uncertainty can also cause indecision about changes in institutional structures, changes that may be essential in response to global change. All these questions call for a long-term view.

One growing reality around the use of ICT in higher education, which cannot be ignored, is that large high tech companies and networks are now showing considerable interest in the development and marketing of educational products. Educators view the prospect of any commercialisation of the teaching process with alarm. Not only may a commodification of education be a threat to job security in higher education but also educators may fear an inferior outcome for students. Initially, corporate interest in this area has been focused on business education and vocational training. But it is by no means certain that this focus will be the ultimate of corporate ambitions in higher education. IBM, for instance, has been active in Europe and the USA promoting education and training by heavily discounting or donating equipment to educational institutions (Brande, 1992). Companies with immense financial resources and production skills such as IBM and Microsoft, already cater to large global markets. This marketing advantage can make it possible for private companies to produce sophisticated multimedia products and other educational courseware at affordable prices; educational institutions have not yet matched these economies-of-scale. Unfortunately, important matters related to the use of ICT in higher education have been submerged in short term conflicts and debates among educators, administrators and decision-makers around the use of scarce funding. Too often strategic concerns are given little weight.

In sum, institutions of higher education are faced with unprecedented challenging questions about how the global diffusion of ICT will affect their educational values, structures, economics and operation. Questions of timing, finance, personnel impact, curriculum, and linkages to other institutions both academic and corporate are paramount. Through this research I intend to seek partial answers to this overall problem, by using the Delphi method to solicit expert opinion in forecasting medium-term future probabilities on educational institutional change through the influence of ICT within a selected time frame, 2005 to 2015.

Research Question

In the context of a global change in communication systems and a knowledge-based economy, this study explores the likelihood of systemic change occurring in higher education institutions through a diffusion of ICT use. For the purpose of this research higher education institutions include public and private universities, colleges, and polytechnics. The research question guiding this Delphi study is set in the context that growing use of ICT has caused radical and systemic shifts in the way business, communication and financial enterprises are structured. How will ICT use impact change in higher education institutions during the years 2005 – 2015? It was explained to panelists that there may be major influences (opportunities, issues, threats, and risks) arising from ICT use that need consideration. As well, competition from the private sector and its capacity for global marketing of educational courseware may be a significant factor.

Significance of the Study

This investigation is justified for several reasons. Writing on approaches to education, Bates (1996) and Twigg (1994) conclude that the problem with all of the uses of information technology in the last decade (computer-aided instruction, networked information, distance learning) is that they were simply bolted onto then current instructional methods. A study of expert opinion about how ICT use in higher education institutions will affect change during the years 2005-2015 may give decision makers an improved understanding of the ways in which new technologies will influences higher education institutions. According to Gordon (1992) and many others, experts are more likely than non-experts to be correct about future developments in their field; therefore a consensus among experts is important. Consensuses or differences of opinion found within a panel of experts-- composed of educators, educational administrators, and IT professionals--can illuminate issues around the re-organization of institutions for technological change.

Through this study, educators may gain new or more complex insights into some major influences of ICT. For example, higher education institutions may have to redefine how educational methods can be structured to equip students for employment in a rapidly changing 21st century. Students completing studies at colleges or universities will need to learn the skills necessary to operate in a much-changed global marketplace. ICT may be influential in this learning. Periodic retraining of North America's workforce will become necessary if Canada and the US are to remain competitive in a knowledge-intensive global economy.

There is a lack of well-researched literature in the area of ICT in higher education in both the U.S. and Canada and much of the existing literature is anecdotal. The data collection and analysis were designed to contribute systematically researched material in this area. The study provides a statistical analysis of responses and ratings from a Delphi panel of experts to three rounds of questionnaires. It also provides an analysis of responses from designated subgroups of the panel: academics, administrators, and IT professionals. The method allows comparison between these subgroups and the entire panel.

The research contributes a forecast showing areas of consensus and difference in expert opinion on influences ICT will have in higher education institutions during 2005 – 2015. Although a Delphi consensus cannot be claimed as an accurate prediction, it does provide a plausible and useful insight into probable changes during those years.

The web-based Delphi instruments created for this research advance the Delphi methodology. They provide online models that can be used in other Delphi research where multivariate data is collected and analysed for feedback and discussion. The minimum requirements in constructing a Delphi questionnaire series to determine a forecast have been met. The fundamentals are: (1) Qualitative [Round 1] --what to forecast; (2) Quantitative [Rounds 2 and 3]—a numerical expression of performance levels; (3) Time --when it will occur; and (4) Probability --to represent the uncertainties (Twiss, 1992). These requirements are operationalized in the instruments and I decided to use 'importance' as an additional criterion for setting priorities among the choices/outcomes in policy making. Panelists' commentary also provides a valuable source of knowledge, as it is useful for the inquiry into possible influences of ICT. Other studies into the future have not probed as deeply as this research into the importance, probability and timing of the use of ICT in higher education.

Dissertation Overview

Section 1 includes Chapters One to Chapter Three. Chapter One introduces the context of the study, assumptions, problem statement, and research question and outlines the significance of the study. Chapter Two presents the literature in two parts. *Part 1* describes literature on the use of ICT in higher education and the opinions of scholars about related changes. The competitive climate is discussed, as is the general rate of adoption of innovation in higher education institutions. Differences between the differing roots and the direction of evolution in Canadian and American educational institutions are discussed, as is the problem of a greying professoriate. *Part 2* describes the academic debate about ICT use in higher education. Chapter Three explains the Delphi method, its roots in futurology and its history, and how it is modified for use in this study. A comparison of Delphi and other survey methodologies is made. The importance of anonymity, feedback and iteration in the Delphi process is described, as are the qualitative and quantitative research procedures. The rationale for panel size, its demographics and criteria for selection of experts are outlined, as is a modification of the classical Delphi to include three panel subgroups. The need for and the design and development process for a new set of web-based Delphi instruments are explained. *Section 2* includes Chapters Four to Seven. Chapter Four describes and illustrates the data collection process, some weaknesses of this process, what I have learned and recommendations for future Delphi research. Items are identified by the level of consensus achieved on probability, importance and timing. Chapters Five, Six, and Seven present the results of the Delphi data collection which fall into three major categories--Institutional Issues (Chapter Five), Faculty and Staff Issues (Chapter Six), and Educational Issues (Chapter Seven)—from which fourteen themes emerge. *Section 3* contains Chapters Eight and Nine. Chapter Eight provides the discussion and synthesis of the findings on key results in the context of the research question and the literature review. Chapter Nine highlights the key influences, implications and consequences that may be of concern to faculty, administrators and leaders in academia. Conclusions include recommendations for practice and research.

CHAPTER TWO

LITERATURE REVIEW

The reality of human choices in shaping the future is one of the basic tenets of today's futurists. They do not see the future as predetermined by fate or divine providence, but as constantly being shaped and reshaped by human actions based on human choices. (Edward Cornish)

Introduction

This chapter has two parts. Part 1 covers the literature on the structures and practices of ICT use in higher education. Part 2 discusses the academic debate on the pros and cons of ICT use. American higher education faces formidable challenges caused by innovations in technology, changing student demographics, severe financial constraints, and lingering institutional rigidities (Baer, 1998).[1] At the same time, increased demands are being placed on higher education to provide greater student access to education, better undergraduate programs, and increased productivity. To address both sets of issues, institutions of higher education are turning to new communications and information technologies that promise to increase access, improve the quality of instruction, and (perhaps) control costs (Baer, 1998).

PART 1: ICT USE IN HIGHER EDUCATION

ICT use in higher education is considered here in a global context but with a North American bias. While much has been written on Information Technologies (IT) there is a shortage of carefully researched material. In a personal email to me, Bates (February 10, 2000) commented that there is "a great deal of hype and unsubstantiated prediction within the literature, which itself is often ephemeral and poorly researched." This lack of adequate data, as Ehrmann (1999)[2] points out, is a serious problem in higher education. Technologies are changing rapidly and unpredictably, and their cumulative costs are increasing exponentially; meanwhile university budgets remains tight. Despite this, faculty and administrators have made big investments of time and money in ICT.

Most serious scholars agree that profound change will occur through ICT (for example, Bates, 1997). While it is true that some literature on influences of these technologies has to be considered with caution, the literature cannot be ignored. One difference from traditional research practice is that much recent literature is available only online, in journals or in scholarly papers. Because of the accelerating rate of change in ICT, I have of necessity considered these writings.

The International Association of Universities (IAU) International Task Force Report asserts that ICT will create fundamental change in higher education. The task force was composed of recognized international scholars. It concludes that Information Technology will lead to a revolution in higher education, that the Internet will act as a powerful supplement to existing teaching, and that universities must face up to this challenge (Langlois, 1998).

The IAU task force acknowledges that, because of economic and technological change, higher education is becoming market-driven. It also acknowledges that some scholars vehemently oppose this notion. However, according to the task force, a computer literate student body is emerging and these students will want a campus well equipped with new technology and technical support from faculty and staff. Technology's increased sophistication has reached a level where education can deepen and widen the educational process. The IAU predicts that ICT will allow universities to collaborate with others internationally in order to serve a global market. On the other hand, a RAND Corporation study contends that the actual evidence of achievement in ICT use in education is, as yet, slim (McArthur & Lewis, 1998). The IAU task force comments on inertia in higher education, where change is measured in years (or decades) rather than months. One problem they comment on is a lack of recognition, financial reward, or promotion for teachers achieving competency in ICT. As well, the IAU report asserts that the career systems in universities and colleges are still too rigid to incorporate these new instructional possibilities. The conclusion is obvious: the IAU task force believes that universities have no choice but to change with the times.

The use of new technology does not by itself guarantee improved educational outcomes. There is a need for rethinking in education, with a special focus on new designs for learning (Harasim, 1997). Colleges and universities, for decades the custodians of intellectual capital, have a head start and a competitive advantage as they respond to the increasing demand for higher education (Katz, 1999b), but they will not retain this advantage through tradition alone. Universities will face serious competition from other educational institutions around the world and corporations have already begun to compete in the remunerative areas of business and management training. In future the private sector may expand into other areas of education.

Bates (1997) sees fundamental change in many universities and colleges as essential in meeting the needs of both public and students; he asserts that labour costs in universities can be reduced through the use of technology, provided the change is introduced sensitively and carefully. He points to retraining needs as an important driving factor since the best paid jobs of the future will require workers who are mobile, and who can work on a global basis. However, a sensitive transition appears unlikely if we look to the experience of the private sector where organisational change, because of ICT, has involved sharp reductions in staff. Change hit middle management and white-collar workers especially hard. Companies merged suddenly and unexpectedly and shed workers who previously had every reason to anticipate years of full employment. Often the process of 'streamlining' a business caused a great deal of pain to individuals. However, Bates is realistic in his general appraisal: forward-looking universities have the opportunity to plan ahead and avoid the worst aspects of restructuring. Bates (1997) sees timing as critical and notes that delay may result in rapid unplanned change and the worst kind of staff disruptions. He acknowledges that some people, in the face of such fundamental change, might ask would it not be better to create new institutions from scratch? However, Bates argues that universities have a wealth of talented, well-educated people on staff and it would be wrong to assume that an institution cannot, or will not, respond to change.

Educators and administrators in higher education hold differing views as to how, what and when change will occur, and in some cases they doubt whether change should occur at all. The issues are difficult to resolve and dissent may inhibit the development of ICT learning systems. Baer[1] (1998) describes two models as currently directing efforts for ICT use in universities. The first seeks to improve existing forms and structures, upgrading administrative and library structures as well as the quality and speed of curriculum delivery. The second is a more radical model in which the Internet is seen as invoking change in both the process and the organisation of higher education. In this model Baer refers to student-centred learning, to collaborative international alliances, and to a move towards a campus-free system of online learning. Although, his discussion seems to favour the second of these models, he concludes otherwise. He states that ICT will be seen as a powerful technical tool for improving systems, rather than as a catalyst for institutional change. The author expects resistance, especially in research-intensive universities, because of tradition, bureaucracy, territoriality and regulation. Baer acknowledges that non-degree programs may become the province of other institutions, but he asserts that research universities will retain control over degree-granting programs with or without an extensive use of ICT. Ultimately, the author sees the Internet as a complement rather than as a threat to tradition.

In the past, studying by distance education was a solitary job, but Westera (1999) describes change in distance education leading to a more interactive role between students and teachers. Yet the author acknowledges students still want the collegial advantages of association with other students, on-campus activities and face-to-face meetings with professors. Another question for students is, 'which universities will accept online course credits?' The answer is probably that few will, until prestigious universities compete forcefully in the online education market. At that point it may be difficult to deny online external course credits.

Baer (1998) contends that most students will want face-to-face instruction and good social interactions and that students will opt for a mix of on-campus and online courses. Other scholars contend that colleges and universities will continue to react against change, with a 'sense of sustained mission' and 'a belief that at its core the academy is largely immutable' – its costs largely fixed, its purposes well established, its educational and intellectual values well honed. They see these tendencies as barriers to the introduction of ICT in teaching and learning (Zemsky & Massy, 1995). Altbach (1991) would agree, asserting, "There is little chance that the basic structures of academic institutions will significantly change, although some of the traditional academic ideologies and practices are threatened" (p. 316). On the other hand, Westera (1999) cautions against a tendency to preserve and protect the status quo, and suggests a fundamental change in education is at hand.

Westera's (1999) prediction of a "fundamental change" is already apparent in many universities; nowhere is it more striking than in the US. Many US universities are now deeply involved in work to improve the Internet. It is not unreasonable to assert, therefore, that within 10 years the use of online technology in higher education will have become commonplace both on- and off-campus in that country. Those who suggest a much earlier transition are probably overly optimistic. Collaborative efforts between academia, the private sector and government will help the USA to maintain its lead in global communication for this decade and perhaps longer. The country's dominance in communication technologies may serve to place universities in the USA at the forefront of change. Those US universities and colleges now participating in the Internet2 initiatives (described later in this chapter) will gain in experience of leading-edge technology and this will make them formidable competitors in the global marketplace.

Whether or not Canada will follow the same path as the USA requires reflection. Because of the proximity, size and strength of the USA, Canada has tended to follow the lead of its neighbour, usually with a lag of a few years. But this pattern did not happen in higher education. Skolnik and Jones (1992), in examining differences between public/private university arrangements in the USA and Canada, comment that longstanding differences in higher education between Canada and the United States are rooted in the respective organizing principles of the two North American nations. Canada was an entity before 1776. The USA is a country of revolution while Canada derived its title to rule from a monarchy linked with a church establishment. The roots of the USA led to its anti-statism, individualism, populism, and egalitarianism, whereas

Canada is seen by the authors as more class-conscious, elitist, law-abiding, statist and collectivity-oriented. They comment that the governments and the respective national ethos that developed from these contrasting roots have led to two different university systems. For instance, there are few private universities in Canada whereas about half of the universities in the USA are private, and of those about three-quarters are church-affiliated. The two countries place differing values on social order as against individual liberty. Canada's publicly funded educational system has less differentiation (except in quality) between its institutions of higher education than does the USA's. The authors suggest that in Canada there is an emphasis on the role of the university as a form of public utility, and a distrust of private enterprise in education. Skolnik and Jones (1992) also assert that the planning and policy environment in the US is more complex and multi-faceted than is the situation in Canada, where they suggest major decisions result from an interplay between senior officials of the ministry responsible for higher education and university presidents.

The American approach allows a relatively free entry of new universities and colleges into degree level education ,which in turn encourages competition. The Canadian approach is to control the establishment of institutions and so restrain competition. According to Skolnik and Jones the differences between the national characteristics of Canada and the USA may cause higher education systems to play out differently in response to business involvement in education and to the use of ICT. In the US, government involvement in education is viewed with deep suspicion, not surprising in a society wherein private enterprise is seen to be the natural state of affairs. By contrast, Canada, with its collectivist traditions, sees public enterprise in the field of university-level education as entirely appropriate, even when public education has a near monopoly. While the authors have over-emphasized the simplicity of decision making in Canada's universities, there is much truth in their contention that Canadians have given tacit acceptance to an unchanging tradition in Canada's public universities. However, this attitude of public acceptance could change as Canadians expect the country's universities to equip its students well for competition in a rapidly changing world. In terms of personal income Canada is falling behind the USA, so the public will want faculty members, researchers and university administrators to keep abreast of international change. The university will be expected to further Canada's economic goals.

The differences described by Skolnik and Jones (1992) may have a significant influence upon the rates at which educational institutions in the two countries respond to a broadened use of ICT in higher education. Canada may trail behind the USA, and its universities may learn from US experience. However, in a competitive global economic arena where change in ICT is occurring at an accelerating rate, time is not on Canada's side. Admittedly, universities have a different culture than business, and systemic change may be a decade away, but it is not too early for Canadian universities to embark on faculty training and infrastructure development, and to engage in experimental projects in preparation for new forms of competition.

According to Altbach (1991) universities are singular institutions deeply embedded in their societies. They provide social mobility to previously disenfranchised groups and are important creators of new knowledge through basic research. The Western university institutionalized the study and production of science and the professor at the centre of the institution has enshrined autonomy. The links between universities and economic systems have been important factors in Western domination. However, Amara (1989) asserts that many citizens are bypassing traditional institutions, because they provide insufficient choices. The rapidity of change because of ICT is unprecedented, occurring in a matter of months, not years. An infrastructure that can adapt quickly to change is essential to survival in the world of ICT. Yet a 1998 National Survey of Information Technology in Higher Education stated that approximately two decades after the first microcomputers arrived on college campuses, American colleges and universities still continue to struggle with computer and IT planning. Just under half of US colleges have a strategic plan for ICT (Green, 1998). The smooth absorption of ICT into higher education will not be easily achieved. I now examine some of the driving and inhibiting factors use of these technologies will face.

Driving Factors for Change

A number of driving factors makes the absorption of ICT into higher education urgent and imperative for many institutions. Altbach (1991) recognises that ICT are both central to and a main causative factor in bringing about radical change in society; they have become driving forces which shape and expand the reach of western business. One factor driving change in higher education is the convergence of communication businesses in the expanding information technology marketplace. Some U.S. universities pioneered the development and scholarly application of the Internet in the 1970s and 1980s. The World Wide Web (WWW)[3] first came online in 1991 and effectively eliminated space and time barriers to learning (McArthur & Lewis, 1998). In September 1999 about 112 million people were online in the USA and 201 million worldwide; the latter number had almost tripled in only 2 years. Currently, the US and Canada have 191.7 million homes with internet access, 39 percent of the world's Internet population (Neilsen NetRatings, 2002).

The US Telecommunications Act of 1996 made mergers of monolithic information conglomerates legal and may have handed unwarranted power to media conglomerates. There is an accelerating trend for companies involved in broadcasting, cable television, computers, entertainment, and retailing to combine and gain competitive advantage. This convergence of communication businesses and their drive for expansion has set the stage for corporate competition in higher education. New possibilities have emerged because of alliances and mergers between communication giants (Katz, 1999b; McArthur & Lewis, 1998).

An explosive demand is forcing higher education to look for new delivery mechanisms, including ICT. According to Twigg and Oblinger (1996), an increase of some two million traditional-age college students is expected in the next 10 years. Add to that an increase in older and employed students seeking skill enhancement and continuing education, and the numbers go much higher. Altbach (1991) asserts that demands for access by previously under-served groups will place additional pressure on higher education's bureaucratic, increasingly complex environment and on the efficient allocation of limited funds. The demand for services from universities will continue to expand because of population growth and cultural change, and adult education is also growing rapidly (NEC Statistics, 2002). While mature students may not always be seeking degree programs, they will demand high quality, contemporary courses tailored to specific learning objectives. According to Twigg and Oblinger (1996) universities, in a global market place, may be called upon to serve much larger and more diverse student populations, necessitating a need to operate "online."

Dede (1992) contends that while ICT are eliminating many traditional jobs in business, they are also creating new ones. He acknowledges that some middle management jobs are vanishing and more are likely to go. For instance, the author predicts a dismal future for bookkeepers, forecasting that the majority of routine accounting jobs will disappear within a decade as expert systems automate financial operations. Dede's message is an unhappy one for professionals, especially if they lag behind in those technological advances that are driving the market place. The author asserts cynically that unintelligent workers and nations with obsolete economic approaches will face difficult times. One result of change may be that professionals will be driven to return to universities and colleges for retraining, creating additional demand and foreshadowing inevitable change in the institutions.

In the first half of the 21st century it may be necessary for North American universities to provide online higher education outside national boundaries. As well, Dede (1992) stresses the challenge of developing a work force capable of operating in a diverse range of cultural settings and in a global market place. Cultural diversity is a strength rather than a weakness, but it can be harnessed only when every group benefits. The USA must overcome deep-seated anger over historic ills, including slavery, before it can fully harness the energies of a large sector of its own people, let alone those from developing countries. But change is occurring in the US: from 1990 – 1995, while the number of 18 to 24 years old white students decreased, the number of Hispanic and Asian students increased substantially (Frances & Pumerantz, 1999). Canada has unresolved problems in the education of its First Nations people. In both countries people from diverse cultural backgrounds now want higher education.

According to an Australian study at the University of Queensland (1999), flexible delivery using ICT has become a big part of the higher education scene in that country over the last few years. This is the result of a deliberate move by government away from elite to mass education. This change in the nature of the student body necessitated a focus on students' professional needs, an increase in 'just in time' learning opportunities and the provision of skill training. In an era of diminishing government funding and strong competition, ICT are driving Australian universities and colleges to develop teaching/learning methods and practices that will enable them to reach larger, wider markets without detriment to either finances or standards. Doucette (1997), Vice Chancellor, of education services and institutional technology at the Metropolitan

Community College District, in Kansas City, Mo., comments that one of the principal driving forces change in community colleges is an enormous increase in the training and retraining needs of the existing work force. This could become a reason for education using ICT to move into the core of higher education. Doucette claims that this issue more than any other, forces post-secondary institutions to think and plan differently about their existing student populations. Historically a campus has been defined in terms of buildings. In the future, an ICT infrastructure may add a virtual new campus.

As business worldwide shifts from national to networked global ICT operations, added pressure may be placed on higher education institutions. Strategic alliances in business allow innovative production and marketing methods, expanded communication networks, rapid distribution systems and client centred services. Multinational alliances provide these corporations with not only a competitive edge but also unprecedented access to markets worldwide. There is a disturbing inevitability to the invasion of such alliances into the previously sacred territory of universities. Twigg and Oblinger (1996) contend that a shift toward a consumer-centric learning model is rapidly accelerating, expanding the number of potential course providers. Geographic, social and political boundaries are becoming less relevant, thereby weakening the grip of traditional institutions.

By the year 2000, more than half of the U.S. population is expected to have access to the Internet (NEC, 2002) and174.6 million Americans are now online (Nielsen/NetRatings, 2002). Over 14.2 million Canadians have Internet access, 40.2

percent of Internet subscribers speak English (Global Internet Statistics, 2002), and the global reach and size of Internet use has become a major factor that may drive change in higher education. For instance, expansion of a university's revenue through the development of an online student population may become crucial to the university's survival (Green, 1998). Green acknowledges that online distance education is costly, requiring expensive infrastructure some of which may have a short life span. However, he suggests that online distance education programs might become viable and even profitable, if managed as a business.

Corporations are more comfortable than universities with managing strategic alliances; they constantly seek new outlets and new profits enabled by ICT. The majority of universities do not operate for-profit, but changes in the marketplace for education are driving universities to reconsider their long-term future. Higher education is both a major supplier and consumer of information resources and an infrastructure that can adapt quickly to change has become essential to survival in the world of ICT. Therefore, alliances between universities and the communication industry may become imperative. While corporate/university partners bring differing strengths to the bargaining table, any combination of a premier university and a multi-national corporation will provide a formidable level of competition for higher education in the international market.

Higher education institutions face critical issues involving faculty, their most important resource. Chronister and Truesdale (1991) provide insight into the problem of a greying professoriate in America. Before the 1970s the number of faculty members on

US campuses was expanding at a rate of about 20,000 per year. But those peak years were followed by a period during which new hirings were limited to the replacement of positions. As we enter a new century, professors hired in the growth years make up the majority of faculty in higher education. In consequence, US universities are now faced with the retirement of nearly two-thirds of existing faculty by 2009 (Bowen & Schuster, 1986). These professors, mostly tenured, will have to be replaced by talented newcomers. Canada may be adversely affected by a heavy US demand for young professors, and any migration to the USA will deepen Canada's own recruitment problems.

In the USA the Age Discrimination rules in the Employment Act of 1986 mitigated against the forced retirement of tenured professors who had passed mandatory retirement age. This uncapping legislation created a change in the contractual relationship between faculty members and the institutions that had awarded tenure. Universities responded by offering beneficial early retirement packages. Unfortunately, as Chronister and Truesdale report, all too often it was the highly productive and most desirable faculty members who took advantage of early retirement. Recruitment of talented newcomers will be difficult for most universities until these retirement situations have run their course. Newly hired faculty will likely bring fresh, independent ideas and will constitute the leadership for academia in the early decades of the 21st century. New leadership may overcome lingering resistance to the use of ICT and to a change in the way the academy is organized.

Slaughter (1998)[4] comments on education decision making in a technology-driven educational economy. She says that the economics of higher education in the US have changed sharply since the US adopted a student-as-consumer, market model in the late 1970s. Changes in funding methods, in R & D for the sciences and in student financial aid have given federal policy-makers a more powerful voice. Furthermore, the author claims, fields of study and departments regarded as close to the market have flourished while others languished. Changes in allocation policies have increased differentiation and stratification within public research universities; new money is concentrated in techno-science and market-related fields in what Slaughter asserts amounts to a higher education version of supply-side economics. Although higher education institutions and their lobbying organizations have opposed a market-driven approach, by and large they have not succeeded. Slaughter demonstrates how, on one hand, a change in government emphasis towards financing science and technology has caused a more entrepreneurial bent to emerge in university administrations, while on the other hand, it has resulted in lower salary increases for professors in the arts compared with those in science, technology and the professions.

Factors Inhibiting Change in Higher Education

Some factors inhibiting change of organizations may require a reorganization within the academy, while others are the result of technology cost. But some inhibitors may be implicit: an education environment does not want to change. Bill Gates, the founder of Microsoft, asserts that government regulation is the primary inhibiting factor in ICT. Gates contends that deregulation will be a key to unlocking bottlenecks in the USA's telecommunication infrastructure. Characteristically, Gates wants a global solution to deregulation. Great Britain was the first to deregulate its telecommunications industry, a move that resulted in greater competition and somewhat lower prices (Ferguson and Weinberg, 1998).

According to McArthur and Lewis (1998), the greatest barrier to moving higher education onto the Internet and the Web has been technical feasibility. However many administrators and academics perceive the inseparable issues of financial capability and ICT cost are inseparable and problematic issues to be the most inhibiting factor in the smooth assimilation of ICT into academia. In the Campus Computing Project survey of 2001, Green (2001) reports a downturn in technology budgets for academic years 2000 – 2001. Furthermore 32 percent of the survey's respondents indicate instructional integration as the key IT issue while 13 percent identify "Enterprise Resource Planning" (ERP) issues as most important. Unquestionably, high capital costs and operating expenses of ICT are inhibiting factors. Paradoxically, a shortage of capital and revenue can be both a driving force and an inhibiting factor in the use of ICT for higher education. . Although high cost is inhibiting, a lack of resources may drive higher educational institutions to seek new sources of revenue using ICT. For example, they may market specialty courses to student populations beyond an institution's traditional catchment area.

In reporting on a 1998 international conference focusing on important issues for a knowledge-based society and the impact of the new ICT, Rubenson and Schuetze (2000) note:

> The significance of ICTs in driving the emergence of the knowledge society lies in their ability to codify information and knowledge. They enable knowledge to be manipulated to meet a multitude of needs and to be transmitted instantly the world over. The capacity of ICTs to contribute to diffusion of knowledge is enhanced by two facts: they are more pervasive than previous technologies; and the prices are falling and their capabilities increasing more rapidly than for any other technology in history. (p. xi)

Although the cost of individual technologies is falling, there is an upward spiral of both cumulative capital needs for technology and respective operating costs in education, costs that are daunting and irrevocably intertwined (Forum Resources, 1999).

Universities may be forced into mega-alliances with more powerful institutions than themselves. According to Frances & Pumerantz (1999) choices about ICT made by budget-strapped institutions may impact severely on other sensitive areas, for example faculty salaries and hiring. The need for constant software updating and systems maintenance, like incessantly hungry mouths, cannot be ignored and will challenge funding. According to the Association of Governing Boards of Universities and Colleges (1995), budget constraints are driving universities to accelerate plans for a partial or total systemic restructuring. The political, educational, and accreditation standings of corporate alliances and university consortia will bring into play attendant ethical and long-term survival issues and alliances that have yet to be fully tested. Global competition may force these issues to resolution.

Faced with an increasingly technology-savvy student body, the demand for and costs of retraining faculty and staff will be high. Choosing the content of a retraining program will be fraught with difficulty and sensitive choices. While a teacher's knowledge of subject matter may remain unchanged, his/her role will alter in significant ways. Claeys, Lowyck, and Van der Perres (1998) report that an overwhelming majority of educators they surveyed agreed that in an ICT situation a teacher will become a guide and mentor rather than an information giver. However, uncertainty about change creates psychological barriers as teachers face serious challenges to their well-entrenched, face-to-face pedagogies (Claeys, et al. 1998). Some teachers are concerned about the effectiveness of student outcomes in ICT-driven education. However, this concern may be unfounded, according to research studies. For example, the University of New Brunswick provides a comprehensive directory of online courses. It reports "no significant difference" in outcomes between conventional teaching and education using ICT (Russell, 1999). The Website on The No Significant Difference Phenomenon identifies 355 research reports and a comprehensive research bibliography on the lack of difference in outcomes. Bates (1997) warns, however, that it is futile to compare the learning effectiveness of a program based on technology if it simply seeks to replicate classroom-based teaching and contend that as of 1997, most research had done precisely that. As Bates asserts, an ICT learning environment demands a completely fresh approach, one that uses the empowerment capacities of technology. In turn, ICT use requires an innovative approach to research design and evaluation. All this may increase the need for faculty training in the design and use of ICT-based learning tools.

Teachers' unions are resistant to the possibility of threats to job security and to the inferior quality of teaching environments that may result from ICT. Yet any change in traditional teaching methods and practices will call for an open-minded approach to employment contracts by all stakeholders. It is not surprising that the very idea of online education arouses fierce resistance in unions. For instance, the American Federation of Teachers Report (1996) demands that online courses taught by faculty be evaluated through traditional procedures. The union also argues that only a limited number of credits should be awarded for online distance education. The federation strongly opposes the notion of graduate degree programs taught at a distance. Time will show whether teachers' unions will prevail in an era of blossoming technological change led by the US with its determination to go online. Canada's teacher unions may be no more eager than those of the US to endorse online education, so change in either country may involve an uphill fight.

Setting fees for ICT courses just above an institution's marginal cost per student may increase revenue and thus potentially reduce an institution's cost per student. But Frances and Pumerantz (1999) assert that computing costs have the potential to exceed the expense of books and supplies needed in the traditional classroom. This and the cost of tutorial help raises serious questions about the economy of scale claimed by online learning advocates.

Political Pressures for Change in Universities

Reporting on Norwegian and international experiences, Tjeldvoll (1999) contends that traditional research universities seem to be in a state of deep transition. The change, he asserts, may cause research universities around the world to move away from a traditional knowledge-based culture toward that of a functionalist service university. He suggests that this shift is to a considerable extent directed by forces external to the university. Tjeldvoll argues that a rationale for change lies in a widespread criticism of universities among governments and industry. Critics claim universities do not respond efficiently or sensitively to the present needs of society in the production of knowledge and its transmission to user groups. According to this author, critics question the relevancy of the present systems education for professions. They ask how effective the university's use of resources is and how cost-consciousness operates in relation to the massive government funds the institution regularly receives.

Tjeldvoll contends that there is an internationally pervasive tendency for governments to exert more direct control over universities than ever before. During the last decade, he asserts, the transition towards the service university has become a movement. This notion of a service university is resisted in academia, but according to the author, the professors are losing control. Tjeldvoll states that a completely new model could be in sight: the complete service university. Here, the administration and management would have full control over the professoriate's total labour and research activities, and there would be an inevitable loss of academic freedom. He asserts that the power relationship has been changed; and that external pressures have reduced the professor's role and power in decision-making. The author does not give much evidence to support his conjectures, but he does provide an interesting view of a university system that may cater to both public demands and research university traditions. Tjeldvoll proposes a tentative framework for higher educational institutions in which, simplistically stated, a university will operate in two parallel modes: Mode (1) the traditional role of the research university with its academic freedoms; and Mode (2) the functional role of a service university. Tjeldvoll comments that along with economic and technological change will come paradigmatic shifts: knowledge no longer can be considered something fixed but rather as something relatively unstable and uncontrollable in our social world. His suggestion above notwithstanding, the notion of a 'service university' will foster formidable opposition.

U.K. Experience with Economies of Scale

Williams (1998) provides commentary on funding experiences in higher education in the UK some of which may be pertinent when considering the difficult decisions North American universities and colleges will have to make. The UK established public funding mechanisms aimed at encouraging universities to expand and enroll additional students at forecasted marginal costs. Universities, in effect, became commercial enterprises in a knowledge industry, selling teaching and research services to the Government. The result was dramatic: between 1989 and 1994 enrolments in universities increased by over 50 percent, a rate of growth unacceptable to the government, and expenditure per student fell by 30 percent. In 1995 the UK government put a cap on further expansion in student numbers, and as a result the total income of universities began to fall. The government also wanted some tuition fees to be paid by the students. The Dearing Committee, which studied the explosive growth in UK higher education, concluded that the only realistic source for additional funding was the student or her/his family, supported by income contingent loans. For Canada there are lessons to be drawn from the UK experience. First, when additional students can be attracted at fees above a university's marginal cost, the UK experience has demonstrated that the cost per student does decline. Second, the notion of an income contingent loan repayment is interesting.

A Central Administration of ICT

Historically, Deans and department heads have controlled their own budgets in making decisions about purchases with respect to ICT. But American colleges and universities have struggled with planning their ICT infrastructure (University of California at Berkeley, 1999). Experience shows that a lack of coordination in ICT management mitigates against the development of efficient and well-integrated ICT systems. Yet adoption of a centralized ICT system remains a contentious issue.

The University of California at Berkeley (UC Berkeley) presents an interesting example. Berkeley's decentralized networked environment had blurred the traditional distinctions between academic and administrative computing. The university found itself with a fragmented and inadequate IT infrastructure mired in unclear policies and technology, along with a failure in budgetary responsibility. Then an extraordinary demand for technologies forced UC Berkeley to re-evaluate its entire approach (University of California, at Berkeley, 1999). As a result, the university found it necessary to vest control centrally under a Director/Vice President of IT, who had the experience and knowledge of the broad spectrum of challenging issues that arise with ICT use in higher education. The job was powerful: the incumbent had to advise on alliances, monitor costs, provide, maintain and update infrastructure, acquire ICT systems and supply support services to faculty, administrators and students. At UC Berkeley, in consultation with Deans and faculty, the Director had authority for ICT training throughout the university. On the other hand, pedagogical control, i.e. the development of new IT learning systems and applications, remained within the authority and responsibility of Deans, faculty and department heads.

UC Berkeley acknowledges that the WWW and the Internet has changed the way people throughout the world will gain access to information and interact. UC Berkeley shares the view of many others that these technologies are changing how we learn, do research, manage our activities, and communicate. The university contends that the impact of ICT is likely to be underestimated. Increasingly, the university's faculty is integrating educational technology resources into most aspects of teaching and learning. UC Berkeley, perhaps more than most, is acutely aware of the inhibiting factors and barriers which have to be surmounted in order to become an effective, globally operating university working in an ICT environment. In sum, the UC Berkeley experience suggests that final authority and responsibility for ICT is best vested in a person and staff fully knowledgeable about ICT use and its challenging issues. The situation at UC Berkeley is neither unusual nor unique, but reflects at some level the experiences and needs of most university campuses.

For-Profit Universities

In the USA there has been growth in for-profit, online universities. Jones University, the first 'Cyber University', was granted accreditation on March 5, 1999, by the North Central Association of Colleges and Schools of the USA. Jones boasts that its content providers include faculty members from Columbia University, University of California (Berkeley and Santa Barbara), Stanford University and Purdue University (Jones University, 1999). Theoretically, a virtual university can be established independent of campus and geography, its students can be drawn from other regions or countries, and its faculty can teach from a variety of universities and colleges around the world. Baer (1998) refers to virtual (campus-independent) universities as being more ambitious and not pervasive; they rely heavily on the online delivery of complete degree programs. A partial list of Virtual Universities is available online (The Association for Institutional Research, 2002; The American Distance Education Consortium, 2002; and Joint Information System Committee, 2002). Virtual Universities have not been tested over time. On the other hand, a change in the role and status of Distance Education is emerging, and an increased integration of online learning with traditional campus education may result in the adoption of some aspects of a virtual campus.

As yet, for-profit, online, and virtual universities do not present a challenge to traditional universities. However, they are growing. For instance, Phoenix University is now the sixth largest in the USA with 125,000 students and over 5,000 staff. It offers three undergraduate and three graduate degree programs in business administration. Phoenix reported a 22 % rise in its 1999 worldwide enrollments (Phoenix University, 1999). Although by no means prestigious, the university is well suited for the specific task of delivering and supporting online education for adult professionals at the jobsite or at home. Given a decade of profitable operation, can Phoenix University build prestige and a strong academic standing? It is an open question, but already senior faculty members from major universities lend their reputations and expertise to online education institutions, for which they are well-remunerated.

Important questions remain unanswered. When, and how strongly, will prestigious universities compete in the online degree granting area? In part, this Delphi panel addresses these questions. Predictably, the initial emphasis by for-profit universities has been in business-related studies, but when prestigious universities do expand to include the liberal arts in their online offerings then other traditional universities may follow. Marchese (1998)[5] gives some indication of the prospective scale of the potential online educational enterprise. He refers to estimates made by Wall Street's Morgan Stanley Dean Witter on "Potential market opportunity." Nearly $300 billion are spent every year on post-secondary education in the USA. Marchese asserts that several Wall Street houses have set up 'education industry' practices to attract investors. The author acknowledges that distance education providers claim only 2 percent of this post-secondary market, but predicts that this may quickly balloon to 10 percent, as ICT facilitates larger transactions. According to him, the University of Phoenix's 57 learning centers across 12 states are just the tip of an iceberg. Marchese predicts that Phoenix will not be the one that sinks whole ships because bigger bergs are forming.

Brand names, cultural diversity, market influences, technical sophistication, advertising and the quality control of educational content may all become part of the lexicon of higher education during the 21st century. Is this a reflection of the commodification of higher education? In one sense, yes; but this does not necessarily mean a degradation of educational standards.

Government/University/Industry Cooperation

Internet2 and Internet K20

Government, industry and academia in the USA are cooperating to drive ICT systems to ever increasing levels of efficiency, wider broadband, and greater capacity. One aim is to enhance the USA's competitive position internationally. Perhaps the most important North American examples of government, industry and university partnerships are the developments of the USA's Internet2 and Internet2 K20 Initiatives. The objective of the partnerships is to get new technologies—advanced networking tools, applications, middleware, and content—into the hands of innovators across all educational sectors as quickly and as "connectedly" as possible. The Internet2 project is expected to increase the speed of today's Internet by 100 to1000 times. The programs will keep the US at the cutting-edge of global information and communications technologies.

The existing Internet has generated strong economic growth, high-wage jobs, and a proliferation of high-tech companies. Over the past decade US government R&D agencies, university researchers, and private companies have developed many of today's Internet technologies. These endeavours created multi-billion-dollar industries, some of which will fail because of corrupt practices, bad management or miscalculation. Inevitably, however, others will help drive the knowledge-based global economy. Internet2 will develop incalculably more powerful technology and spur development in many sectors of the US economy using ICT (Internet2, 2002).

The Internet2 Initiative is a university-led R & D project, with over 200 US universities working in partnership with government and industry. Member universities have committed over $70 million per year in new on-campus investment. Internet2 corporate members have committed more than $30 million to Internet2 R & D. To this can be added $100 million of R & D funded by the US government. As well, member-universities received funding in the form of competitively awarded grants from the National Science Foundation (NSF) and Science Foundation's Knowledge and Distributed Intelligence program. A companion program, the USA government-led and funded Next Generation Internet Initiative, is related to Internet2 in many areas, for example, the National Science Foundation (NSF) merit-based High Performance

Connections program. These also include networks such as UCAID's Abilene and the very high performance Backbone Network Service (vBNS) developed by the NSF and MCI/Worldcom. Internet2 is also a participant in the NGI, Joint Engineering Task Force (JET) that aims at ensuring the cohesiveness and interoperability of all systems.

Participation in Internet2 was made open to all US universities that committed investment to provide on-campus facilities for advanced applications development. That investment was more expensive than many institutions could manage, but in due course the cost of using the technologies developed by Internet2 can be expected to drop within the reach of any institution that has an Internet connection. Canada's version of Internet2 is important. Canada's advanced Internet Development Organization (CANARIE) is developing the world's first national optical Internet. CANARIE's E-learning mission is to catalyze the development and diffusion of technologies, applications and services based on open-systems standards.

The new ICT systems under development in the US and Canada foreshadow change in the way some large universities may operate internationally during the 21st century. But sovereign countries can and will assume independent policies for higher education. For instance, Canada, with its history of public education, may ignore some of the drives in education pursued by the USA in the international marketplace. However, too restricted a view of higher education could cause a decline in Canada's role internationally.

In McCallum (2000), the Royal Bank's chief economist warns against a 'business as usual' attitude in the Canadian government. He contends that nothing is being done to reverse a trend that has seen Canadian incomes fall from 74 percent of those in the US in 1989 to 61 percent in 1999. He predicts that if this trend continues unchanged for the next 10 years, Canadian incomes will decline to be a mere 50 percent of those in the USA. McCallum states, "We would be doing a disservice to those who built this country if we simply sit on the sidelines and watched Canada become increasingly irrelevant" (pp. A1 and A2). McCallum may be politically motivated but Canada has much to gain by investing in higher education, in research and in training its workforce.

Government Control

Kearns (1998)[6] discusses the accountability of US higher education institutions. He explains that there are innumerable expectations, some more tangible than others. Ties to government affect higher education's degree of freedom in decision-making as universities wrestle with a balance between traditions and online education in a marketplace that is becoming global. Kearns comments that many in academia insist that educational institutions must remain entirely independent of specific constituencies in order to preserve the university's cherished role as a bastion of academic freedom and critical thinking. There has been a waning of public support, but the author asserts that an academy should not commit itself in terms of accountability to something as large, diffuse, and fickle as the general public. While the author's assertion about a line between receptivity and capitulation on this issue is valid, the argument that public opinion can be discounted is questionable. Universities and colleges remain heavily dependent on the support they get from the public they serve. However, Kearns does suggest a sensible framework that divides public accountability into four areas—legal, negotiated, discretionary, and anticipatory--with an increasing level of freedom from external control in each successive area.

Slaughter (1998) asserts that weakness in the university system has resulted from a market-oriented bias in government and that universities need to look closely at their own cherished beliefs about what kinds of knowledge merit the investment of resources. Dill (1998) notes that there is a strong preference among faculty members for research over teaching, because most academicians have an intrinsic interest in a particular research area and in their department's reputation. As well, the reward system within universities and colleges favours research over teaching in terms of promotion, future earnings, government grant revenue, etc. However, this favourable treatment of research over teaching in universities may be challenged later as student populations increase and as government alters its priorities. For instance, Canada may direct research funding to more closely support new economic goals. Teaching could be given a high priority as government insists on education that fits students for work in an ICT intensive world economy.

Dill, Massy, Williams and Cook (1996) [7] report that the USA rejected proposals from a National Policy Board on Higher Educational Institutional Accreditations (NPB) that would have linked voluntary regulation in universities and colleges with measurable improvements in student achievement. These authors assert that the public des not see academic quality so much in terms of the academic accomplishments of individual teachers, but rather in the light of the collective impact of academic programs on the skills and accomplishments of post-secondary graduates. In the US the responsibility for educational quality still rests with the collegial parties on each campus. Dill, et al. assert, however, that self-regulation of educational quality has been undermined because of a 'hallowed collegiality'--a determined pursuit by faculty of discretionary time, academic specialisation, and a rigid retention of traditional, centralised regulatory control within universities. Nevertheless, it has to be acknowledged that the autonomy of faculty members, research and allocated discretionary time are primary attractors when recruiting researchers who will bring prestige to colleges and universities.

According to Dill, et. al., a process for external assessment has been implemented in both England and the Netherlands despite strong objections from faculty and administrations. For instance, the UK government acted, on the public's behalf, as a monopolistic purchaser of educational products and thus theoretically acquired the power to monitor quality. However, the traditional question about the evaluative state is whether government agencies can be trusted to act in the interest of the public. Problems include the introduction of yet another level of governance and bureaucracy into an already overburdened educational system and an erosion of academic freedom. By contrast with the UK, US and Canadian evaluation models rely on a number of competitive institutional arrangements and their research grants rely heavily on a highly competitive situation which concentrates on internal peer review.

Innovation Adoption in Universities

Getz, Siegfreid and Anderson (1997) surveyed 238 colleges in the USA, estimating their rate of adoption of 30 innovations. They provide a somewhat detailed analysis of the adoption rates for various departments. The authors found that, on average, about 26 years elapsed from adoption of an innovation by the first percentile institution to its adoption by the median institution. Their findings about technology diffusion would appear to foreshadow a slow rate of adoption for ICT learning systems in academia. Although these research findings are important, there are countervailing factors that may speed the rate of technological adoption:

(1) The revolutionary nature of the Internet, its reducing costs, its improvement in speed and quality, its ubiquity and its broad implications for higher education.

(2) The coming emergence of both a computer-literate student body and a young professoriate that will be well trained in ICT use.

(3) Possible competition from commercial educational products.

Industry's experience in the rate of technology adoption offers an interesting comparison. Bosworth (1996) examined the use of 13 advanced technologies, in 706 UK companies, comparing adoption with the related professional qualifications of senior management and Board members. Bosworth's principal finding was that neither the presence of qualified professional engineers on the board of directors, nor their employment in leadership roles in the company, was a significant factor in the early adoption of technology. The most important factors leading to early adoption of high technology were foreign ownership, or the fact that a managing director was a 'self-made' man [or woman]. The parallels in education for Canada may be that pressures to adopt ICTs may come from competition by the USA. While it is difficult to imagine an enterprise with more PhDs than higher education, the adoption rate of ICT may have more to do with the personal leadership of a dynamic individual than with the qualifications of its senate, academic or administrative staff.

Getz, Siegfreid and Anderson (1997) comment that on average, higher education seems to take three times longer than US industries in adopting technology. Twigg (1994) identifies incrementalism as the favoured course for change by academia and claims it will no longer work in an ICT situation. Clotfelter, Ehrenberg, Getz, and Siegfried (1991) assert that university's graduates contribute to productivity throughout the economy; as well, higher education provides intangible cultural and social elements that are not traded on the markets. A slow rate of ICT adoption is clearly unsatisfactory in an era when rapid change is occurring and universities are expected to be a source of new ideas.

Summary

In sum, the literature reveals differences between scholars over the probability and merit of ICT use in universities. Opinions range from those who hold that the academy is largely immutable and well honed to those who assert there will be fundamental change within a decade and a widespread adoption of ICT. There are differences on the likely quality of online offers, as well as union concerns about potential adverse effects of online use for members. The US and Canada, with their differing historic roots, are expected to react to the use of ICT in higher education in disparate ways. The US will take a free enterprise approach, Canada a public one. The US will encourage relative freedom in the formation of new universities; Canada will not. There has been rapid growth in for-profit universities in the US (for example, University of Phoenix) and a merger of giant communication industries which may stimulate further development of such enterprises. Marchese (1998) warns that it will not be the University of Phoenix that sinks big ships, as bigger "bergs" are forming. The expanding needs of previously under-served student populations, including women and minorities, have already increased demand for higher education. These, and education/training for employment to meet government economic goals, will accelerate the demand for teaching. There is a potential for conflict between government and academia over the university's role in re-skilling the workforce in a knowledge-based economy. Government assessment vs. self-regulation may be at stake here as will be academic freedom to pursue research, independent of the economic goals of government.

PART 2: THE ACADEMIC DEBATE ON ICT

I believe that this whole exercise of considering the future of higher education is a task of great importance. It will make us all ask the most searching and difficult questions. It will compel us to define a successful future. Having defined it we may well fall short of it. But if we do not define it at all we do not deserve to succeed at all because we have failed to have any sense of direction and will not even know what we would like to achieve. The clearer our vision of what we wish to bring about the more likely it is that we shall design a structure and method of working to help it come about. (Sir Alastair Pilkington)

Defining the Debate

The debate within academia reflects tensions and differences over how ICT may play out over the next 10 to 15 years. Although there is a general recognition that ICT will affect education, there is not much agreement on either the benefits or the directions of change. The Internet reaches into every corner of public and private society in the developed world, including academia. The technologies have changed most economic sectors but how, when and to what degree ICT will be adopted by universities is hotly disputed. A transformation of higher education by ICT appears likely, but not everyone agrees with this proposition, nor do all scholars agree that change is desirable. What is agreed is that the adoption of ICT, totally or partially, will have both positive and negative consequences for the stakeholders. It is useful to present here some of the differing views of scholars, from those who want to embrace ICT and all their ramifications, to those who want to take a more measured approach, to those who are fundamentally opposed. There are universities and colleges which will be slow to react, reluctant to cast out tradition, preferring to dig in their heels and wait. Is there time to wait? What should be done first? What last? These questions now face decision makers.

David Noble has become recognised as a leading outspoken opponent of the whole idea of learning with ICT. Noble (1997 & 1998) launched a vitriolic and somewhat detailed attack on the whole idea of ICT use in education. The author starts his attack with a generalized statement about the future of the higher education system:

> At the very outset of this new age of higher education, the lines have already been drawn in the struggle which ultimately will determine its shape. On the one side university administrators and their myriad commercial partners, on the other those who constitute the core relation of education: students and teachers. (5th para.)

The author is somewhat arbitrary in defining the players on each side of his dividing line. He argues that a fear of being left behind is driving what he calls a "headlong rush" to implement new technologies and accept a consequent commercialisation of higher education. He alleges that a form of conspiracy exists between commercial entities and educational administrators towards this commercial end. In his essays Noble (1997 & 1998) describes a commodification of education which treats teachers as "labour" drawn into the commercial process to assist in the design and efficient creation of educational products. He claims that the asynchronous learning systems of ICT will draw teachers into long and unpaid hours of work. Noble also warns that automation "...robs the faculty of their knowledge and skills, their control over their working lives, the product of their labour, and ultimately, their means of livelihood"(1997, 21st para.).

Noble (1997, 1998) asserts that the use of online education threatens the job security of non-unionised faculty members and comments that the real target for online courses will be the on-campus population. He warns that faculty at all levels ultimately will be drawn into the new regime through encouragement or coercion. He claims that university administrators use the academic incentive and promotion structure to reward cooperation from faculty and to discourage dissent.

Noble argues against business/university partnerships involving intellectual property and asserts that patents belong to inventors, not institutions. He alleges that universities have established ad hoc arrangements with their own professors, giving them a share of revenues in exchange for patent rights. Noble forecasts that universities will eventually adopt formal intellectual property policies under which employees will be required, contractually, to assign their patent rights to an institution as a routine condition of employment. As a result, Noble argues, research that has been pursued as an end in itself, as a contribution to human knowledge, will be used for commercial ends. As Noble alleges, universities and colleges may insist on the assignment of intellectual property as a condition of employment; such an assignment is often required in US corporate employment contracts.

The methods of paying for educational content may have to change. Noble has raised controversial issues over the ownership of intellectual property that demand attention. Negroponte (1995) suggests that copyright law is totally out of date (like a Gutenberg artifact). He contends that, since copyright is a reactive process, it will have to break down completely before it is corrected. This concept cuts across much of the current highly charged debate about the ownership of intellectual property, yet Negroponte's conclusion is too rational to be ignored. Already people using the Internet are able to access and change the work of writers, scholars and artists. Who is to control this? Negroponte suggests that nobody should do so. How will IT creators be paid? One possibility is an Internet user fee, but how will the money be shared? We are living in a time when technology is outpacing a legal system which was designed to protect copyright in a different era. Whether an equitable solution will be found for the owners of intellectual property is open to serious doubt. An ICT transmission can be originated from anywhere in the world and copyright infringement lawsuits will be difficult and costly to pursue.

After predicting that good quality higher education will become the exclusive preserve of the privileged in an era of ICTs, Noble (1997) goes on to forecast:

> For the rest of us a dismal new era of higher education has dawned. In 10 years, we will look upon the wired remains of our once great democratic higher education system and wonder how we let it happen. That is, unless we decide now not to let it happen. (conclusion, 1st para.)

Though White (1999) supports Noble's defence of faculty rights, he challenges Noble's biased and ill-informed opinions about distributed learning technologies and expresses concern that Noble may be alienating potential faculty and student allies. He comments, "Professor Noble seems convinced the battle is won [for ICT]" and contends that "the victory parade is premature"(online, into.). Similarly, Ben Schneiderman (1998), in response to Noble's essays, acknowledges that there is reason to be cautious about ICT use in education but comments, "David Noble is unhelpful in guiding us. His fear-filled rhetoric and whipping of the boogie–monster of entrepreneurial corruption of education is misleading, shallow and even counterproductive" (Schneiderman, 1998, 23rd para.).

He goes on to suggest that we get on with the important issue of figuring out how to improve education by taking advantage of ICT while preserving the guiding and mentoring role of teachers, and working towards a lively interaction among students. One might add to Schneiderman's agenda the development of collaborative strategic alliances or partnerships with other universities and possibly with corporations around the world.

Herman (1998) asserts that much of learning can only be accomplished through traditional modes. Herman's overall criticism of Noble is that he has painted a one-sided picture, based on the premise that universities are isolated from society. Herman suggests that private sector-university partnerships have more often than not, brought great benefit to students and faculty alike. He sees the use of ICT in education as a perfectly appropriate extension of the land-grant tradition. He argues, however, that government-industry-university partnerships do bring with them very real issues around intellectual property rights. Herman comments that issues related to conflict of interest, conflict of commitment and intellectual property deserve to be debated at the universities and resolved by faculty—in concert with the administration.

Furthermore, Herman (1998) disagrees with Noble's charge that there has been a "wholesale reallocation" of university resources away from teaching. He comments that

UCLA's agreement with a media corporation to market some of its courses, which Noble finds threatening, could just as well be seen as motivated by a desire to provide increased access to education. He says that there is a need for faculty control over quality in ICT, but Herman argues that failure by universities to respond to online education will automatically assign to others the responsibility for shaping a large part of the future of higher education.

Arguing that intellectual property and copyright law stems from a legal system that is outdated and which has been outstripped by the ICT revolution, Negroponte (1995) takes a somewhat different view from Herman and many others. He forecasts that the intellectual property system will collapse under pressures from the Internet. Green (1998) comments that the growing role of the WWW as a vehicle for scholarly dissemination and as a repository for instructional resources raises important questions about who owns intellectual property. Yet Green's Campus Computing Project reveals that most campuses have not developed policies to address intellectual property issues.

Phil Agre (1998) comments that Noble's essays challenge educators to develop a sophisticated institutional understanding of higher education, and fears that change may be too abrupt or radical:

> Will we have a revolution in the university? I hope not. Revolutions are destructive. By caricaturing the old and idealizing the new, they falsely posit an absolute discontinuity between the past and the future....if issues of power and governance are neglected then it can lead to catastrophe. It is both a product and an instrument of human choice, and it leaves the burdens and dangers of choice squarely in human hands. If universities are to remain a foundation of a democratic society, then it will be necessary to make those choices wisely. (last para.)

Agre argues that students inherit from high school a conception of education that is closer to vocational training than anything they will encounter at a research university. Agre argues that technological skills rapidly become outdated, but other skills-- reading, writing, talking to people and navigating on a social network--do not go out of date. He supports those uses of ICT that help to connect skills to concrete experience in the real world.

Peter Denning (1998) comments that Noble is not alone in his concern that computers and networks will automate all the jobs now typical of universities—lecturing, note-taking, testing and record-keeping. He says that many faculty members find Noble's scenarios plausible and worry that their personal futures will be barren. Denning characterizes Noble's position as a complex set of claims and assumptions supported by facts that make them plausible, but he contends that Noble embeds his picture in a conspiratorial tapestry: predatory university administrators (and their profit-hungry corporate partners) on the one side, students and faculty as prey on the other. Denning argues that the agendas and interests of administrators, business, and faculty vary widely and often conflict, but to suggest that administrators are engaged in conspiracies or monopolistic practices stretches the meanings of these terms beyond recognition. He disagrees with Noble's claim that administrators undermine or exploit faculty members, pointing out that most university administrators, in decision-making positions, are faculty members. The author finds it hard to accept the notion that these administrators have an animus against faculty.

Denning also denies that faculty members are being forced by administrators into using digital technologies. On the contrary, many faculty members are annoyed that administrators are not moving fast enough, that there are too few dial-in lines, inadequate bandwidth, poor server capacity, too little technical support, and too little training in the use of technologies. Many faculty members use web sites, and favour the asynchronous nature of e-mail in their relationship with students. Denning concurs with Noble that teaching presents the greatest stress for faculty and agrees that digital systems may take over the familiar faculty roles of presenting, testing and record keeping. But he asserts that no machine can automate the teacher's role of inspiring, motivating, guiding, coaching and managing students. Denning concedes that the routine parts of teaching can be automated but maintains that a redefinition of roles because of ICT will enable faculty members to spend more time on the human side of their work.

White (1999) shares and supports many of Noble's social concerns and causes, but disagrees with his allegation that there is no real evidence of pedagogical usefulness in online instruction. The author does not support Noble's suggestion that students neither demand nor support online initiatives or his claims that instructors will be unable to cope with increasing demands on their time. He contrasts Noble's dismissal of the technology with Feenberg's open-minded spirit of exploration and experimentation. Feenberg's (1999) work was on a design team that created the very first online educational program in 1981.

The concerns expressed by Noble have merit but may be less credible to some because of his strong anti-technology. The use of ICT needs to be approached cautiously yet, as White (1999) says, with an open mind. Academic freedom, the ownership of intellectual property, the quality of teaching, job security and the financial prospects of faculty--all are major areas in which ICT can be expected to cause change. All these issues require mature reflection and decisions by a well-informed faculty and administration, but educators will have to acknowledge the changing needs of students in the 21st century.

Neil Postman (1992) argues that we live in a society in which traditional beliefs have been weakened or abandoned, and also that we have surrendered sovereignty over social institutions to machines. He comments that at first the two opposing world views, "the technical" and "the traditional," co-existed in uneasy tension. He says that in America there is a love of "things new" and that the exploitive genius of its captains of industry coupled with a weakening of traditional beliefs has led to the successes of technology, and a devaluation of traditional beliefs. This devaluation, argues the author, pushed technocracy[1] in America over into a Technopoly.[2]

Postman notes that in earlier times spiritual and social customs acted as controlling forces in the world but now, he infers, we pay too little attention to the spiritual teaching on which our civilization is based. The author looks to older simpler days when traditional institutions, such as the church and the university, were powerful in influence and held great sway over most changes that occurred in society. He builds his thesis about the dangers of a 'Technopoly' on a story from Plato's *Phaedrus*, about

Thamus, a king of a great city in Upper Egypt. When faced with the invention of the art of writing; the king was skeptical about the benefits the invention foreshadowed for civilization. Postman cautions against too ready an acceptance of today's ICT, saying, "My defense is that a dissenting voice is sometimes needed to moderate the din made by the enthusiastic multitudes. If one is to err, it is better to err on the side of Thamusian skepticism" (p. 5). He accepts that technology "gives" to society but reminds us that it also "takes away." He asserts, "once a technology is admitted, it plays out its hand . . . when we admit a new technology to the culture, we must do so with our eyes wide open" (p. 7). It is pertinent at this juncture to interject that in considering ICT use, the 'genie' of these technologies is already well and truly 'out of the bottle'; Postman's caution that any new technology can be expected to 'play out its hand' is well taken. He argues against a tide of change that has already engulfed society.

Postman (1992) also complains that those who achieve competence in the use of the machinery of technology become an elite group and are "granted" undeserved authority and prestige by those who have no such competence. He asserts that the benefits of the new technology are not distributed equally. These assertions are true, but the same could be said about writing and the consequent increase in power of the Church and University. Today all institutions are being forced into a reappraisal of their role; technology is breaking down barriers and making international boundaries transparent. Contrary to Postman's assertion, the 'power' of these information technologies does not reside in the hands of technicians but in the hands of leaders who understand how to apply the empowerment capabilities offered by ICT. Postman rightly asks, "...to whom will the technology give greater power and freedom?" (p. 11) This is not an easy question. Jacobsen (2000) considers technology in the context of social and political action. He comments that socio-organizational changes (institutional, managerial, legal, and educational) will be essential if technical innovations are to flourish in socially beneficial ways. Any examination of the assumptions guiding technological design should be inseparable from a scrutiny of the social forces that shape them. If we accept Postman's parallel between ICT and the invention of writing, we have to conclude that, given time, the people of the world's civilizations will benefit both in freedom and in material well-being through the advent of ICT. However, it is interesting to note that in the case of writing, power remained in the hands of the elite for centuries. In the case of ICT, the challenge to society is urgent and fundamentally different. By their very nature, ICT are rapidly shattering traditional boundaries between the public and the elite.

Humanistic and sacred values endure because they serve deeply held beliefs of the world's civilizations. Some institutions may want to remain rooted in the past, but new approaches will be needed if educational and religious institutions are to remain relevant in a changing 21st century. Postman (1992) comments, "Thamus understood well the limitations of inventors in grasping the social and psychological—that is, ideologic—bias of their own inventions" (p. 15). It is true that we do not always see where new technology might take us, but fear could direct us back to a past which was far from perfect. Rather, future generations will build on foundations in education we now provide. This is the way our ancestors built on the inventions of writing and printing to fashion our learned institutions.

Postman (1992) describes what he calls the rise of technopoly as a system that eliminates the "thought world" of tradition. He claims it makes traditions invisible, and therefore irrelevant, and does so by redefining what we mean by religion, by art, by family, by politics, by history. The author claims that technopoly is a totalitarian technocracy. Without much supporting evidence, he describes the US as a technopoly. Admittedly, some of the degenerative factors Postman lists may exist in specific populations of the US, but they cannot be generalized to that whole nation. Religion, art, family values, a sense of history, truth, privacy, and intelligence are all cherished virtues of North Americans. As well, Postman sidesteps the benefits of technology in enabling an affluent democratic society.

The computer, Postman (1992) says, has usurped powers and enforced mind-sets that a fully attentive culture might have wished to deny. He complains that the computer subordinates claims of our nature, our biology, our emotions, and our spirituality. But computers have no power to usurp; they are not (yet) animate, independent entities. Postman is probably right in his claim that computers and bureaucrats are made for each other. He describes the bureaucratic/computer "relationship" as an, "almost magical tendency to direct attention away from the people in charge of bureaucratic functions and toward the machine as if the computer were the true source of authority" (p. 115). But the author is well off the mark when he belittles the importance of computers in commerce by explaining that computers serve to divert attention away from discovering whether or not a business enterprise is necessary and how it can be improved, for competition roots out unnecessary business activity. Postman argues against the automation of operations in universities, asserting that computers do not reveal destructive issues. He contends that "defects in their [universities'] assumptions, ideas, and theories will remain untouched" (p. 116). True, but scholarly reflection and debate among faculty and administration can resolve such matters. Postman's ideal school situation has history and religious studies at its core--a non-technical, not child-centred, not skill-related schooling involving the disciplined use of language and a wide-ranging knowledge of the arts, history and religion. Postman sees this approach to education as a good defensive measure against a society lost to a technopoly.[2]

Postman (1992) blames technology for the loss to modern culture (particularly that of the US) of symbols that draw meaning from traditional religious or national roots so that they become drained of sacred or even serious connotations. Contrary to Postman's supposition, it could be claimed that traditional religious beliefs are thriving in the US. Postman claims that a technopoly lacks a moral centre and blames this on technological progress, but a breakdown in family values, a lack of political morality, and an acceptance of low community values all have identifiable human causes. We are still challenged to build a world with sound moral beliefs.

Nicholas Negroponte is a scholar with a very different view from that of either Noble or Postman. His book, *Being Digital* (1995), is especially useful because of the author's wide-ranging knowledge and deep experience in the development of interactive technologies. He understands the current status of technology and its potential for convergence. The author also offers insight into new technologies that may be just around the corner. He is well informed about technological applications in the general market place and in academia. Negroponte is an important voice in the academic debate on pro-technology; he argues against any premature condemnation of ICT as technocratic, de-humanized nonsense.

Negroponte (1995) also comments on ICT value in learning. He describes hypermedia, a term used to describe highly interconnected narrative and video,"as a collection of elastic messages that can stretch and shrink in accordance with the reader's actions. Ideas can be opened up and analyzed at multiple levels of detail" (p. 70). According to the author, translating freely from one system to another is where the field of multimedia is headed; for higher education this flexibility may be crucial. Sophisticated chip design will allow a rudimentary form of 'intelligence' to be incorporated into computers. The author sees this process as, one day, allowing near perfect voice recognition and a computer's ''understanding'' of its user. Primitive versions of voice recognition programs that translate speech to text are available now, but they are very slow and not at all precise; however, it is reasonable to predict these will improve. The 'intelligent chips' described by Negroponte may, in a decade or so, be incorporated into ICT learning systems that enable students to set problems in real life contexts that demand synthesis. These learning systems may enhance a learner's capability in critical thinking and allow him/her to choose from an array of learning approaches. At some time in the first half of the 21st Century, 'intelligent' chips embedded in programs may be instrumental in allowing abstract subjects to be learned online by scholastically bright students. However, if we become too dependent on sophisticated online programs we may lose in maturity and breadth of view.

Certainly Negroponte (1995) does not see ICT as a threat, or believe that teachers somehow will become redundant. Rather, he expects teachers to be freed from routine, repetitive work and empowered to discuss, lead, motivate and counsel learners towards a deeper understanding of knowledge gained. He points out that good teaching lies not so much in the delivery of facts but in stimulating a learner to adventure in the self-discovery of knowledge. Because of ICT this adventure now starts at an early age. The pedagogical philosophy of learner-centred education and of learning by doing emerged long before the use of computers in education. In North America the educational method has already moved well away from teacher dominance and the passivity of students. Negroponte explains how ICT may accelerate and enhance this progression. "What I am advocating should not be construed as anti-intellectual or as a disdain for abstract reasoning—it is quite the opposite. The Internet provides a new medium for reaching out to find knowledge and meaning" (p. 202). According to him we are moving away from a hard-line mode of teaching toward one that is more porous and draws no clear lines between art and science, or right brain and left. Negroponte suggests that education through ICT will "cater to a wider range of cognitive styles, learning patterns, and expressive behaviors" (p. 220). He asserts that through the use of ICT "our future adult population will be made 'simultaneously more mathematically able and more visually literate" (p. 220), resulting in a much richer intellectual panorama. Negroponte acknowledges that change towards a fully "digital world" will have its victims. There will be loss of employment for some and disillusionment for others, especially for those who do not have the flexibility to adapt to a new system. However, Negroponte points out that, "Like a force of nature, the digital age cannot be denied or stopped. It has four very powerful qualities that will result in its ultimate triumph: de-centralizing, globalising, harmonizing, and empowering" (p. 229).

Will education become generally accessible online? The answer may be a qualified 'yes' in developed countries, but not for some years in developing countries. Will there be equal opportunity? This is a much more difficult question. It is likely that there will be an increased opportunity to make higher education available for far more people, and the quality of life for the poor may improve. However, because of socio/economic factors, learners' characteristics, etc., it is probable the gap that now exists between high achievers and those who are poor or have learning disadvantages will widen because of ICT. Yet students with learning disadvantages still may benefit through access to "enabling" technology, for example, the availability of voice/translation computer technology for the blind.

How may the conflicting views of scholars about the use of ICT play out? Postman's fears about a loss of tradition, are not shared by Christopher Dede (1992).[3] Rather, Dede expresses concern that the education system of the USA has remained far too static; he asserts that higher education has not responded efficiently to a changed global socio/economic environment. The author finds this disappointing since excellence and quality will depend upon a pluralistic understanding of worldwide markets. He underscores this failure by lamenting that a future of little or no change in American education may be probable, as similar opportunities for innovation have slipped away in the past. Dede may be overly pessimistic: historically, the US has shown a remarkable capability to rediscover and re-invent itself in response to difficult times and now may do so in higher education.

Universities face an array of options ranging from a full commitment to global online higher education to a refusal to participate seriously in the use of ICT. Given so wide a choice some universities might adopt Tjedvoll's (1999) dual mode structure, that of a research university and a full online service university operating in parallel modes; alternatively, they may choose a mixed mode of face-to-face and online education. It is probable that most colleges and universities will choose to adopt the technologies incrementally, but may develop a central ICT administration. The capability of ICT to transmit synchronous/asynchronous education training programs to sites anywhere in the world will remain an important driving factor in online education (Lundin, 1998). A few powerful and wealthy online partnerships between universities and corporations might become dominant in the international field of higher education.

Hackman (1992) recognizes ICT use in higher education as inevitable. She accepts the choices they present and recognizes the social change that needs to be considered in designing their application. According to Hackman the demand for education by women has outstripped that of men. Still, many women cannot attend universities because of family obligations. The demand by minorities is also growing. For instance, Hackman notes that in the USA between 1970 and 1989 the total enrolment of women in colleges and universities grew from 3.5 million to 7.2 million while men's enrolment increased more slowly from 5.0 million to 6.3 million. She also points out that in 1989 women received 52.6 percent of undergraduate degrees. At the doctoral level women also made progress: 18 percent in 1973, 28.6 percent in 1979 and 36.5 percent in 1989. Ten years later (between 1999 – 2000), the profile of undergraduates in U.S. postsecondary educational institutions showed 56% female, and 30% a race other than White (National Center for Educational Statistics, 2002).

Commenting on doctoral level graduate education (which feeds the pool of minorities available for faculty positions), Hackman reports that the number of Hispanic, Asian American, and Native American doctorates increased during the 1980s, but African-Americans doctorates declined. Hackman recognises that we are evolving rapidly to a new knowledge-based society in which intellectual, rather than financial and physical capital will be the key to a nation's strength, prosperity and social well-being. She asserts that the silicon chip has created a truly international exchange of ideas and perspective, one that cannot be constrained by government. Expanding technology carries a mandate for all those in higher education who work in a global multicultural context.

Outcomes of the Debate

The debate over ICT has been neither won nor lost, but continues. Some scholars fear a loss of values in an academy they have served for a "working" lifetime. Yet, with vigilance, those values can be preserved. Scholars have witnessed and supported decades of dramatic change in academia, yet some oppose a different future. Undoubtedly change will continue because of ICT and it will happen with increased rapidity. The competitive online market in academia that worries Noble and many others probably will result because of ICT. Although there will be profound change for faculty, teachers will not become redundant, nor will the quality of learning suffer.

Summary

In sum, there is ongoing dissent in academia on the merits of and necessity for ICT use. Noble, an outspoken critic of the technologies asserts that faculty may, eventually, be deprived of their livelihood and the academy damaged and reduced because of ICT. In my view he overstates his case, but his claims resonate with genuine worries held by many others. Postman's concerns about ICT come from a broader and more philosophical direction. He expresses a fear that, because of technology, the US has abandoned the older spiritual, cultural teachings on which its civilization is based. He constructs his premise on a story about skepticism over the discovery of "writing" and the fears, then, of its unknown implications. Postman suggests a parallel fear that a headlong rush into ICT use may have consequences that may damage our world. Dede (1992) takes an opposite view from Postman in fearing that the US, as so often before in education, will fail to seize the opportunities for innovation presented by ICT. Negroponte expects ICT to change education in many ways as reach out to find knowledge, moving away from a hard-line mode of teaching, to one that is more porous. He suggests our future adult population will simultaneously become more mathematically able and more "visually literate."

CHAPTER THREE

THE DELPHI METHOD: HISTORY, DESCRIPTION, CRITIQUE AND APPLICATION

Introduction

C.P. Snow (1993) says a futurist must be able to imagine solutions and inventions that no one else has yet imagined. This insightful remark is applicable to all fields and is nowhere more important than in higher education. In considering the influences of ICT a researcher is well advised to 'step out' of education's immediate context and view higher education from a perspective of a vision for the future. Radical change can then be viewed somewhat objectively, or at least distanced from the current ferment among scholars around the use of ICT.

Stepping outside an immediate context to view the future is more easily said than done. Obtaining a clear view in the sometimes nebulous field of higher education and in the ever-changing field of communication technology can be problematic. It takes a creative, flexible method for a researcher to gain reliable forecasting data. One such instrument, perhaps unique in its capacity to handle complex issues about the future with little or no hard data, is the Delphi method. Delphi appears to be underrated as a methodology, though it was popular in the 1960s and 1970s.

History of Futurism and the Delphi Method

The history of futures studies is interesting. Although this history is rooted in mythology, my chronology begins with Plato's *The Republic.* According to Gutlek (1997), Plato is considered the founder of Western Idealism (427-347 B.C.). This chronology identifies some key philosophical/ideological authors on education. Some notations (in italics) give an overview by decades (Appendix A).

In 1942, Ossip Flechtheim, a German sociologist, coined the term 'futurology' to describe a search for the logic of the future in the same way as history is a search for the logic of the past. The Delphi methodology falls within his idea of creating logic for the future. Flechtheim contends that Futurology is a science in its own right which, by projecting the present into the future, tries to detect evolutionary patterns and to distinguish the unavoidable from the avoidable.

It is quite clear that the future cannot be observed, is not knowable and is not evidential. Joseph (1974) comments, "Forecasting the future appears to be a contradiction in terms, for to do so is tantamount to inventing the inventions (of the future) before the inventors" (p. 1). Riner (1987) says there can be no knowledge of the future. Bell (1996b) points out there are past facts, present options, and future possibilities, but there are no past possibilities and no future facts. Yet the most important knowledge we require may be that of the future, as through this knowledge we may be able to take action to shape events in our favour. Therefore, a tension exists between the need to forecast information about the future so society can act intelligently and the impossibility of obtaining knowledge of the future, in the strictest sense.

There are fundamental differences in ideological perspective among educators that affect their view of the future. Differing perspectives influence not only our view of the future, but our ideas about whether it can be predicted, to what purpose, and with what methodology. Utopian authors criticize existing conditions in society and offer a vision of a better world, an enduring tradition in the West. Pragmatists believe that we create knowledge by interacting with our environment in problem-solving episodes. Positivists believe that knowledge of the future is basically the same as observed knowledge because it can be confirmed or denied at a later time, i.e., when the future becomes the past. Critical realists give up the positivist's commitment to certainty and accept a belief that we cannot have certain knowledge. They redefine knowledge of the future as "conjectural knowledge," allowing for the possibility of fallibility in their conjectures. Critical realists require one of three conditions:

- the proposition is true
- the proposition is true if a person believes that the proposition is true
- the person is justified in believing that the proposition is true (Musgrave, 1993)

Bell (1996) believes that a major purpose of futurists is to maintain or improve the welfare of humankind, but acknowledges that professionals in the field often work for clients who are interested in practical results, not abstract theories. According to Bell (1997a) there are nine key assumptions in futures studies:

- Time is continuous, linear, unidirectional and irreversible. Events occur in time before or after other events and the continuum of time defines the past, present and future.

- Not everything that will exist has existed or does exist. Thus, the future may contain things—physical, biological or social—that never existed before.

- Futures thinking is essential for human action, for the consequences of action always lie in the future. But futures thinking, both by ordinary people and high-level decision makers, is done only more or less well. The power and utility of futures thinking can be improved.

- In making our way in the world, both individually and collectively, the most useful knowledge is 'knowledge of the future.' That is, humans move with time, constantly moving toward the future. In making plans, exploring alternatives, choosing goals and deciding how they ought to act, humans have a need to know the future and how past and present causes will produce future effects.

- The future is nonevidential and cannot be observed; therefore there are no facts about the future. It is possible to have 'conjectural knowledge.'

- The future is not totally predetermined. It is more or less open, because it hasn't happened yet; the future is uncertain for humans as cognitive beings. The future represents liberty, power and hope, a time when dreams might come true.

- To a greater or lesser degree future outcomes can be influenced by individual and collective action. The future is at least partly available to be shaped by human will, either through human control or anticipatory adaptation.

- The interdependence in the world invites a holistic perspective and a transdisciplinary approach, both in the organization of knowledge for decision making and in social action. Scientists take a granular approach, reductionistic and delimited. But in order to act effectively in the world, humans need a holistic approach that incorporates the attempt to estimate the consequences of a given action on many human goals and values so as to guard against unintended and unanticipated consequences that are unwanted.

- Some futures are better than others. (pp.162/3)

B.B. Brown (1968) believes that a consensus of opinions from a group of experts is superior to that of an individual expert since the risk is higher if one relies on the judgment of a single specialist. She admits the singular opinion of an expert ultimately may prove to have been correct--futurists make no ontological claims to knowing that which does not yet exist. Brown further comments that the judgment of experts may be of assistance when it is necessary to choose among several alternative courses of action. When there is little or no hard information available to a forecaster, the initial stages of an investigation must of necessity be speculative, but speculation is best founded on thoughtful and reflective judgment and insights from the best minds available. Three analogical stages in the history of futures studies are identified by Ogilvy (1996):

> 1. At first a study of the future was literally an attempt to uncover God's intentions.
>
> 2. Then God's design gave way to scientific attempts to trace causal chains in the manifest text of physical reality.
>
> 3. Then struggle could be justified by dialectical materialism's 'scientific proof' of what life would be like after the revolution (communism).

A more contemporary position is that alternative futures (or preferred futures) are forecast in order to inform our creative thinking, shape our policies and inform our decision-making. In the early 1960s, Herman Kahn developed the concept of "alternative futures" in reaction to "positivism." His notion of paradigm shifts infers that the future is not a single inevitable state, but can evolve. However, Kahn warns that alternatives imply choice and social costs. McHale (1983) also writes about freeing the mind from the ideas of utopian ideals through an exploration of alternative futures. Funded by the Ford Foundation De Jouvenel was the founder of 'Futuribles International' in Paris. In assessing "possible futures" he brought together a forum of interdisciplinary scholars to prepare independent papers that examined problems concerning the future, each from the perspective of his/her own field. Bertrand de Jouvenel became the first president of the World Futures Studies Federation; his book *The Art of Conjecture* (1967) explores the psychology of fearful or hopeful people trying to look and think ahead.

Conjecture is a surmise or belief concerning a situation, often a possible future development (Loye, 1978). Much of futures studies is based on conjecture, but so too is science. Scientific assertions are conjectures (Bell, 1997). Although science is committed to seeking the truth, its methods and logical structures encompass conditionals, counterfactuals, dispositionals, theoretical speculations, and creative formulations of hypotheses. In consequence, many scientific statements do not differ epistemologically from many assertions about the future made by futurists. Dator (1996) looks upon the future as emerging from the interaction of four components: events, trends, images and actions.

The proliferation of futurist work since the 1960s has provided futures studies with an acceptable level of respectability. Amara (1978) writes about three essential questions futurists address: What choices do I have? (the art of the possible); What do I know? (the science of the probable); and What do I prefer? (the politics of the preferable). He outlines important objectives for thinking about the future: (1) identify and examine possible alternative futures; (2) characterize the degree of uncertainty involved; (3) identify key areas that may be seen as precursors or warnings; (4) examine a variety of "if...then" sequences; (5) acquire an understanding of the underlying processes of change; and (6) sharpen knowledge and understanding of preferences. Indeed, the strength of the futures field is its flexibility, its trans-disciplinary, and its "outside-the-box" thinking. Forecasting challenges our expectations for the future and can be a means to encourage creative thinking. Some advocates consider the futures field as a discipline, but the field has not yet developed the knowledge base and theoretical underpinnings that are required to substantiate that claim. Knowledge about the future is at best conjectural. McHale (1978) categorizes future study approaches:

- Descriptive – including conjectural, speculative, and imaginable modes;
- Prescriptive – normatively oriented projections of the future; and
- Exploratory – forecasting based on a methodical and relatively linear extrapolation of past and present into the future.

Prescriptive forecasts are normatively oriented projections of the future that can assist us to achieve desirable futures. The exploration of alternative futures questions 'what was' as a preparation for conjecturing about 'what will be,' 'what might be,' 'what could be,' or 'what ought to be' (Bell, 1996). Extrapolations are useful when forecasting relatively short-term futures, where the past may provide a reliable indicator for the immediate future, but not as useful when considering longer-term situations, especially those where abrupt, radical and accelerating rates of change may take place. The accelerating rate of innovation that may occur in ICT use in higher education is a case in point. Futures methods (including the Delphi Method) give a basis for forecasting probable, exploratory, and sometimes (normative) preferable futures. At best, the purpose of a forecast may be to aid a decision-maker, as her/his decisions cannot be probabilistic; the future is unique in that only one of all possible outcomes will eventuate (Twiss, 1992).

The Delphi Method

Developmental

According to Jantsch (1968), the forecasting methods used during the first half of the 20th Century involved primarily exploratory (opportunity-oriented) forecasting. Jantsch claims that S. Colum Gilfillan pioneered technological forecasting in1907, but Gordon (1992) claims a more recent 1950s origin, when the Research and Development Corporation of the USA (RAND) introduced methods for systematic forecasting.

The Delphi method was named by its inventor (RAND) after the Ancient Greek Oracle of Delphi; the technique constitutes a powerful set of tools for forecasting likely futures (Joseph, 1974). Bright (1968) comments, "Strictly speaking, it [the Delphi method] is not a forecasting technique, but a means for obtaining a consensus" (p. 348). In the 1950s, under US Air Force-sponsorship, RAND began its development of Delphi as a systematic methodology for examining likely futures. RAND's initial objective was to forecast technological innovations for incorporation into weapon systems. By using a statistical analysis of expert opinions the corporation addressed questions about the military potential of certain developing technologies and about political threats, such as communism, to the US. As well, when the US Defense Department's estimates had become a matter of sharp debate, as heavy cost overruns in Pentagon spending occurred, RAND used Delphi in the development of tools for realistic cost analysis. RAND's method was to obtain a reasoned consensus from experts by using a series of questionnaires about future possibilities, and by giving panel members controlled feedback on panel answers before seeking further responses (Linstone, 1975). Delphi methodology has evolved systematically based on this early work of RAND.

Before the development of the Delphi, the US Army used a "Genius Technique" in forecasting utilizing the differing opinions of outstanding individuals. Data collected and compared was reconciled by conference. The 'genius' approach in forecasting was also used by study groups or symposia. According to Bird and Darracott (1968), forecasting that predated the 'Delphi Project' is often overlooked in the literature. For instance, in 1955, the US Army's Office of Research and Development called for a one-time "Technical Capabilities Forecast" from each of the Technical Services. Prior to World War II, forecasts were made by the National Research Council (Bird & Darracott, 1968). Before reorganization of the US Army in 1962, each Technical Service (the Signal Corps, the Ordnance Corps, etc.) made its own long-range technical forecast which was updated every five years. Gordon (1992) outlines how the Delphi approach removes conference-room impediments to accomplishing an unbiased expert debate. There are differing opinions among scholars about the origins of the field of Delphi forecasting.

Helmer (1968) claims that he developed the Delphi method in collaboration with Norman Dalkey of RAND Corporation and T.J. Gordon of Douglas Aircraft. However, much of the literature credits the Delphi methodology to N. Dalkey and O. Helmer. Although T.J. Gordon (now retired from the Institute for the Future) conducted a great deal of research on applications of the Delphi technique, his contribution is often overlooked (Lanford, 1972). Bell (1997a) asserts that Helmer (1983) exaggerates the importance of operations research when he says that it is the 'parent discipline.' What cannot be exaggerated is the influence that various rigorous Delphi methodologies have had: Delphi is now a fundamental tool for those working in technological forecasting (Linstone & Turoff, 1975).

McHale (1978) describes "future studies" as "...implying a more open-ended inquiry while avoiding the more rigorous connotations of 'research' with its implications of scientific objectivity and value neutrality" (p. 9). Future studies experienced its formative development during the post-World War II years, especially during the 1960s and 1970s. The emerging field of futures studies was affected by the social upheavals of the 1960s and 1970s, especially the attacks on science in general and positivism in particular. The dominant intellectual currents and important events of those times can help us understand the social forces behind future studies.

Applications

While acknowledging an earlier beginning for futures, the work by RAND on Delphi provides a credible starting point for an understanding of systematic forecasting research. The Delphi forecasting method has been used extensively to generate ideas and forecast change in business, medicine, library studies and many other areas. Any topic that can be discussed at a committee meeting can be investigated through a Delphi inquiry. For instance, a Delphi study was conducted on Civil Defense Policy by the office of Emergency Preparedness, using RAND as a consultant. Turoff (1970) reports that by 1970 Delphi had become a frequently used method for forecasting likely futures in a wide variety of societal matters. By 1970 about 35 percent of RAND Delphi projects were non-military. The corporation was heavily engaged in technological forecasting using its Delphi technique. The roots of the Delphi methodologies were embedded in US military, civilian, planning and forecasting.

Use of the Delphi methodology quickly spread in the US and overseas so that by 1969 Delphi studies numbered in the hundreds (Linstone & Turoff, 1975). By the mid-1970s, they were in the thousands (Stewart, 1987) and today there are also many thousands of Delphi studies. Much of the material is not available in the public domain, as it was commissioned by private corporations for their own decision-making (Linstone & Turoff, 1975). This is confirmed by Bell (1997), who asserts that a considerable amount of Delphi research is proprietary and private; therefore, results are kept secret from competitors and the general public. Peer review and professional criticism is lacking in these private studies. Early Delphi forecasting was dominated by the physical sciences and mathematics, but by the mid 1960s the use of Delphi method was expanded and applied to long term large-scale technological forecasting. By the 1970s the social and behavioural sciences and the humanities were using Delphi in their research concerning the future.

The RAND corporate website helps identify documents that trace the historical development of Delphi technique and its varied applications from 1949 to 1990

(Appendix B). In 1967 alone, there were nine reports covering the testing of the Delphi method. The chronology identifies documentation which shows the development, testing, modification and varied applications of the Delphi technique (from 1949 to 1990). A seminal report by RAND (1958) outlined a new epistemological approach (to inexact sciences) using expert judgment.

According to Scheele (1975), nearly all Delphi studies prior to 1975 were action-oriented, with results aimed at affecting the actions or thoughts of decision-makers. The method has been used for a wide array of educational purposes. For instance, some examples are:

- curriculum development
- forecasting for adult education
- institutional planning
- determining educational effectiveness
- forecasting expectations relating to the condition of emotional disturbance/behaviour disorder
- identifying which conditions are most likely to encourage full participation in non-formal education programs
- examination of the Delphi benefits in qualitative higher education research
- forecasting for distance education programs
- assessing goals for elementary school gifted child programs
- identifying futures for effective in-service practices
- identifying competencies; forecasting for vocational training in nursing evaluation

- investigating future directions in education for students with disabilities
- determining teacher effectiveness
- determining likely futures for marketing teacher education

RAND also studied medically oriented systems, problems in urbanization and the economics of population growth in under-developed countries. By the early 1970s, RAND's systems included methods for the investigation of organizational structures and communication systems. Though originally used strictly in forecasting, Delphi's evolution and modification were later directed towards exploring the advantages and disadvantages of available policy options and setting government priorities and social goals. The Delphi method has been well tested and frequently modified. It is still widely used in technology forecasting and in considering likely mid- to long-range futures. Futurists have applied additional methods of scientific analysis to Delphi and have invented approaches aimed at improving the reliability and acceptability of its forecasts. Although the technique now stands as just one of many research methods, Delphi can be of crucial importance in long-range forecasts especially where there is much uncertainty.

Comparative Comments

The Delphi methodology both shares common features and has differences with other future methodologies. Analytical forecasting extrapolates past trends through the present and into the future and is particularly useful in short-term predictions. However trend extrapolation can be less reliable than Delphi when used in mid- to long-term forecasting, especially in those areas where abrupt or rapid change may take place. In areas where there is much uncertainty, a Delphi forecast can be of crucial importance. For this reason, Delphi is often called the method of last resort, not because it is inferior, but because Delphi provides a method that can inform thinking in a situation where reliable evidence is not available. In 1975 Coates was the first to identify Delphi as the method of last resort, particularly useful when dealing with complex problems for which there are no other adequate models. He further states that the Delphi technique seeks "public wisdom." Masini (1993) comments that futures studies techniques including Delphi, are generally best suited to medium- and long-term studies beyond five years in scope.

The Delphi method and survey research have some similarities, but there are essential differences. At the time of Delphi's origin, surveys were already widely used in psychology, sociology and economics. The Delphi method was seen as an advancement in research methodology. According to Gordon (1992), the value of a Delphi study rests in the ideas that it generates, both those that evoke consensus and those that do not. A Delphi methodology collects qualitative data from the conjectures of experts, and later expresses them in quantitative terms. By contrast, survey research uses a representative sampling from a large population to produce statistics about either quantitative or numerical descriptions of the study population as a whole (Fowler, 1988).

There are other differences. Most surveys use sampling and inferential statistics to define, from a random sampling, the characteristics of a representative finite population. The descriptive statistics in sampling surveys are usually based on properties that already exist. In a Delphi investigation these properties do not yet exist; instead, expert opinion about likely future outcomes is gathered. Furthermore, the descriptive function of survey research is heavily dependent upon instrumentation for measurement and observation (Borg & Gall, 1989). By contrast, the Delphi instrument is directed at a polling of expert opinion and is not intended to produce statistically significant results or to predict either characteristics or the likely responses of a larger population. "A Delphi questionnaire is neither a public opinion poll nor a psychological test" (Martino, 1983, p. 33).

Unlike a survey, all members of a Delphi panel have expertise within the field (topic) under investigation. The experts are invited to make forecasts about likely outcomes on issues under review. Analysis of these data together with any panel commentary is communicated as feedback to inform all panelists before they undertake a subsequent questionnaire. The panelists use their experience, training, intuitive judgement and this feedback in making predictions. Panelists' opinions are analysed after each round of questions to determine whether or not a consensus of opinion is developing on any of the items under investigation. As expert opinion is a desired goal, the method of panel selection used in Delphi sets it apart from other survey methodologies.

Three Types of Delphi

According to Linstone and Turoff (1975) there are three types of Delphi: Classical (also known as conventional); Policy; and Real-time. There are also minor modifications to these three types.

The Classical Delphi is essentially a communication process used for achieving a consensus among experts around likely futures. Heuristically, Delphi is an educational technique which informs participants who are exploring a problem area, leading them to greater insights. The classical Delphi method mutes the problems of authority, as the method does not bring the participants together at one location. It also respects panelists' privacy and individuality of opinion. The Delphi technique seeks expert opinion, including conjecture about the probability of defined future events or issues, together with forecasts as to when the experts expect these developments to occur and the importance they place on various items. A classical Delphi study involves several rounds of questionnaires with feedback from the researcher, between iterations, based on an analysis of earlier panel responses. Anonymity is a strict requirement of the Delphi process; this substantially reduces the social-emotional behaviour found when using other methods (Clayton, 1997). Linstone (1975) points to another reason for anonymity, besides respecting an expert's natural wish for privacy. He contends that the participants' heterogeneity must be preserved in order to assure the validity of the results, for example, by avoiding domination by numbers or by strength of a single personality. The Delphi technique is a method for achieving a structured anonymous interaction between carefully selected experts through the use of a series of questionnaires with controlled feedback (Twiss, 1992). In essence, Delphi is a form of controlled debate among experts in a field.

In a classical Delphi panel, members are not known to one another and responses and commentary given are not identified with individuals during feedback. As well, participants are geographically separated. Thus, in a well-conducted Delphi study, panelists reviewing analysis and feedback will not know which specific respondents gave particular answers. Experts work separately to answer the questionnaires. Anonymity encourages openness and candour, reduces inhibitions and permits a change of position in subsequent rounds without embarrassment. Anonymity allows experts to consider all items and commentary offered on merit alone, unbiased by irrelevant criteria such as the 'status' of another participant. Once anonymity of response is assured then fears about "loss of face" in the eyes of other panel members is removed.

A classical Delphi is well suited to this study, as the research question requires a systematic method for obtaining a mid- to long-term forecast in a situation where rapid, unexpected change in technology is likely to occur. This type of Delphi is a straightforward, well-structured method with systematic procedures, which help establish clear communication between a large number of participants. In addition, a consensus of expert opinion is more persuasive than the opinion of an individual working alone, and a consensus of pooled opinion indicates solidarity in judgment and belief. Anderson (1998), in reviewing ways in which the human race approaches knowledge, refers to knowledge based on authority. The Delphi method does not require the physical presence of a participant, but it does require the panelists' active engagement in expressing views in writing or electronically. The Delphi process overcomes some disadvantages of large committee meetings, which can be divisive, slow, unproductive, expensive, and perhaps impractical when international participation is wanted.

With a Policy Delphi, as a rule, decision-making on important issues is left to administrators, policy makers and educational theorists. Collectively these people afford a formidable knowledge base on which to form judgments and make decisions. A Policy Delphi is a forecasting methodology developed specifically to enhance planning for policy-making and departs radically in method from a classical Delphi. Turoff (1970) proposed the framework for a Policy Delphi as a variant of the Classical method, providing an approach that can be used to explore policy-related matters. However, the outcome sought in a "Policy" Delphi is in sharp contrast to that of a classical Delphi study.

The goal of a Policy Delphi is not to obtain a consensus but rather to identify all the differing positions advocated by its panelists, and subsequently to explore the principal pro and con arguments for each of these positions. A Policy Delphi is structured so that all the alternative options for solving a policy issue are brought forward through discussion. According to McNamara (1974), Policy Delphi panel members need to have knowledge of "...the decision-maker's information needs, the critical time dimensions for planning, the available resources, and the organization in which these methods are to be applied" (p. 375). While the modified classical Delphi used in this research does not include a Policy Delphi, the modification will bring into focus differing conjectures, priorities and ideas of panel subgroups, all of which may be in positions to influence policies in higher education at some future date.

Interestingly, Turoff (1975) claims there can be no experts under the conditions of a Policy Delphi, only informed advocates. The Policy Delphi method is described as a tool for the analysis of policy issues, not as a device for decision-making. The issues or options raised in a Policy Delphi are evaluated according to their desirability, feasibility, confidence, importance, and validity. The following are the main objectives of a Policy Delphi according to Turoff (1975):

- To ensure that all possible options have been put on the table for consideration
- To estimate the impact and consequences of any particular option
- To examine and estimate the acceptability of any particular option. (p. 87)

A Policy Delphi emphasizes differences in views, with supporting arguments, rather than a consensus.

Real Time Delphi is a methodology in which the collection and analysis of data are conducted electronically at a particular site. The method is somewhat similar to computer teleconferencing (Linstone & Turoff, 1975). Lanford (1971, 1972) notes that The Real-Time Delphi method occurs during a meeting or conference and is sometimes called a "Delphi Conference." A Real-time Delphi study disseminates questions, gathers and analyses responses and gives respondents immediate feedback through several iterations of the Delphi method. A Real-time Delphi has the advantage that responses are collected over a short period, so the method reduces "the bandwagon effect" in conferencing (Linstone & Turoff, 1975). However, A Real-Time Delphi may be expensive and difficult to organize.

Minor modifications to the classical Delphi methodology have been numerous other than the three identified by Linstone and Turoff (1975). Some examples are self-rating by experts, cross-impact analysis, the use of focus groups and the testing of countermeasures. As well, some Delphi procedures begin by setting a context, or by giving multiple dates and/or an initial list of events. Even a method offering only partial anonymity has been developed. However, according to Martino (1972, 1983), all the variations of the classical Delphi must retain three essential characteristics—(a) anonymity, (b) iteration and (c) controlled feedback. Without these elements, he claims the method is not a Delphi technique. Linstone (1978) similarly claims that there are three key elements: (1) structuring of information flow, (2) feedback to the participants, and (3) anonymity for the participants.

Contemporary modifications of the Delphi may include one or more of the following characteristics:

An extra preliminary round includes a Round 0, which precedes the open-ended initial questionnaire. Its purpose is to help delineate the subject matter of the inquiry (Helmer, 1983).

Mini-Delphi (partial anonymity) has part, but not complete anonymity, due to the participants being gathered in the same room for a debate. As a first step, each panelist independently and secretly writes down his/her estimate of the outcome. Then the debate takes place, followed by another secret, independent vote. Results of this vote are analysed and the median ratings are accepted as the group's consensus (Helmer, 1983). At least in theory anonymity of response is achieved, but where a relatively small number of participants is involved such may not be the case.

Self-rating was applied by Brown and Helmer (1964) (RAND P-2986) to test the affect of self-appraisal (of a participant's expertise) on the outcome of a Delphi consensus. In an almanac study, each respondent was asked to evaluate his/her own degree of expertise on each question. The authors found that self-rating of expert competence is a powerful tool for increasing the reliability of group estimates. Helmer (1967f) introduced the idea of weighted opinions using self-assessment (RAND's P-3558). After self-rating by panelists, the estimates were combined in a weighted-average, with the self-ratings used as the weights. Rowe, Wright, and Bolger (1991) question the self-rating of individuals who believe themselves to be experts; however, these individuals may also be considered by peer groups to be experts. This study does not introduce self-assessment or weighting into the method. Self-evaluation is subjective and depends on such human values as personality and self-worth; the process, therefore, can create an additional level of uncertainty. Self-rating is also cumbersome and might discourage participation among potential participants.

Cross Impact Analysis is aimed at improving the Delphi technique by introducing an additional level of analysis. Gordon and Helmer introduced the cross-impact concept in 1966 to improve analysis of forecast results from sets of intuitive Delphi forecasts. Helmer (1983) explains that the original idea emerged when he and Gordon were commissioned (by Kaiser Aluminum) to design a game that dealt with the construction of a world twenty years into the future. The assumption for the game was that some or all of sixty potential events such as technological breakthroughs, legislative measures, natural occurrences, international treaties, and so on, might alter predictable futures. Each of the variables has an initial set of probabilities, all of which might change as the play of the game progresses. Instead of simply requiring an estimate of the probability of occurrence of certain potential events (considered in isolation from one another), the cross analysis method inquires into the affect each occurrence will have on the probability of occurrence of other events in the set. A cross-impact matrix is developed to establish the causal relationships among all the potential events under consideration.

In the absence of a well-confirmed theory, a cross-impact analysis can be a useful substitute. A cross-impact analysis lists a set of events or trends that may occur along one axis of a matrix and the events or trends that could be affected along the other axis. Where there are difficult multidisciplinary considerations, a cross-impact analysis can be the first step toward the construction of a theory (Helmer, 1983). Cross-impact analysis has achieved the status of a separate method for some writers. Usually the method is used as an extension of a Delphi study (Gordon, 1968, Gordon & Hayward, 1968). A cross-impact analysis is not used in this research. Apart from prohibitive constraints of time and cost, the escalating rate of change in ICT might make cross-impact an unproductive refinement in the analysis of an uncertain future.

The countermeasures variation of Delphi was tested by Gordon and Helmer (1966) and used in considering countermeasures that could be employed to reduce the ill effects of an event (e.g., unemployment because of automation). Countermeasures against undesirable futures can be incorporated into additional rounds of a Delphi study and panelists can be asked to appraise them, thus bringing a designed or engineered perspective on the future into a study. In this modification Gordon and Helmer (1966) also ask panelists to identify responses they find surprising.

Provision of an Initial List of Events starts with a given list of future events generated by some external process, for instance, a literature review. In this procedure much care is required to avoid the introduction of bias into a questionnaire.

Context setting provides the panelists with certain assumptions about external events that give them a common base from which to respond; however, if the assumptions given are incorrect so will be the forecast. In this research, the initial questionnaire does describe a context in which the research question is set, i.e., a comparison with systemic change that has occurred in business because of ICT. The context is used to focus the panelists' initial set of statements in questionnaire one.

Multiple dates are used when panelists are asked to forecast when, within a stated study period, a particular event is likely to occur. In some multiple date applications, panelists are asked to give three dates: a "barely possible" date; a "break-even" date; and a "virtually certain" date. These dates can be quantified as 10 percent, 50 percent, and 90 percent in a probability estimate. In this study, four incremental five year periods are given: "Before 2005"; "2005 to 2009"; "2010 to 2015"; and "Beyond 2015."

Robustness of the Delphi

This Delphi investigation fits into Gordon's (1992) exploratory category, and Hencley & Yates (1974) under the term 'forecasting probe'. They claim that this method can offer "...a system of quantified estimates of change and alternatives; that is, a prediction of the timing, character, and degree of change...the design, evolution, or process of something according to a specified system of reasoning"(pp. 10-11). When a consensus is obtained from a panel with several subgroups, there is added reliability. As well, views that differ from a consensus sometimes provide the most interesting of responses, whereas in some cases a consensus may be obvious. In this research participants were encouraged to offer commentary on all the items under review and panelists did make extensive use of this option. The commentary collected was made available to all panelists through the web, and selected commentary is included in the results section, but each author's anonymity is preserved.

The Delphi method gathers data on expert opinion from which it generates consensual knowledge; it also generates non-consensual knowledge where experts do not agree. With these data Delphi forecasts mid- to long-term futures. The method allows us to move beyond a purely speculative conjecture about the future.

Moore (1987) gives four reasons why the use of a group, rather than an individual, makes good sense in applied social research:

(1) It is a logical approach and provides a better chance of getting close to the truth.

(2) It helps in gaining an understanding of social phenomena by getting the views of others.

(3) The use of a group in researching conclusions makes it reasonable to expect support from the group that has participated in the research.

(4) Complex ill-defined projects can be addressed only by pooled intelligence.

Expert opinion derived from the Delphi method has the advantage that opinions originally held by experts can be refined during the several iterations of the Delphi procedure.

Strengths

A Delphi study has both strengths and weaknesses. Some of the strengths of the methodology are outlined here. A Delphi study helps participants to explore an issue thoroughly and may lead to insights into a target problem. It facilitates communication among a group that otherwise would be too large, too diverse, or too separated geographically to meet in a face-to-face situation. Experts can offer their opinions separately and individually; yet these conjectures can be drawn together as research data and analysed. Delphi responses are dealt with less subjectively than, for instance, a researcher's interpretation of a series of interviews; a Delphi study offers a statistical analysis on areas of consensus and lack of consensus based on pooled expert opinion.

Linstone and Turoff (1975) comment that a Delphi process is actually makes two substitutions: (1) expert judgment for direct knowledge, and (2) a group for an individual. The Delphi method may produce a more authentic expression of opinion than would the interactive communication between people in a traditional meeting. In a seminal case study, Cyphert and Gant (1971) assert that the Delphi technique mutes problems of authority or deference to an assertive personality, differences in persuasiveness, a desire to conform, or a reluctance to admit error.

A consensus of expert opinion derived under the Delphi process has the advantage that experts contribute the items they deem relevant for review based on their experience and training. In giving opinions, experts are not making 'snap judgments' as, through questionnaires and feedback, they are encouraged to give serious thought to the items under consideration. As well, commentary by other experts refines and informs a panelist's opinion. A strength of the Delphi method reported by Twiss (1992) and Gordon (1992) is that the quality of forecasting improves as the procedure draws on the knowledge and experience of people with differing backgrounds; a range of expertise lends credibility to an outcome and can be valuable in gaining acceptance of a forecast.

Delphi research is educative and can be used to organize diverse opinions into cohesive statements. Experts who are fully immersed in their area of expertise deal daily with new developments and think about the future of their fields; thus, they have a distinctive perspective on changes that may take place. Experts may have insights about practices, methods or technologies that may be on the verge of breakthrough and they often know what is being researched. According to Gordon (1992) and many others, experts are more likely than non-experts to be correct about future developments in their field; therefore, a consensus among experts can be important. A Delphi consensus reflects reasoned and self-aware opinions expressed by experts in light of the opinions given by other experts, and thus may provide a sounder basis for long-range decision making than would individual, intuitive judgments (Lanford, 1978). The Delphi method allows a group of individuals to work together when dealing with a complex problem (Linstone & Turoff, 1975). A Delphi study provides an accessible and inexpensive method for measuring and making forecasts in situations where historical objective data are either non-existent or impossible to obtain.

Some Delphi panel members may be more easily persuaded than others towards joining a consensus. However, with a good-sized panel (say 20 or more) any consensus that results is likely to provide a persuasive forecast, though not one capable of proof. All opinions are subjective, but by accessing many opinions it is possible to achieve a certain level of objectivity. As in all research, much depends on the rigour with which the Delphi study is conducted; unfortunately, a Delphi study can be dressed up to confer a sense of methodological rigour that is just not there.

In sum, the strengths of the Delphi Method can be listed as follows:

- Group communication is structured systematically
- Allows the analysis of qualitative data to be analysed quantitatively
- Collects opinions from a large, diverse and geographically distanced group
- Gathers the organization of diverse opinions into a cohesive statement
- Usually less expensive than a face-to-face meeting of a group
- Personality biases that can occur in group meetings are avoided
- Committee activity is eliminated
- Accessible and inexpensive method of measuring past and future events when objective data are difficult, or impossible, to obtain
- Probing expert opinion through a Delphi study constitutes another 'window' through which forecasters can view the future
- The repetitive rounds and reiterations allow the participants to refine and further inform their opinions

- The method supplements data achieved from other sources, e.g., trend analysis of objective data, simulation, or gaming
- Experts often have knowledge about breakthrough technologies
- Expert judgment as a contribution to the forecasting process is more significant than is the precision of the forecast
- The method facilitates problem solving and may be crucial to policy formulation and decision-making
- Predictions provide a sounder basis for long-range decision making than do individual intuitive judgments. The method creates a well-defined process capable of being quantified

Weaknesses

Although a Delphi study has many strengths, there are also some weaknesses. Data assembled about expert opinion are the result of conjecture, no matter how complex or sophisticated the process of collection and analysis may be. In an evaluation of Delphi research and theory, Rowe, Wright, and Bolger (1991) cast doubt on the self-rating of experts. However, expert opinion cannot so easily be discounted as the concept of expert opinion is widely accepted in society as for instance, when one seeks counsels' opinion in legal matters. However, in the final analysis all data collected are subjective. The future will be full of surprises and the Delphi method relies heavily on intuitive opinions.

Sackman (1974) is recognized as a harsh critic of the Delphi method. His contribution comes from a positivist paradigm in which knowledge claims are only meaningful if they are observable and verifiable. The author's criticism of Delphi has been mentioned in much of the Delphi literature since it was first published in 1974. Sackman's epistemological, ontological and methodological premise is logical-deductive and it is from this perspective that he attacks the Delphi methodology. The author suggests the Delphi technique be allied with metaphysics. Sackman asserts the Delphi concept of the expert is scientifically untenable and overstated. Sackman's (1974) Delphi assessment criticizes the Delphi method as lacking the basic standards of empirical science, accusing it of sloppy execution in its "interpretative standards; empirical validity; standards for use of experts; theoretical standards; reliability; and experimental sampling standards" (pp.22-65). In response, Coates (1975) alleges that Sackman misses the point when he attacks Delphi as producing unscientific forecasts.

One of Sackman's (1974) assertions that requires thoughtful consideration is that a Delphi consensus is "specious." There is evidence that some Delphi panelists will recognize the median response in an initial questionnaire as a reference point and move towards that median in subsequent iterations (Weaver, 1971; Goldschmidt, 1975). But does this flaw make a Delphi consensus "specious"? It is true that superficial initial considerations may be abandoned in a move toward consensus, but opinions based on panelists' professional experience may not (Goldschmidt, 1975). However, a move toward conformity is a weakness that cannot be eradicated entirely from the Delphi method.

Sackman's (1974) question: "Does Delphi systematically encourage or discourage either the adversary process or exploratory thinking?" also merits serious consideration. Debate and conflict between adversaries can be productive and spark creativity. Unfortunately, the element of controversy is muted in a Delphi investigation, even though panelists may be fully exposed to the responses of other panelists during feedback. Coates (1975) comments on this weakness in the methodology as a "…failure to push hard enough on the challenge to concepts and underlying assumptions. The author points out that "...more attention should go to into the basis of divergence rather than the basis for convergence…the diversity of judgment" (p. 194). A Delphi study finding may provide a useful topic for a debate that will spark creative thinking through adversarial confrontation. A face-to-face debate between people holding differing opinions can be valuable. On the other hand, to depart from the Delphi principle of anonymity would negate a crucial element of the method.

The Delphi is a commonly used—and often misused—technique. A Delphi can sometimes confer a sense of methodological rigour that is not really there. The Delphi method may promote shallow, narrow, conventional thinking (Stewart, 1987). As well, experts may be unaware of developments in related fields. [Linstone, (1975) cites, for instance, the 1930s forecasts of maximum speeds for aircraft. Experts assumed propeller-driven aircraft would dominate the skies, but the 1930 forecast erred by failing to anticipate the possibility of technological change that would to lead to jet engines.] A Delphi study is best used as input into further thinking and analysis, rather than as a final product for decision-making (Hines, 1995; Coates & Jarratt, 1989). In a review sponsored by 18 large organizations, Coates, Mahaffie and Hines (1994) comment on the state of "futures" forecasting during the period from 1970 to 1993. They state, "...we see forecasting as underdeveloped. It was better developed in the 1960s and has decayed in methodological quality and substantive content" (p. 23). This discouraging conclusion is a strong reminder to return to and uphold the principles of the methodology.

In sum, the weaknesses of the Delphi method can be listed as follows:

- Questions may overly influence responses, resulting in self-fulfilling prophecies
- Experts may not be as expert as they claim or may not be aware of developments in related field.
- There is the possibility of superficial conformity to a majority opinion
- The literature shows no underlying clear theory of a social structure and social change
- It is difficult to assess and utilize panel expertise or to consider the unexpected
- In some instances, Delphi is slow, expensive and too blunt an instrument
- The complexity of the inter-relationships between issues can be neglected since the technique makes projections one at a time.

As in any research, scientific or otherwise, there can be threats to validity and reliability from poorly designed, executed and analysed studies. For example, problems can arise in the identification of experts, but in this research criteria were established

(Appendix E) and a well-experienced and qualified panel recruited (Appendix K). Questionnaires can be biased, ambiguous or overlapping. Instructions and/or data in iterations might be poorly communicated. Data analysis can be flawed and the 'true story' distorted or obscured in the final report. In any case, errors are usually due to the failures of a researcher rather than inherent in the Delphi technique itself (Bell, 1997). There are few safeguards against incompetent work and few guarantees of quality. However, as Philips (1990) sagely comments, "What is crucial to the objectivity of any inquiry—whether it is qualitative or quantitative—is the critical spirit in which it has been carried out" (p. 35).

Reliability

According to Dator (1998) and Hines (1995), assumptions must be clearly stated and discussed up front. A forecaster is then forced to confront individual biases. In a Delphi study, hidden assumptions can damage a perfectly reasonable forecast. For instance, a study should include a clearly stated time horizon for the forecast, even though timing may be an approximation and not guaranteed (Hines, 1995; Bell, 1997). In this investigation the study period is defined as 2005 to 2015. This study also assumes that ICT use will continue to spread throughout North America at an accelerating rate and that much innovation will occur. A further assumption is that the rapid development of ICT will have influences on and consequences for higher education.

Linstone and Turoff (1975) argue that the criteria needed for reliability testing in the scientific method do not apply in a Delphi study. Scientific theories about the future and predictions of human values are, in principle, impossible. In a Delphi study the data are basically an analysis of the conjectures of a panel of expert respondents, and expert opinions are not entirely speculative as they are based on the participants' knowledge and experience in their field of expertise. Their responses are not generalisable to a larger population, but are the opinions of a particular Delphi panel. As far as the research steps taken are concerned, the Delphi method for data collection and analyses can be objective and scientific, from specifying the criteria for "expert," to writing questions, to statistically analysing data and reporting the research results (Bell, 1997a).

A key advantage of the Delphi methodology lies in its use of a qualitative technique to draw on collective expert judgment in a format that allows for a subsequent quantitative analysis of these data. The methodology is systematic and uniform and can be used to collect data from individuals who are widely separated geographically. Pooled data from a large panel provides an objectivity that is not usually possible from a committee, an interview, a brainstorming session, or an individual expert. A weakness in the method is its subjectivity, inescapable in a forecast of a future that may be full of surprises. Although a Delphi investigation can explore a subject matter objectively and thoroughly, it cannot necessarily have the depth of a series of interviews with an individual expert. On the other hand, a Delphi study may have a more important result because of its pooled expert opinion.

This chapter has discussed the history of futurism, and referenced its chronology (Appendix A), as well as a description, a critique and the application of the Delphi. It has also described the robustness of the Delphi with its strengths and weaknesses. Chapter Four discusses the procedures for the research design (see Figures 1 to 4), the web-based instrumentation developed for this research's data collection. Also to be discussed are the procedures for combining the results into dichotomies for the sake of simplification.

Section 2

Chapter Four	*Data Collection and Online Delphi*
Chapter Five	*Institutional Issues*
Chapter Six	*Faculty and Staff Issues*
Chapter Seven	*Educational Issues*

CHAPTER FOUR

DATA COLLECTION AND RESEARCH DESIGN FOR THE ONLINE DELPHI

Introduction

The purpose of the research was to identify consensus within a select international panel of experts on how ICT will change in higher education institutions during the period 2005 to 2015. The academy has not made the same deep systemic changes in response to ICT as has the business community. Although ICT is widely used in academia, this change has not fundamentally altered its centuries-old traditions of teaching, research, and service. Will this happen? There is ferment in universities and colleges over this issue. This Delphi forecast draws on expert opinion from an experienced panel to explore how higher education may change over the next twenty years in response to the influences of ICT. I examine which traditions will remain untouched in terms of teaching, research and service and how the reach of universities and colleges will change in response to the globalising influences of technology. A thorough examination of issues and careful evaluation of the consequences of choices can help in making informed decisions about our educational institutions before change takes place.

There have been other studies specific to a particular technology or practice, but this web-based Delphi study examines broad systemic change that may occur in higher education institutions through the globalising influences of IT. Although a Delphi consensus cannot be claimed as an accurate prediction, it may provide plausible and useful insights into probable change. For the purposes of this research I adopt Bell's (1997a) interpretation of *prediction* as a statement or assertion about how the future might turn out to be. If a statement concerns some future outcome, event, or condition it is a prediction, projection or forecast. The terms "projection," "prediction," and "forecast" are used interchangeably.

Web-based Research Design

Chapter Four describes the Delphi procedures used in the collection of data and the design and development of the web-based Delphi instruments. This includes a discussion of the Delphi modifications taken, data on the panel, minimum participation levels and rates of participation in each of the questionnaire rounds. This chapter also contains the design of the online Delphi instruments involving the four elements to make a forecast, the Delphi rounds are explained and the advantages of the web-based methodology given. The details of the design and development, pilot testing, details of Round 1 online instrument design, development and administration are followed by an analysis of Round 1 results. Details of Round 2 online instrument design, development and administration, Likert-like scales and the categories and values used for Round 2 are followed by the Round 2 results. Specific features of the web-based Round 2 instrument and the controlled feedback informed the panel on the Round 3 web-based instrument.

I prepared four figures for the research design (at the end of this chapter) to illustrate and clarify the online Delphi steps taken in this research. The medium used is ICT, Figures 1 – 4. Figure 1 is the *Organisational Phase,* which shows the procedures for preparing the Round 1 questionnaire, Figure 2 is *Round 1*, and the qualitative steps taken in Round 1, Figure 3 is *Round 2,* which exhibits the quantitative (and qualitative) steps in the second questionnaire, and Figure 4 is *Round 3,* which demonstrates the events of the final phase of data collection.

The Delphi method is well suited to this research and clearly the methodology of choice. The research question requires a method for obtaining mid- to long-term forecasts in a situation where rapid and sometimes unexpected change in technology is likely to occur. The possibility of unexpected change disqualifies a trend extrapolation since that method relies heavily on the projection of historic data into the future and becomes unreliable in longer forecasts. Since Delphi's origination, the method has been repeatedly tested and has gained acceptance as a way to achieve plausible forecasts. As well, the methodology lends itself to complex forecasts. The classical Delphi Method has been modified here to study online the many items under review in considerable depth. The modified classical Delphi methodology is at the centre of this research.

Unlike other methodologies, the Delphi methodology can handle conveniently and instantaneously multivariate data collected from a large panel of experts, separated geographically. Data from three iterations of questionnaires and responses from three subgroups of a panel, disparate in experience, discipline and profession were gathered electronically for this research. The first questionnaire was the qualitative phase, in which the panelists made statements on the major influences of ICT in higher education institutions. In each of two subsequent questionnaires, a range of over eighty items across several categories was explored. Pooled data from the panel provided a level of objectivity that is not usually possible in a committee, an interview, a brainstorming session or from an individual expert. The weaknesses outlined in Chapter 3 are less important than the strengths described. An additional strength, discovered during the data collection was the method's capacity to be modified for use online and at the same time become more robust and gain rather than lose in effectiveness.

The modifications used here seek out diversity of opinion in panel subgroups as well as within the entire Delphi panel. Coates, Mahaffie and Hines (1994) assert that forecasting becomes especially interesting when people of diverse backgrounds and expertise reach a common understanding and are able to consider the direction technology will take in a predetermined context. They comment:

> *Technology forecasts that are very specific about some aspect of a technology, e.g. the number of transistors on a chip, are common. Less common are broad-based looks at a whole field, its related fields, and the social context surrounding them (p. 24).*

This panel drawing on three subgroups of experts in higher education (academicians, administrators, and IT professionals), and probing into future uses of ICT in higher education, falls within Coates et al.'s, (1994) description of a broad-based study. The reliability and reproducibility of a prediction increases when subgroups from differing disciplines reach a common consensus.

Modifications

Several specific modifications of the classical Delphi were implemented in this research. First and foremost the Classical Delphi was modified and adapted for use on the worldwide web. The issues considered were probed deeply by using Likert-like scales investigating the probability, importance and timing of each of over eighty items, under review. The total number of variables was over two hundred and fifty. In addition, separate areas of consensus (or non-consensus) for each of three panel subgroups were investigated. Panel commentary was invited on each item, then reviewed together with panelists' concluding remarks and their final evaluation of the online Delphi.

The web-based instruments used were designed and developed by me specifically for this Delphi research and facilitate instantaneous and simultaneous consideration of the questionnaires by panelists widely separated geographically. The web-based questionnaires and the online methods developed for the administration of these instruments may provide models for use in other multivariate surveys. An existing Delphi instrument that provided features similar to those designed for this research was not found. These instruments responded to a need for convenient use by panelists accommodating their personal working styles. They allowed for idiosyncratic work schedules and interruptions, without loss of data. The online feedback features incorporated in this web-based methodology can be used to illustrate complex data either as text or in a readily understandable graphic format. In this research, participants made extensive use of 'commentary boxes'; these provided a form of written debate that respected anonymity. Panelists welcomed the opportunity to review commentary from other panelists.

These Delphi modifications may, in part, cater to Gordon's (1992) concern about the under productivity of a Delphi when compared with an interview. Martino (1972) explains how, even with the best efforts, panelists may find two distinct parts to what was intended to be a single event [item]. He suggests that arguments for and against each item should be summarized and presented in a compact form, which makes it easy for the panelists to follow the arguments and connect them with a question. To view the three Delphi instruments and other online documentation described in this chapter, see CD-ROM or URL "ubcdelphi.net."

Commentaries from the panel's three subgroups provide a useful insight into the diversity of opinion expressed in response to each item. Other research has used subgroups to investigate difference within a Delphi panel. For instance, Richie and Earnest (1999) conducted an investigation into the field of instructional design to demonstrate some areas of differences between corporate and academic respondents as well as to determine where a consensus was achieved among panelists.

This research was exploratory and descriptive, not normative, and had two purposes. The first was to find where consensus existed within the panel and its subgroups. However, unlike the classical Delphi, there was no intention to use a methodology that would encourage panelists to move either towards or away from a growing consensus. As far as practical, any consensus would emerge from the separately held opinions of the panelists. The second purpose was to identify those areas where there was a lack of consensus or a difference of opinion, either within the panel or between its subgroups. Any such lack of consensus or a difference of opinion may point to interesting areas for further research. For instance, it may be important to discover why academicians, administrators and IT professionals report differing views on a particular item. Gordon (1992) contends that the value of a Delphi study rests in the ideas that it generates, both those that evoke consensus and those that do not. Weatherman and Swenson (1974) also point out that the opinion of divergent thinkers must be respected and may be important. A diversity of view may be found to exist not only in the overall panel, but also between the various subgroups, or even within a subgroup. Exploring a difference in opinion may require in-depth interviews or the application of a Policy Delphi method; however, except in identifying differences, that research does not lie within scope of this investigation.

The percentage of agreement at which a consensus can be claimed is open to argument. In the literature there was no general agreed upon level, but it is usually context specific. Therefore, in this research, to get a sensitive understanding of the extent to which consensus was achieved, several alternative levels at which consensus might be achieved were used. Panelists rated the variables of probability, importance and timing on each item. As well, panelists were asked to select the most probable date for the occurrence of each item, from a given set of five-year segments: "before 2005", "2005 to 2009", "2010 to 2015" or "beyond 2015."

In summary, it is fair to say that the design, development and applications of the online instruments for this research are unique. This web-based Delphi provides a model for future Delphi research and a contribution to knowledge. How effective is it? The web instruments were successful and several panelists comment on how well they liked the methodology (Appendix C). However, other researchers will have to test it as well.

The Panel

Identifying Experts

The Oxford's Paperback Dictionary (2000) defines an expert as a person "having special knowledge or skill in a subject" or "a person having special knowledge or skill." This general definition of expert has common usage and is seen by this researcher as appropriate when setting criteria for the selection of a panel of experts. Gordon (1992) asserts that the key to a successful Delphi study lies in the selection of the participants. Before qualifying and inviting individuals to become members of this Delphi panel, I considered each panelist's experience with higher education and her/his familiarity with ICT. Experts were identified through the literature, via the Internet, and through higher education professional associations. Authors who had published on the subject under study were considered and in some instances invited. I researched higher education institutions, and professional and other associations for candidates.

I sought advice from EDUCAUSE, an independent non-profit organisation affiliated with over 1800 educational institutions and 180 corporations. It is against the association's policy to recommend individual members, but its membership list is accessible on the web and therefore useful. EDUCAUSE maintains a large data bank on educators and on ICT professionals in business and education. Some potential for bias is acknowledged, as the mission of EDUCAUSE is to advance higher education through promoting the intelligent use of information technology. However, as I was given no specific recommendation on a panelist the possibility of bias is much reduced. Web sites of higher education associations in Canada and the USA were also reviewed for potential panelists.

As well, colleagues recommended potential experts; this is called a 'snowball' approach (Anderson, 1998). According to Martino (1983) peer judgment is frequently a good criterion for identifying an expert, although Linstone (1978) comments that this kind of inbreeding can be a weakness. I am, however, satisfied with the experience and qualification of the individuals who were invited to be panelists. Each individual identified as well-qualified was sent an invitational package (Appendix D). Neither financial reward nor personal benefit was offered to participants; however, all panelists who did participate in the research were promised access to the results of my data analysis and a report.

Panel Criteria

All panelists selected meet specific criteria established for this research (see (Appendix E 1 to E 2). Individuals holding positions of power were invited, as these people are likely to instigate change. Scholars, Deans, Professors, Chancellors, and Presidents of universities, colleges and polytechnics were invited, as were CEO's of corporations. When an invitation was sent to a President/Chancellor of a university or college or to the CEO of a major corporation, they were asked to participate personally. If personal involvement was not possible, these principals were asked to delegate the task to the individual in their organisation they considered best qualified to respond to the research question (Appendix F).

Panelists were recruited from several countries. There is nearly a 50 percent Canadian participation in the panel, but the majority of corporate IT professionals are drawn from the US. Some highlights of the panel demographics are outlined later in this chapter and in the appendices (Appendix G). Some of the selected panelists are senior faculty members in universities or colleges and others are educational administrators in academia or government. The IT professionals selected from corporations have experience in managing IT/networking, or in the organisation, operation, design, development, production, or marketing of educational services using ICT. I also selected IT professionals responsible for managing IT services in higher education institutions.

Invitations

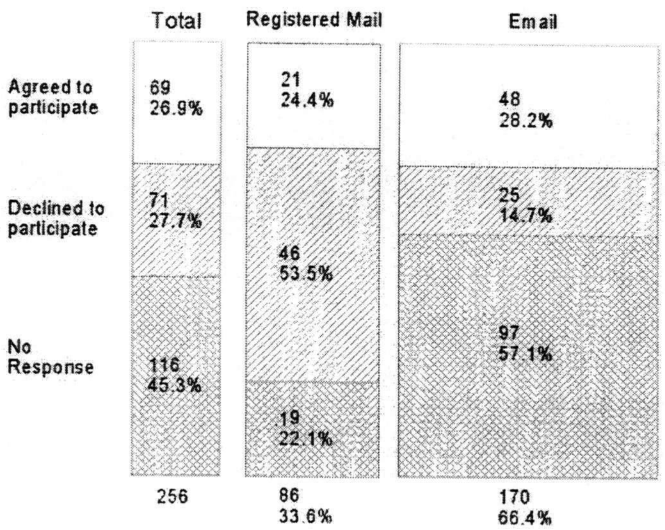
The online search for experts began in the spring of 2000. As a result of that investigation, invitations were sent to 256 people, all of whom had been pre-qualified and meet the research criteria. After dropout, I hoped to achieve a panel of twenty to thirty experts, but the result turned out to be much better than expected: sixty-nine panelists accepted my formal letter of invitation. These individuals submitted a signed Consent Form and a Panel Profile Form outlining their experience. Of those who accepted, all but two actually took part in some aspect of the research. Success in achieving a large panel was, in part, the result of follow-up using email (Appendix H4, H5, H7). Through email communication, panelists became satisfied that their contribution was important and not just part of a routine call for information.

Each invitation was produced individually. The first of the registered mailings was sent August 1, 2000 and email invitations continued until August 29, 2000. Several variations of an Invitational Package, on UBC letterhead, were used, the format dependent on whether it was sent by postal service or email, or to a person recommended by another (Appendix H 1 to H 7). All invitational packages comprised five pages: a two-page invitational letter which gave the panelist a unique password code, a Consent Form, a Panel Profile Form, and a Round 1 Questionnaire as a suggested format. The invitation included my website address and an offer of more information and instructions regarding the Delphi method. An online Panel Profile was established at "http://www.ubcdelphi.net/profile.htm" (see CD ROM or URL ubcdelphi.net and 'click on' Panel Profile).

Each panelist provided a personal profile giving their name, employment title or rank, name of employer, address, email address, country and gender. As well, they indicated the major area of their professional responsibility (as of July 2000). Panelists also gave the aggregate number of years experience they had in each sector investigated in this research (i.e., academic, educational administrator, IT professional). This personal profile form also asked the panelists to identify a preferred method of communication (postal service, fax, or email/web). For the Round 2 and 3 questionnaires all panelists expressed a preference for email and each reconfirmed her/his personal email address.

Separately from the Panel Profile form, the researcher gathered biographical material, where available via the Internet, to supplement and confirm the information provided in Panel Profile forms. An email thank you note was sent at the time the individual completed the Round 1 questionnaire (Appendix H 8). Of the 256 invitations sent, 170 were emailed and 86 were sent by registered mail. Sixty-nine (69) people agreed to participate in this research and, of these, 67 persons replied to Round 1, Figure 5. The potential panelists showed more courtesies when they received registered invitations, nearly 80 percent responded with either acceptance or decline to participate. By contrast, those invitations sent via email nearly 60 percent did not respond at all.

Figure 5. – Number of replies to invitations



Subgroups of the Panel

Using the Panel Profile information, online resumes and, in some cases, personal discussion, I assigned each panelist to a subgroup. All panelists were advised with the Round 2 instructions that "If you disagree with our designation, please let us know and it will be changed " (Appendix I 1). Where necessary a change was agreed; this contributes to validity. The following is a simplified version of the categories used in forming subgroups:

Academicians: Educators (professors/scholars/researchers) involved in higher education.

Educational Administrators: Administrators from higher education institutions/associations or government departments involved in higher education.

IT/Internet Professionals: Leaders from the private/public sector, companies/ corporations/consultancies involved in the development/ diffusion of IT and Internet systems; as well, Vice-Presidents of IT, Chief Information Officers, and key IT administrators in higher education institutions.

Panel Size

Delphi studies of expert opinion have been conducted with as few as ten panelists or with several hundred. At an industry or national level, the number of participants in a Delphi study can be large (Twiss, 1992). For instance, Gordon and Glenn (1994) reported on the Millennium Project, a landmark study which used a modified Delphi methodology for a complex, very large-scale study aimed at forecasting social, scientific and technological developments. The Millennium Project design involved four panels, each from one hundred and fifty to two hundred members. Information collected from this venture was too extensive to be discussed here and generally lies outside the dissertation topic. A small panel (e.g. ten) does not provide the needed breadth and diversity of opinion or experience needed in a broad-based study, but obviously a large study involving hundreds of panelists is beyond my scope. A panel with twenty-five members is often accepted as a desirable target. In this research a sixty-seven-member panel provided a realistic expectation of wide knowledge, experience and creativity.

Minimum Participation Levels

Twenty-five panel members is a desired goal in many Delphi questionnaires. Therefore, in Rounds 2 and 3 at least twenty-five responses were required on any item before the data was accepted for analysis. This requirement was achieved comfortably. Some, though not all, of the sixty-seven panelists contributed to all rounds. There were over fifty respondents in each of the three Delphi rounds; although, some members answered items selectively or did not take part in all rounds. The results of Round 3 were used in the final data analysis, and a variation in panel size between rounds was considered acceptable. The participation level in Round 3 was 13 academicians, 26 administrators and 16 IT Professionals.

The courtesy in correspondence demonstrated by all invitees was impressive. Even people who did not agree to participate politely explained why this was not possible (Appendix J 1 - J5). Usually, the reason for non-participation was a lack of time. Email allowed informal communication with the panelists about deadlines. As well, the use of email increased the participation from experts around the world, allowed easy communication about queries on questionnaire instructions and helped maintain the interest of panelists during a rather long Delphi process.

Demographics of Panel

For details of panel composition see (Appendix G) as mentioned earlier. In completing Round 1, 64 percent of the invitees responded personally, while 36 percent were designates of a President, CEO or Director. Twice as many males as females participated. Canada had the largest participation, 49 percent, followed by 36 percent from the US, and 15 percent from other countries. Twenty-four percent of panelists were academics, 48 percent administrators, and 30 percent IT Professionals. The largest employers were universities and colleges (63 percent); the next largest employers of panelists were National Higher Educational Associations and International Higher Education Organisations/Associations (16 percent). Governments (either Federal, Provincial and/or State) employed 12 percent of the panelists. Nine percent of panelists were employed by IT organisations. Figure 6 shows the Round 1 number of panelists in each subgroup.

Figure 6. Round 1 Number of Panelists in Each Subgroup

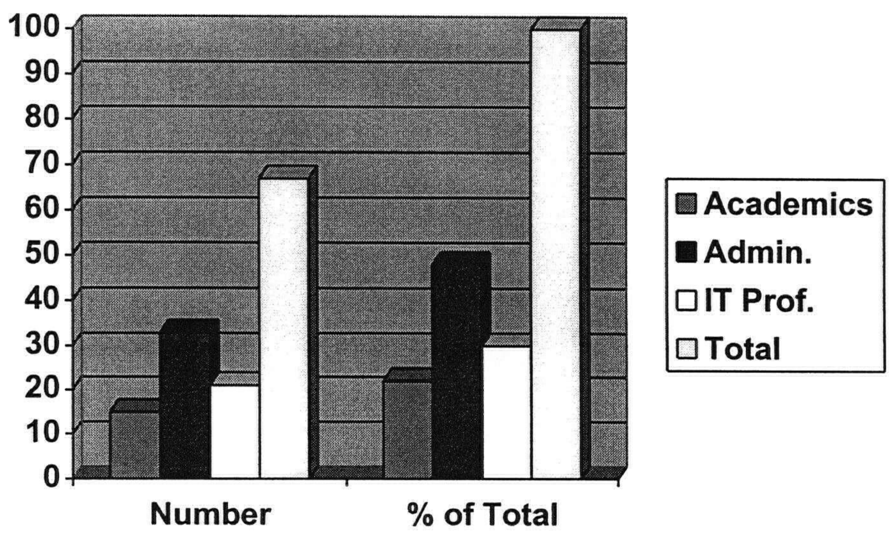
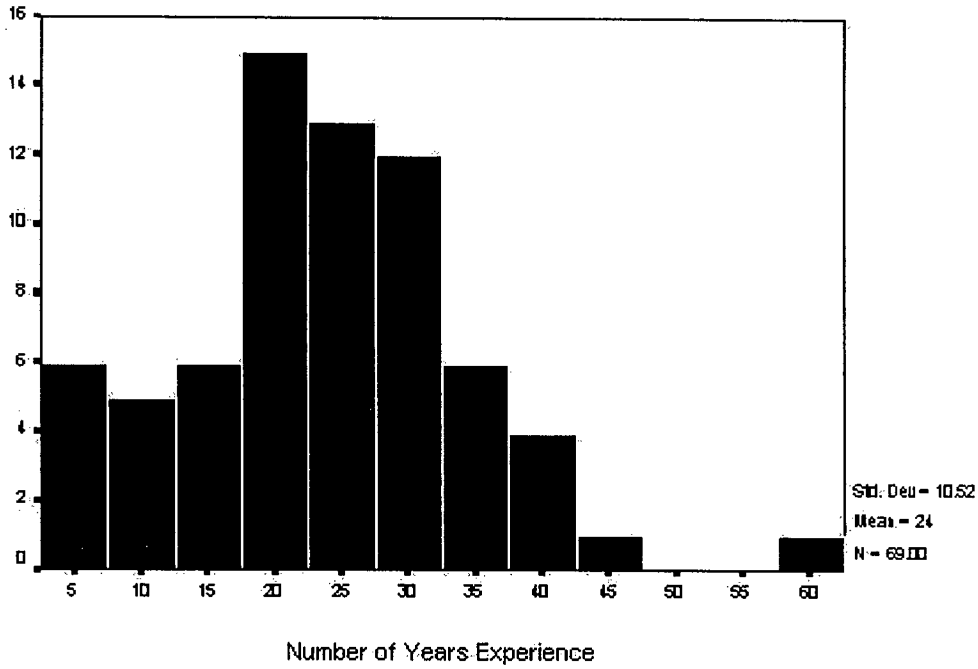


Figure 7 shows the panels 'total number of years of experience of the panelists who participated in Round 1-- academics, administrators or IT professions. Average experience as of August 2000 was 24 years. For example, 15 participants have 20 years experience, 6 panelists have 35 years experience, and 4 panelists have 40 years experience.

Figure 7 - Round 1

Total Years of Experience



Mean = 24, N = 69

X axis = number of years experience

Y axis = number of panelists

Figure 8 shows the Round 3 panel's total number of years experience; for example 13 panelists have over 20 years' experience and 9 have over 30 years' experience. Mean of total years of experience is 23.

Figure 8

Round 3 - Years Total Experience

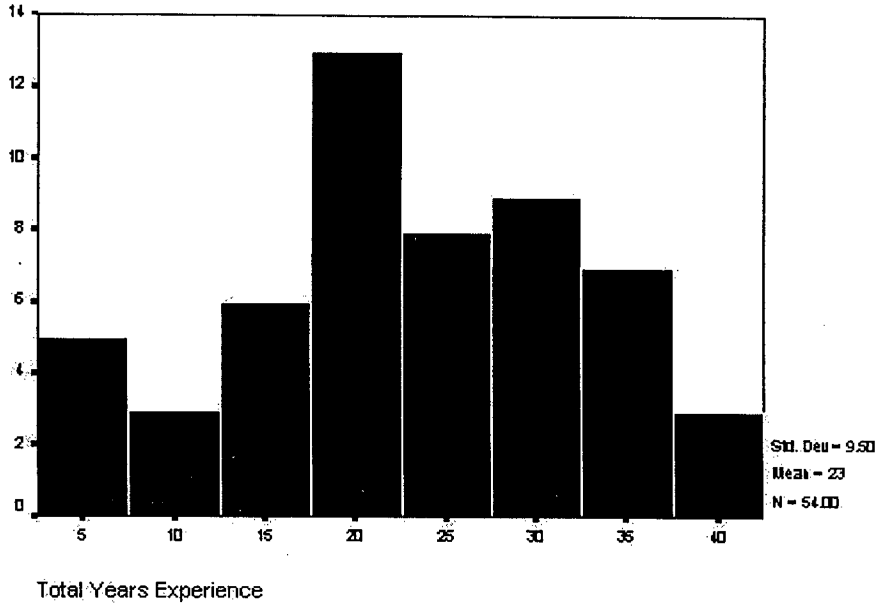
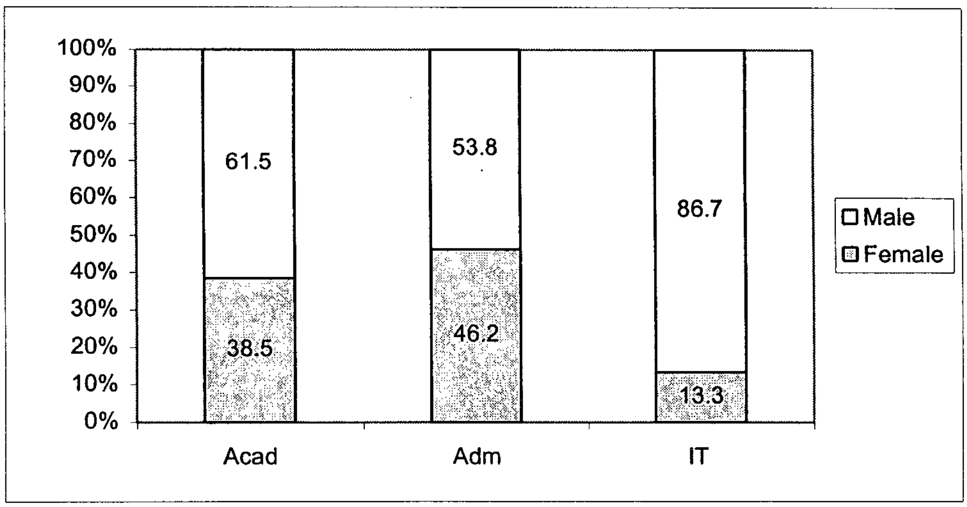


Figure 9.

Percentage female/male in subgroups (Round 2)

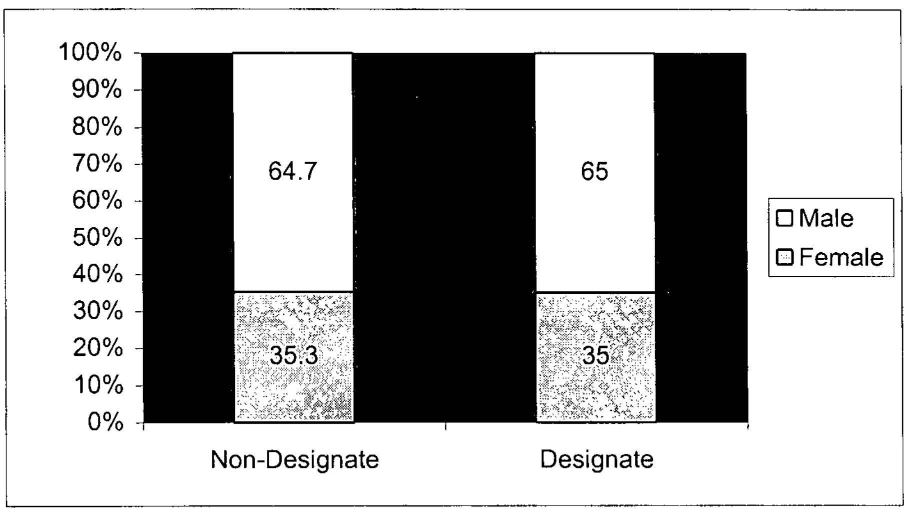


Some Highlights About Participants

The panel members were well qualified. All but three panel members agreed to be named at end of study (Appendix K). The panel includes six university presidents, five vice presidents, one of which is a Vice Chancellor, five leaders in their association or institution, six individuals who are influential in Distance/Extension/Continuing Education divisions within universities, and seventeen who are responsible for either educational teaching and/or learning/training or research technology, curriculum development, or evaluation. Eleven are vice presidents, executive directors, or Chief Information Officers of Information Technology services/systems. Two excel in science, two in business administration/commerce, and three direct educational policy and/or theory.

Ten panelists are designates of their university presidents. Fourteen respondents are professors at a university. Nine are directors at universities. Several of the panelists are known as leading experts on flexible learning, having done pioneering work on networked learning. Two panelists are members of the Advisory Board for the Pew Learning and Technology Program which is an invitational symposia and monograph series about topics concerning learning and technology. Two are members of the US Internet2 committee. A Canadian served on Canada's CANARIE project. As well, three Canadian panelists are members of the E-Learning Steering Committee of the CANARIE E-learning Program; this committee reports to the CANARIE President and CEO, and advises on strategic directions for the E-learning Program, the development of policy and programs. Two panelists are members of the Office of Learning Technologies Committee, Human Resources Development Canada. Two US panelists are entrepreneurs whose companies developed well-known ICT platforms. One participant was a member of the Dearing Committee (1997): The National Committee of Inquiry into Higher Education (UK). At least three panelists are policy makers for their governments. All academics and a majority of administrators have published. Brief biographies were available on the web for most of the participants as they have individual web sites. Figure 10 gives the percentages of female/male in subgroups that were designated by the president, CEO, or director. The ratio of females to males was almost equal whether they were designates or not.

Figure 10. Percentage of panel as designates by gender



Common Links

The majority of the organisations, associations, corporations, and institutions I approached for participation have a membership in EDUCAUSE. In several cases, the invited participants are the chief contacts between their employers and EDUCAUSE. My reason for seeking participation from national associations was that associations usually represent constituent/organisation's interests to governments and help to establish policy and regulate standards within their areas of interest and jurisdiction. The work of some panelists who took part in this research had already been included in my literature review.

Participation in Rounds

There was a good participation of panelists in all rounds, although not all panelists answered all the items in the questionnaires. Some panelists responded on all items, others responded selectively. The N (total number of participants) is given on the website (or CD-ROM) for each item in the data analysis of Round 2 and Round 3 and in each instance was greater than the minimum participation level required.

Table 4.1. Participation Rates in Rounds

Round Number	Number of Panelists
1	67
2	53
3	54

Design of Online Delphi Instruments

Questionnaires

According to Twiss (1992), a forecast will be ambiguous without four essential elements. He asserts the necessary elements for constructing a Delphi questionnaire series are: (1) Qualitative [Round 1] --what to forecast; (2) Quantitative [Rounds 2 and 3]—a numerical expression of performance levels; (3) Time --when will occur; and (4) Probability --to represent the uncertainties. All the above requirements were operationalized in this research. As well, 'importance' was used as an additional criterion since this characteristic will be relevant on setting priorities among the choices/outcomes used in policy making. Examples of Delphi I found in the literature limited the dimension of inquiry to 'importance' or 'agree' versus 'disagree' as the criteria, and the medium used was pencil and paper. In my opinion the traditional Delphi procedures as explained in the literature require rethinking because of expanding use to the WWW and the Internet. Turoff and Hiltz (1995) state that there has yet to be a true merger of Delphi with Computer Mediated Communications. However, technology has now become available to support the high degree of tailoring necessary to structure such communications into a single conferencing system.

As no appropriate online Delphi instrument could be identified in the public domain, this research required the design, development, implementation and execution of an online Delphi process. Moving the traditional paper-based Delphi documentation online was challenging. In and of itself the design and development of these instruments became a major undertaking; little, if any, material on the subject of web-based Delphi instruments was found in the literature. As explained in Chapter 1, the web-based instruments developed for this research is an advance on the Delphi Methodology. Once designed and developed, these new instruments allow for instantaneous collection of data on the web, while preserving anonymity and allowing private and separate responses from each panelist. Respondents were given feedback (on the web) in statistical and graphic format, with relevant commentary from other panelists. An in-depth exploration of all the items studied was achieved. As ICT are rapidly becoming the medium of choice in scholastic research, moving the Delphi instruments online from a paper format is a natural progression for the Delphi methodology.

Delphi Rounds

The traditional Delphi method usually involves sending three rounds of questionnaires to selected experts through the postal service. However, in this research all three rounds were web-based and took place between August 12, 2000 to June 11, 2001. Specific dates for each round follow. The Delphi sequences in this study are illustrated in Figures 1 – 4:

Qualitative Phase of Research – Round 1

- Identified the research question
- Prepared a draft questionnaire, hard copy and online version
- Selected experts

- Pilot tested draft questionnaire and incorporated modifications into the open-ended questionnaire (Appendix L)

- An Invitational Package was sent by email or registered postal service. An open-ended questionnaire was included with the invitation (Appendix H1). Instructions gave a specific web site for more information about this survey and the option to complete the questionnaire online (Round 1) [1] or (CD-ROM)

- Data Collection was from August 12, 2000 to October 2, 2000.

- Analysis of Round 1 results

- Issues for review suggested by panelists were deconstructed into like items and used to construct the questionnaires

Quantitative Phase of Research – Rounds 2 and 3

- Drafted Round 2 Questionnaire

- Pilot tested Round 2 Questionnaire (for testers see Appendix L). See web-based questionnaire[2] online or CD-ROM. Printed version not included in appendix due to size since it would exceed 58 pages dependent on font size.

- Established Mailing List (I am administrator)

- Announced the online Round 2 quantitative questionnaire to respondents by broadcast email. Followed up with personal emails (reminding them of password code) and giving a web site location for the Round 2 Questionnaire [2]

- Data Collection was from January 11, 2001 to February 15, 2001.

- Analysed Round 2 results and provided appropriate feedback to panelists

- Constructed Round 3 questionnaire (modified from Round 2) incorporating panelists' suggestions where necessary to overcome ambiguities or double-barreled questions

- Pilot tested Round 3 questionnaire (Appendix L). See web-based questionnaire [3] online or CD-ROM.

- Announced the third and last round of online quantitative questionnaire to respondents by broadcast email and followed up with personal emails (reminding as to password code). Along with the questionnaire, I provided controlled feedback (commentary and statistics from Round 2). Gave panelists a web site location for the Round 3 Questionnaire [3]

- Data collection was from May 2, 2001 to June 11, 2001

- Analysed Round 3 results, (relevant commentary from Round 3 and statistics from Round 3) and provided these data online to panelists [4]

Advantages of the Web-based Methodology

Implementation of the web-based Delphi instruments was onerous, time-consuming, and costly. However, now that they have been developed, the instruments combine the advantages of a Classical Delphi with those of a Real Time Delphi. This web-based method does not, suffer the disadvantages of the partial loss of anonymity, or the loss in privacy of response that is associated with a Real Time Delphi. ICT allow the use of the web so that panelists may respond to complex questionnaires electronically and asynchronously, without the inconvenience and waste of time involved in a paper or fax-based Delphi. The web-based methodology facilitates the involvement of a large panel of experts located worldwide and allows their responses to be coordinated and conducted electronically during a strictly limited period.

The web-based instrumentation allowed panelists to respond twenty-four hours a day from any time zone, over several sessions, and to fit their response time with idiosyncratic work schedules. As well, the system allowed for extensive commentary about the items under review. This later feature was much used by panelists and provided a rich source of data. As well, the panelists advised that the large resource of web-based commentary was useful in informing their responses. Data were received into a database electronically and did not need manual transfer for analyses, thereby reducing the chance of clerical error. Feedback to panelists was provided electronically with coloured graphics that were easy to understand. The web-based Delphi designed for this research is a natural broadening of the Delphi methodology allowing its use on the Internet. If these questionnaires and responses had been paper-based, the printed version would have been cumbersome with more than one hundred pages. Undoubtedly the participation rate would have dropped significantly.

Design and development of the web-based Questionnaires

As mentioned earlier, I did not locate a model, other than my interpretation of the Delphi Methodology literature. The Delphi Rounds 1, 2 and 3 questionnaires were established online with the assistance of two web designers. Round 1 was designed with the assistance of Andrew Seary "http://www.sfu.ca/~richards/", a graduate student at the School of Communication, Simon Fraser University, and Rounds 2 and 3 were administered by Alexei White, a third year undergraduate student at the Faculty of Commerce, The University of British Columbia. In response to my specifications, these two web designers wrote the computer code and handled the administration of the web-based instruments.

Pilot Testing of the Three Instruments

A group of qualified people was recruited to review and pilot test the three instruments. The pilot testers examined the questionnaires for clarity, to eliminate bias and to avoid ambiguity in the three Delphi Questionnaires (Appendix L). After pilot testing, the Round 2 questionnaire was subjected to a further pilot test, by two volunteer members of the Delphi panel. This additional test was done before presenting the questionnaire to all members for their response. As part of the panelists' response to the Round 2 questionnaire, respondents were invited to (and did) suggest further modifications to clarify any item under review. Modifications suggested by panelists were used in the construction of the Round 3 questionnaire. After these modifications, the Round 3 questionnaire was pilot tested by Applied Research and Evaluation Services (ARES) at the University of British Columbia before Round 3 was made available (on the web) for response by the Delphi panel. Only data from the Round 3 questionnaire were used in the final analysis of this research. Features of the design of the web-based Delphi instruments are discussed in this chapter.

Details of Round 1 Online Instrument Design, Development and Administration

Round 1 questionnaire was included with the invitational package. This was the qualitative phase of the research. In Round 1, panelists were invited to make one or more statements in response to an open-ended questionnaire. They made statements about issues (items) where they expected ICT to be influential in higher education institutions during 2005 to 2015. Panelists had options to respond by fax, by email, or via the web-based questionnaire. Web design procedures began in June 2000, with Seary as webmaster. He used the software application Common Gateway Interface (CGI) 'mail to' program that was written at MIT as a method of processing HTML. Web-based replies were automatically e-mailed to me via the CGI. To protect anonymity, each response was stated to be from "nobody," but was identifiable by a password that had been assigned and identified by me only. Simon Fraser University was the host computer. When a panelist wanted a copy of his/her response, a separate email was sent to me; I then sent a copy by email. Twenty-eight (28) such requests were made and these copies were sent between August 2, 2000, and October 2, 2000. To ensure anonymity, a panelist's email address was not built into the computer program. Submissions were accepted up to Friday, October 2, 2000.

Analysis of Round 1 Results

Responses from the sixty-seven panel members who participated in Round 1 generated over 420 items panelists saw as relevant for review. It is considered especially important that panelists propose the issues in order to reduce bias in a mid- to long-term forecast such as this. Most panelists had given much time and thought in preparing responses. Some responses involved long, complex paragraphs, which had to be deconstructed, as some narratives included several separate items. From all these data there were over 800 possible factors for review. Obviously, the number of items had to be reduced. Therefore, I abandoned statements that were not relevant to the research question. Other statements that covered similar ideas were clustered. Where clusters of ideas were mentioned more than once, they were accepted for the Round 2 questionnaire. All these data were edited and constructed into an 81item Round 2 Questionnaire. Panelists were kept informed on the analysis of Round 1 (Appendix M1 to M 3).

Details of the design of the Round 2 Delphi Online Instrument

The Round 2 Questionnaire was made available online. In it, the panelists were asked to make forecasts as to the probability, importance, and timing of occurrence for each item. The analysis of these data used a five-point Likert-like scale.

Likert-like Scales

Tittle and Hill (1967) have compared the effectiveness of several scales and found Likert-like type scales superior. However, in this research two of the three areas investigated, probability and timing, did not in the strictest sense fall within the requirement of a Likert Scale as defined by Wiersma (1986) -- a scale with a number of points, usually five, in which the spaces between the points are assumed to be equal and for which a set of related responses, one for each point, is given. The authors explain that individuals can respond by checking a point or circling a letter representing a point on the scale (paper-based). These points are assigned numerical values, 1 to 5 or 0 to 4, which are then totaled over the items to give each respondent an attitude score. Usually, the items are scored so that the greater the score, the more positive the attitude.

In this research, a response of 'no opinion' was made available in case panelists wished to express an option such as 'don't know,' or if they felt unqualified or too uncertain to offer a conjecture on an item, or if they did not understand or were dissatisfied with their interpretation of the intended meaning of an item. Therefore 'no opinion' scores could be counted separately from missing data. A 'no opinion' option was in my view important since a no opinion response is more likely to increase validity than is a guess or a simple move towards conformity within a growing consensus.

Scales for Round 2

Panelists were asked to rate the probability, importance and timing for each of the 81 items. Respondents had a 'click on' button for the text, Figure 11. To identify their selection, a five-point Likert-type scale was written into the computer language code. On the respondents' computer monitor, it appears something like this, but in larger font size, colour highlights, and 'click on' buttons.

Figure 11. Round 2 Rating Categories

Probability:	Highly Improbable	Improbable	No opinion	Probable	Highly probable
Importance:	Not at all important	of little Importance	No opinion	Important	Highly important
Timing:	Before 2005	2005 – 2009	2010 – 2015	Beyond 2015	No opinion

On probability and importance, "No opinion" had a value of 3, and was set centrally in an ascending scale with highly improbable (not at all important) given the lowest value of 1, and highly probable (highly important) the value of 5. On timing, the 'no opinion' option had a value of 5. The entire numeric scale as used for Round 2 is shown below, Figure 12.

Figure 12. Round 2 Rating Values

Probability	Importance	Timing
5 = Highly Probable	5 = Highly Important	5 = No Opinion
4 = Probable	4 = Important	4 = Beyond 2015
3 = No Opinion	3 = No Opinion	3 = 2010 - 2015
2 = Improbable	2 = Of little importance	2 = 2005 - 2009
1 = Highly Improbable	1 = Not at all Important	1 = Before 2005

Analysis of Round 2 Results Online

After experience with the web-based Round 1, I decided the CGI system was too cumbersome and not suitable for use in Round 2. A major weakness of the web-based Round 1 format was that it requires completion in one sitting. As well, the CGI design format did not lend itself to collecting the detailed quantitative response required in subsequent rounds. Since the Rounds 2 and 3 online questionnaires were unlikely to be completed in one sitting, an entirely fresh approach to online data collection was needed. For convenience, panelists needed access on multiple occasions, with a system that would allow responses to be made over several sittings, or possibly several days. Of crucial importance, a participant's contribution had to be saved, automatically, between sessions (i.e., not lost when signing off-line). To allow this level of convenience, a database was incorporated into the new instrumentation.

Rounds 2 and 3 were designed with the assistance of White, who was contracted to write scripting codes for the new questionnaires and to administer the web-based instruments; he provided a web designer agreement (Appendix N). I set the design guidelines and specifications, while White developed the scripting codes and applications. The online instruments developed were based on operationalizing Twiss' (1992) four elements required for a forecast, but adding the criterion of importance.

The design of the Round 2 and Round 3 instruments was more complex and time consuming than I had at first anticipated. Codes had to be written and tested by the webmaster (who at that time was faced with a full schedule of classes and also worked for IT Services at UBC). A number of innovations were introduced into the web-based instruments to encourage participation; these were designed to make response easy, efficient, accurate and convenient. The software was designed to keep track of the progress made by each panelist; respondents were also provided with text boxes for commentary on each item. 'Click on' buttons were set out in a clear, understandable electronic format that allowed subsequent statistical analysis of data. Details on the innovative features of the web instruments are provided later in this chapter; however, the Rounds 2 and 3 instruments can be viewed at URL: "http://www.ubcdelph.net" or the accompanying CD-ROM.

The Rounds 2 and 3 instruments were written in Allaire Coldfusion with a Microsoft Access Database. The webmaster, White, arranged for a Coldfusion 4.5 account and an ODBC DSN for the web host application with an estimated 50 MB of traffic per month. Unfortunately, the questionnaire design required too much computer memory and the programming language was not compatible with programs available at the University of British Columbia IT Services Computer hosting services. In consequence, it became necessary to locate an outside host and to purchase new domain names; ubcdelphi.net and ubcdelphi.ca were secured. The host relocation involved additional testing and re-testing, sometimes with challenging results.

Because of the unavoidable delay caused by web design and implementation, panelists were given several progress reports on the web-based instrument development (Appendix O1 – O 5). Notice of availability of the online Round 2 Delphi quantitative phase and information about feedback from the analysis of Round 1 responses were sent via email to the panelists from January 11, 2001, through January 17, 2001. Feedback on the Round 1 Questionnaire and the Round 2 instructions were made available to the panelists at "http://www.ubcdelphi.net/notice.cfm."

The design development process for web-based Delphi instruments required several months of work. Over 1000 emails were exchanged between the two webmasters and me to create, develop, implement, correct, and update the online questionnaires used for this study. However, once completed, the instruments were used successfully in this research and were much appreciated by panelists. Two academics commented, "This was the best use of Delphi that I have seen," and "The process was excellent. The data were presented in a way that assisted my reflection rather than distracting me." Some panelists gave evaluations at the end of the web-based Delphi process, which were useful (see

Appendix C, as mentioned earlier). Other web-based Delphi research could be based on these models, although they could be improved by reducing the number of items to be rated.

Specific Features of the Round 2 Online Instrument

Announcement of the beginning of Round 2 (Appendix P 1 to P 2) included instructions and a reminder of individual passwords. A response to Round 2, a password sign-in was required. A 'click on' button allowed panelists to get a printed copy of the Round 2 Questionnaire (approximately 58 printed pages). The questionnaire included 81 items, constructed from statements given by the participants in Round 1. These items were grouped under sections and themes. Some specific features of the questionnaire include:

- The three sets of scales' response nodes (probability, importance and timing) on each item are distributed evenly across the web page, allowing a variety of fonts to be chosen from a respondent's browser.

- A consistent format is used on all items, allowing participants to move accurately and quickly through the survey.

- The design avoids the need for several different items to be displayed on a screen at one time.

- The text for probability, importance and timing is highlighted in blue. This background colour disappears when the three-part response to an item has been answered.

- Each item for response can be downloaded, separately, from the participant's web server so her/his responses can be checked and reviewed.

- The format automatically advances to the next item after a panelist has completed a set of ratings.

- An online Index Page is provided to assist in navigation through the Delphi questionnaire.

- A 'click here' button is provided to return to the last item reviewed.
- Navigational aides allowing participants to control the order of the items are provided. These aides also allow a panelist to stop and return to the survey at a later time or date.

- A coloured progress meter provides feedback on the respondent's progress through the survey.

- A navigational "pull-down" window allows panelists to choose a specific item for review.

- A commentary box is provided with each item, allowing respondents to make any qualification, elaboration, or statement of concerns they have about the item. As well, the box allows them to give a rationale supporting a response.

- There is a help 'click on' button (labeled "instructions") on each page of the survey.

- There is a 'click on' button to indicate whether a panelist wants a copy of her/his response.

An administrative program was installed with a built-in set of statistical tools. One tool was a progress bar on each of the participants. If a panelist had not responded, or had stopped before completing all items, I sent a personal email to inquire if she/he was experiencing difficulties with the questionnaire program (Appendix Q 1 to Q 3). Non-respondents were sent two personal emails at different times. While the online data collection instruments were under development, continual refinements of the program were being made, and the webmaster was asked to provide additional features which appeared useful. Panelists were notified of such web developments via email. Due to development work, the Round 2 deadline was extended to February 15, 2001.

Round 2 Feedback Online

The purpose of the Round 2 feedback was to inform panel members of any emerging consensus and commentary about rationales and to make panelists aware of the ideas held by others. The data collected from Round 2 were analyzed and displayed as separate histograms for each item, by subgroup. The numbers of panel members who had responded to an item, as well as the mean (shown graphically as a bar), mode, standard deviation (and the number of respondents in each subgroup) were also shown on the histograms. In the commentary section outliers were indicated by an asterisk (*). A colour code was used (green for academics, red for administrators and yellow for IT/Internet Professionals). Response distribution on histograms was presented as horizontal bars to make the labeling of text easy to read. These graphics allowed panel members to observe the dispersion of opinions and the strength of any emerging consensus on any item. Quartiles on each response node were shown for each subgroup. A panelist could also scroll down the screen to view Round 2 commentary.

This Round 2 feedback was provided online when presenting the Round 3 instrument to ensure that each respondent to Round 3 was fully informed before making a response. The choice to view the commentary, using a 'click on' button was an option, not mandatory. The data on means, standard deviations and interquartile ranges were skewed in this feedback because of the values of the no opinion responses (value = 3) were included in the calculations. This data analysis problem is explained later and was corrected for Round 3. Progress reports on the development of the Round 3 web-based questionnaire were sent regularly, via email, so panelists were kept well aware that the Delphi research was active (Appendix S1 to S 4).

Round 3 Online Instrument

Access to the Round 3 questionnaire is password protected, before any Round 3 data or commentary were accepted a password had to be approved by the database administration system. However, Round 2 panel commentary could be accessed and printed without a password by clicking a 'link' button. This feature allows participants a 'hard copy'; some found this feature useful, as it allowed reflection before responding to Round 3. The disadvantage was a printed version would be approximately 50 pages, depending on the font size.

The Round 3 Instrument design uses a split screen to display items for response, together with related statistical feedback from Round 2. The split screen has two equal parts: the top half displays the Round 3 questionnaire and information on the item to be rated, while the bottom half provided statistical feedback on responses to the corresponding item in Round 2. A separate 'click on' button gives access to Round 2 panel commentary.

Some Features of the Round 3 Online Instrument

- A 'click-on' button allows the printing of an edited version of Round 2 commentary (approximately 50 pages). An unedited version would have been too lengthy and much too cumbersome.

- The top half of the screen displays the text for response one item at a time, together with response nodes for the three variables to be rated ---probability, importance and timing.

- The Round 3 items are highlighted in yellow. The corresponding item number for Round 2 is shown in parenthesis. The highlighting disappears when the variable of the item had been rated.

- The bottom half of the screen presents coloured graphics showing the distribution of Round 2 subgroup and panel responses. A 'click here' button provided additional feedback and also a review of panel commentary on the item.

- A consistent format is used so the panelists could move accurately through the survey.

- Thirty-six items in Round 3 had to be modified to reflect clarifications suggested by panelists (where this was done a modification is noted). Four additional items were added; more description of these will follow.

- A progress bar provides visual feedback to the respondent, showing her/his progress toward completion.

- There were several 'click on' buttons allowing panelists to select "Panel Comments," "Statistical Analysis" (subgroup responses), "Instructions" (how to proceed), and "Aggregated Responses" (entire panel responses). These separate links allows panelists to be selective in the review process.

- A panelist could refer to feedback on all questions, or selectively as s/he chose.

- A 'click on' button allows a copy of an individual's responses to be sent to her/him. The program advises by email that a particular password holder wants a copy of his/her responses. To ensure anonymity, I sent requested copies individually, so a password would not be linked to an email address in the scripting code.

- Towards the end of a questionnaire, a message to the panelist indicates how many items had been missed during rating. Then a 'pull-down' window allowed the panelist to select a specific item for review.

- A final commentary box is provided for additional statements regarding any major influences of IT and the Internet on higher education institutions that had not been covered by the questionnaire (Appendix R). Most of these comments are rich and are included in the findings in Chapters 5, 6, and 7.

As well, a box is provided for the evaluation of the web-based questionnaires, the Delphi process, and the feedback at the end of the questionnaire (Appendix C).

Items Modified for Round 3

Only the Round 3 responses were used in the data analysis for this Delphi study. It is on these data and the literature review that findings, discussion, conclusions and recommendations are based. Moreover, no analysis or comparison was made of trends toward consensus between Round 2 and Round 3. This was for two reasons: first, any movement towards consensus between rounds was not relevant to answering the research question and, second, some Round 2 items were modified to comply with panel suggestions and to increase clarity when constructing the Round 3 Questionnaire.

The Round 2 questionnaire had 81 items to be rated, but Round 3 had 85 items. Items 9, 28, 77, and 81 were split into two for the Round 3 instrument in order to avoid ambiguities or double-barreled interpretations. As well, a total of 38 questions were modified to improve clarity as a result of panelists' commentary. The numbering split the four items into 9(a) and 9(b), 28(a) and 28(b), and so on. Martino (1972) claims that feedback between rounds is advantageous, ". . . not only for the exchange of information among the panelists, but in helping the director [researcher] to improve the questions" (p.

55). Martino asserts, "The clarification [of an item] can sometimes be as valuable as the forecast itself" (p. 55). He explains that even with the best of efforts panelists may find two distinct parts to what was intended to be a single event (item). Participants were notified of these changes when the Round 3 was announced (Appendix T1 to T 3).

Commentary

To protect the anonymity of panelists, a new numbering code (cross-referenced to specific passwords) and the subgroup abbreviation -- Academics (Acad), Administrators (Adm) and IT Professionals (IT) – was combined with a notation as to the participant's country of employment. Countries other than Canada (Cda) and USA (US) were described as (Other) to protect anonymity as some countries had two or fewer participants. At the end of Round 3, the panel had the option to make additional comments about the major influences of ICT in higher education in the study period, (Appendix R) as mentioned earlier.

In sum, the methodology worked well and was favourably received by panelists. But there were complaints about the large number of items raised and the consequent time required to complete the questionnaire. A reduction through further clustering in the number of items presented for review might have avoided this research disadvantage. On request from one panelist, permission was granted for the description and duplication of several pages (screen shots) of the web-based Delphi instruments; these will be included in his upcoming book.

Round 3 Results Online

Round 3 data were also collected and presented as histograms demonstrating ratings for each item. The format was similar to that used in Round 2. But in Round 3, a 'No Opinion' response was given a zero value (not a value of 3) and was not included in the arithmetical calculation of the Mean and Standard Deviation (see following rationale section). The number of 'no opinions' and no responses on each item is reported online. In Round 3, an additional histogram, using a 'click on' button, was provided showing data collection results for the entire panel. Results are available on the website[4] and the CD-ROM.

Rationale on "No opinion and No Data"

Since a "No opinion" rating value skewed the Round 2 results for mean and standard deviation, I decided to eliminate this skew from Round 3. The skew arose because I had combined "no opinion" data (which has a nominal value) centrally within an ordinal scale. Central or not, wherever a "no opinion" response is situated within a scale, it does not belong. Whether placed at the beginning, the end, the middle, or between other values in the series, a "no opinion" rating (on probability and importance) is out of place. As well, because there is no rational central point between improbable and probable, Wiersman's (1986) requirement for equal spacing between points on a Likert scale cannot be met. An analogy is that there is not a "slightly pregnant" value between "not pregnant" and "pregnant".

To address these concerns for Round 3, I assigned a zero value to "No opinion" instead of the value of 3 and I corrected the values on the ordinal scale. The change to zero was achieved in the Statistical Program for Social Sciences (SPSS) by assigning a value of –9999 for 'No opinions' and 999 for missing data. Missing data and "no opinions" were then identified simply by the numbers of respondents to an item who failed to rate or who responded with a 'no opinion.' As well, for Round 3, I did not include a fifth ordinal.

Ordinal Scales Used in Round 3 Online

The following scales were used on the website in analysing Round 3 responses:

Figure 13. Round 3 - Ordinal Scales

Probability	Importance	Timing
4 = Highly Probable	4 = Highly Important	4 = Beyond 2015
3 = Probable	3 = Important	3 = 2010 - 2015
0 = No Opinion	0 = No Opinion	0 = No Opinion
2 = Improbable	2 = Of little importance	2 = 2005 - 2009
1 = Highly Improbable	1 = Not at all important	1 = Before 2005

"No opinion" data and missing data (no response) were not assigned arithmetic values; rather, the number of panelists was recorded in each of these categories.

4th Round

I decided not to conduct a fourth round. In a classical Delphi investigation a fourth round has been found not to change materially a consensus derived from earlier rounds. Cyphert and Gant's (1971) case study concluded that 3 rounds are usually sufficient to form a consensus. According to that study, "virtually all (99 percent) of respondents' changes in opinion occurred by the third Questionnaire III; therefore, one might seriously question the need for going beyond the third round"(p. 109). By contrast, a Policy Delphi investigation may require four to five rounds before it is complete (Turoff, 1970).

Reporting

Panelists will be provided with a final report on the results of this study as a gesture of thanks for participation.

Reporting on Round 3 Results For Dissertation

Analysis Round 3 data were examined to identify areas of consensus (or non-consensus) and differences in responses between the subgroups and the entire panel. Themes emerged after an examination of the Round 3 ratings and the panelists' commentary. The themes were addressed using tables and a graphic analysis of data. Data collected indicated areas of consensus as well as some interesting differences in opinion on various items under review. In some cases, panel commentary offered reasons for disagreements. From all these data, findings emerged for consideration.

Levels of Consensus

When does a consensus occur and how is it determined? A Canadian Referendum defined a consensus as 50 percent plus one. But does a single level of agreement indicate a consensus best? Some Delphi literature refers to 10 percent, 50 percent, or 90 percent levels, but the literature does not provide a consistent definition of consensus. One author asserts that the degree of disagreement within a panel is represented by means of the low and high probability of dates (Martino, 1972). For this investigation, I offer several levels at which consensus is achieved, thus allowing a reader to gain a sensitive understanding of the strength of the consensus on an item. The percentage of consensus ratings were calculated by comparing the number of panelists rating an item as probable, important, and so forth, with the number of panelists responding to that item. The level of consensus was determined by using these various percentages (Table 4.2). In some instances, strengths of consensus may differ from the median rating on an item and will be reported. No opinion ratings and no data (lack of response) were not included in determining these percentages. The total number of respondents participating (N) was given for each item. Whenever no consensus was achieved (i.e. below 70 percent), then percentages for and against were provided in parentheses (with low probability, low importance and timing sooner listed first).

Table 4.2. – Strength of Consensus

Level of Consensus	Maximum Percentage	Minimum Percentage
Strong Consensus	100	90
Consensus	89	80
Minimum Consensus	79	70
No Consensus	69	N/A

There was uncertainty about the timing of ICT influence and it was too difficult for panelists to agree on precise forecasts because of the rate at which technological change is taking place. However, when a broader definition was used -- "sooner" (before 2010) or "later" (after 2010) -- then an interesting insight into panelists' expectations about ICT was achieved.

Combining Results into Dichotomies

For the dissertation, written results were combined into dichotomies, in order to simplify an understanding of the broad influences implied by the data presented in the following chapters. The tables report data analyses of "*highly probable*" and "*probable*" responses for each item collapsed to a single value named "high probability." Also collapsed to a single value named "low probability" were the data for "*highly improbable*" and "*improbable*" responses. Responses on importance were also collapsed: "*highly important*" and "*important*" collapsed to a single value named "high importance." Also collapsed were the data for "*of little importance*" and "*not at all important*" named "low importance." The analysis of timing based on five-year increments were also collapsed as follows. Responses "*Before 2005*" and "*2005 to 2009*" were renamed as "Sooner" and "*2010 – 2015*" and "*Beyond 2015*" were renamed as "Later" (Table 4.3). A more complex analysis may be useful (and is available) for further research using these data. This can be achieved by accessing detailed data provided on each item. To observe the detailed panel (and subgroup) rating distributions as well as other descriptive statistics for each item at "http://www.ubcdelphi.net" or CD-ROM.

Table 4.3 – Dichotomies

Collapsed		Rating	±	Rating
High Probability	=	Highly Probable	+	Probable
Low Probability	=	Highly Improbable	+	Improbable
High Importance	=	Highly Important	+	Important
Low Importance	=	Of little importance	+	Not at all Important
Sooner (Before 2010)	=	Before 2005	+	2005 – 2009
Later (After 2010)	=	2010 – 2015	+	Beyond 2015

The level of consensus (or non-consensus) was calculated on each item according to the probability, importance, and timing. Items were clustered into themes according to the areas of higher education they may influence. Results on the selected themes are discussed in Chapters 5, 6, and 7.

Lessons learned in Data Collection

Round 1 resulted in over 800 possible statements for review. Obviously, the number of items had to be reduced; therefore, statements that covered similar ideas were clustered. Where clusters of ideas were mentioned more than once, they were accepted for the Round 2 questionnaire. It is acknowledged that an idea mentioned only once, and not used, could have been the most insightful and potentially the greatest influence on academia. However, dealing with more than eighty items derived in this manner was arduous for panelists and complex in analysis. A more rigourous "pruning" might have been advantageous.

The web-based instruments designed for this research made it possible for me, in presenting the results, to explore, in-depth, issues underlying the set of items used. Although the panelists found the web-based approach clear and convenient, the scale used in this study is not strictly a Likert Scale. In future research it is recommended that the ordinal scales be considered. In situations where increasing rates of change or much uncertainty are expected, timing may be more difficult more to predict. In those instances a three-point scale is recommended. For a more specific timing, at least a four or five point ordinal scale could be used.

The lack of a model, already scripted, for Delphi web-based instruments that could meet my needs came as a surprise to me. At the outset, data collection was stressful, even overwhelming. I also found it challenging to learn a new computer jargon, and to find technical support in administering the web-based questionnaires. An experienced person skilled in web-design and scripting code would have been an invaluable resource at the start of this research. A good research team is really necessary on a project as large as this. In addition, websites are more fully developed now than they were two years ago. Nevertheless, the research experience has been interesting and rewarding. Most enjoyable was the personal email communication with potential panelists. Correspondence with panelists provided another motivation to succeed which was an important element in this research. It led to a determination not to let down panelists who gave so much of their time to help in this research.

What lesson have I learned from conducting this research that I can share? First, I recommend that researchers, who undertake a broad, complex study such as this start by forming a research team with other graduate students. Second, sponsorship by an organisation or software company would be helpful. Though I made some attempts to get support, it was not forthcoming. The experience of cooperative-work in a research team would have made the task less demanding and could have been useful in conducting further research. Third, I would have been better served if I had designed and developed my web-based Delphi instruments at the outset of this research. Alternatively, I would have benefited by finding a scripted online Delphi survey that would have meet my needs. To have the instruments in-hand before issuing the invitations to panelists would have been ideal. Yet, at the time of the invitation, I did not know the panelists' preferred method of communication, nor did I know that a web-based instrument would not be found. However, now that these web-based instruments have been developed they can be adapted and modified for other surveys, thus easing the process data collection. Fourth, a true Likert Scale would be implemented. Fifth, I would designate passwords that were not similar to each other in order to eliminate potential confusion or clerical error. Sixth, over-estimate the time, skills, and costs that would be required to design, develop, maintain, and update an online instrument. Seventh, clearer explanation that if an item is rated "not probable," the timing would be meaningless; therefore an appropriate response would be "no opinion." Eighth, the immediacy and instantaneous capacities of a web-based data collection improved the response times. Ninth, personal emails to and with the respondents, though time consuming, kept participants interested in the research and added a personal dimension. Tenth, the web-based Delphi process was an efficient communication tool, ensuring anonymity among panelists, providing statistical controlled feedback and a reasonably free flow of ideas within a context.

Locating a person with web-design and script writing skills at a reasonable fee was difficult. I placed many advertisements on-campus and received no replies. At first, not having a conceptual understanding of JAVA Scripts and other various technical terms put me at a disadvantage in communicating with "techies." It is recommended that the faculty of education department consider arranging ICT help for students at a fee that is affordable. I had to learn about both compatibility issues between ICT systems and the technical and memory requirements of hosting companies. To learn what hosting companies actually supported, and not simply advertised, it was necessary to ensure that the software used in this research would be compatible with the hosting company. An example was the need for a ColdFusion Host Provider to operate on a Windows NT platform. After all that work even this platform is now out-of-date, just two years after the initiation of this research.

A weakness of some earlier Delphi questionnaires was that commentary given a lesser value, or in some cases not even considered a part of the questionnaire. By contrast, I found panel commentary a rich and valuable addition to the quantitative findings provided in the research. The commentary did not, however, change the quantitative results. In sum, this research seems to me to be at least two research projects in parallel – one online and the other paper-based. Since these web-based instruments have been created they can be easily modified for a normative and/or descriptive surveys.

Summary of Data Analysis Methods

For the dissertation, ten different methods of analyses, five quantitative and five qualitative will be done. Five types of quantitative analysis will be reported: (1) Level of Consensus (strength of consensus or non-consensus) for each item within the themes (Tables 5.6. to 5.19); (2) Comparison of medians between panel and subgroups (Tables 5.3. to 5.5, in appendix) on each item; (3) Identifying the differences among and between subgroups when consensus is not achieved (CD-ROM); (4) Means of Scores within the themes [Table 5.1(a) – (n)]; and (5) A ranked order of items reviewed based on means as to probability, importance and timing (Tables 5.22. to 5.31, in appendix).

Five types of qualitative data will be reported: (1) Analysis of statements provided in Round 1 into an 81 item questionnaire for Round 2; (2) the individual panel commentary on each item in Round 2; (3) the individual panel commentary on each item in Round 3; (4) at the conclusion on Round 3, open-ended commentary by panelists on other major influences of ICT use on higher education institutions they saw as not covered by questionnaire (Appendix R); and (5) Panelists' evaluation of the web-based Delphi process.

Chapter Four described the research design, the web-based Delphi instruments utilized for data collection and methods of analysis for results. The results of these data are organized into selected themes in the following three Chapters Five to Seven discuss the findings of the quantitative and qualitative methods that are used in analysis. Chapter Five, *Institutional Issues* covers the influences ICT may have on the operation, structures, funding, and competitive organisation of universities and colleges in a global education market. Chapter Six, *Faculty and Staff Issues* addresses how the use of these technologies is likely to affect the job security and rewards of university, college, and polytechnic employees, as well as how the intellectual property of faculty members will be protected or eroded in an ICT intensive environment. Chapter Seven, *Educational Issues* considers how broad and pervasive the use of ICT might become in higher education and how these technologies will challenge or refocus approaches to practices, teaching, and challenge or change educational values. Chapter Eight is the discussion on the findings compared with the literature review. Chapter Nine is the implications and consequences of the findings and recommendations for practice and research.

Figure 1. Round 1 Organizational Phase

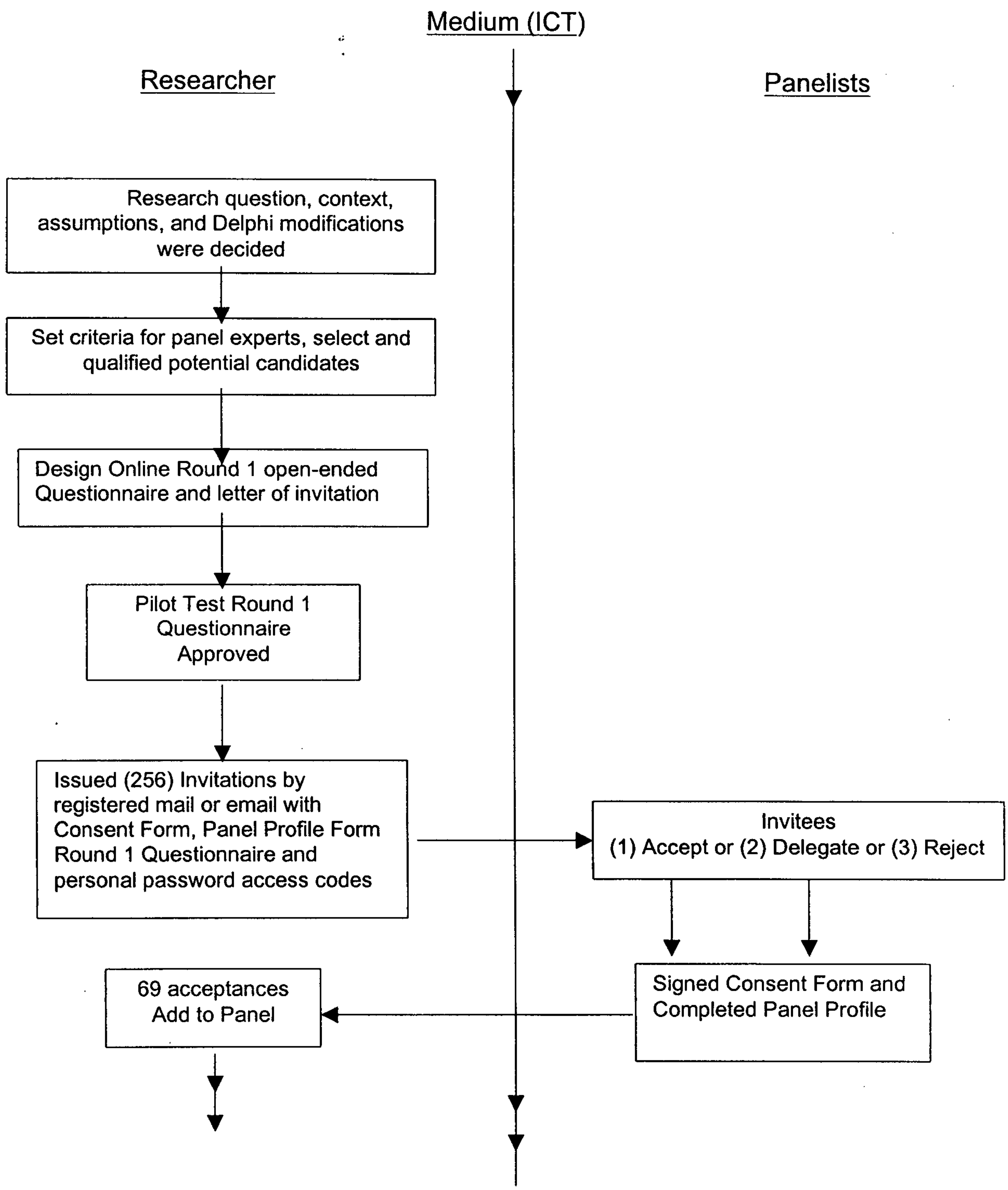


Figure 2. Round 1 - Qualitative Phase

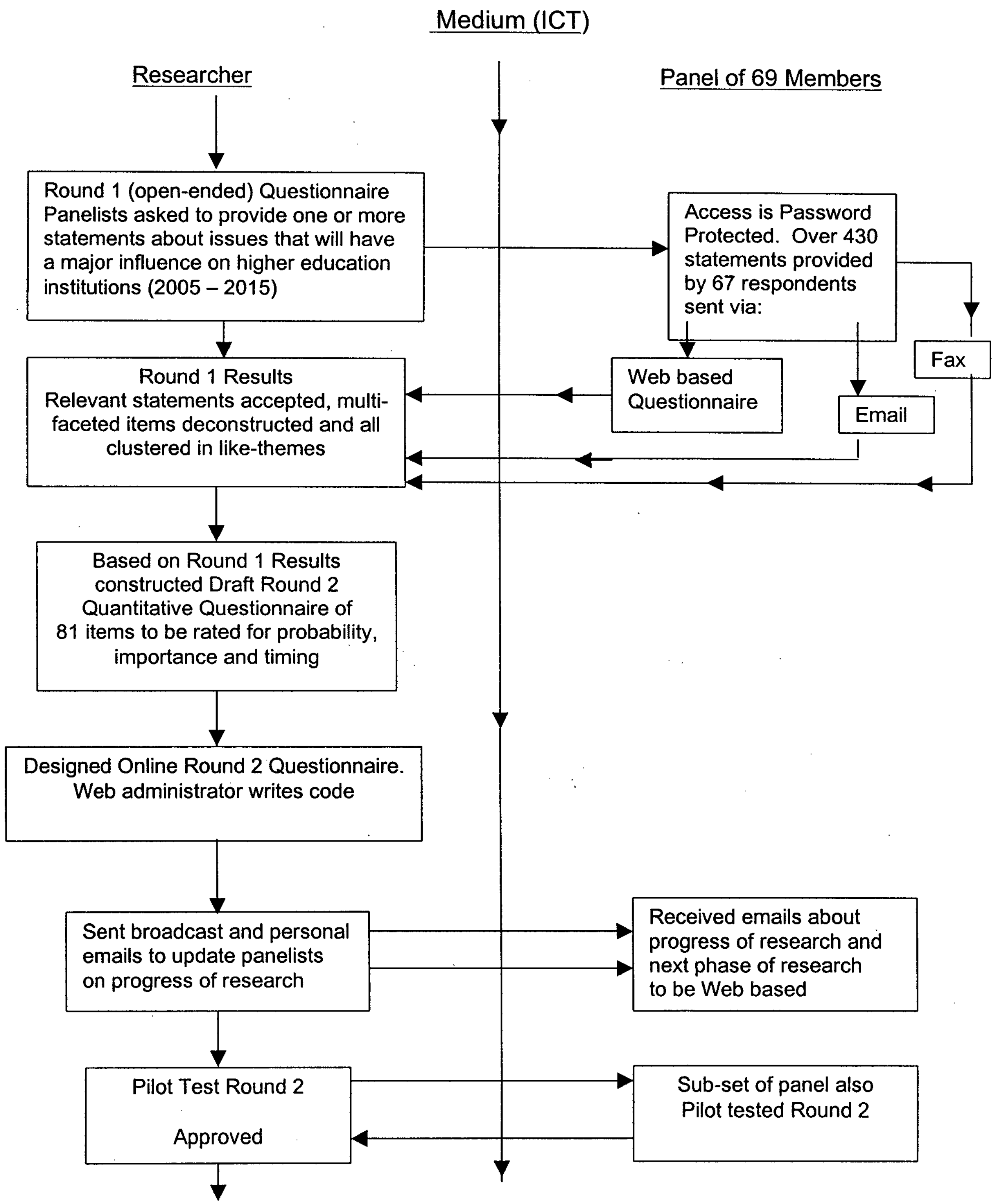


Figure 3. Round 2 - Quantitative (and Qualitative) Phase

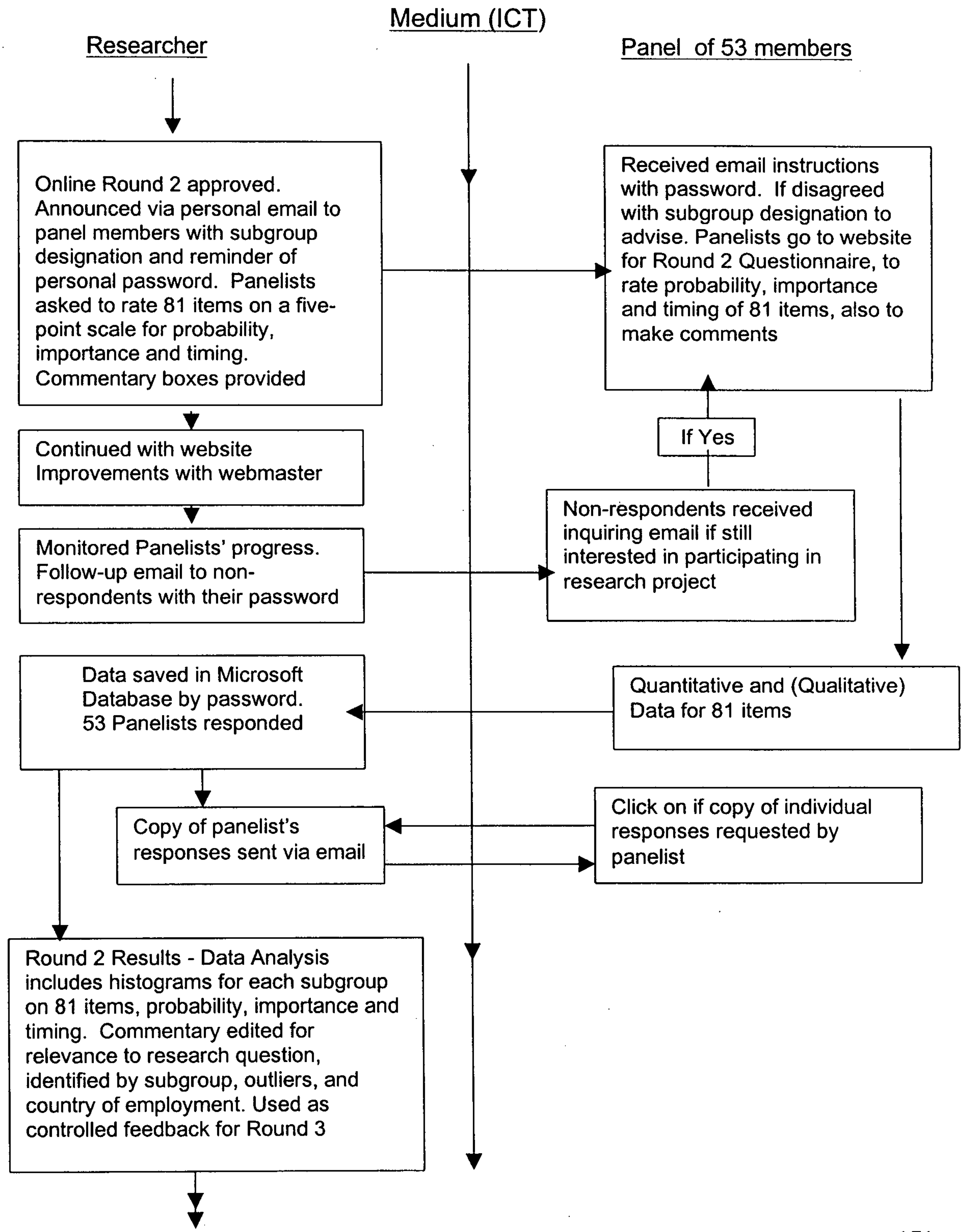
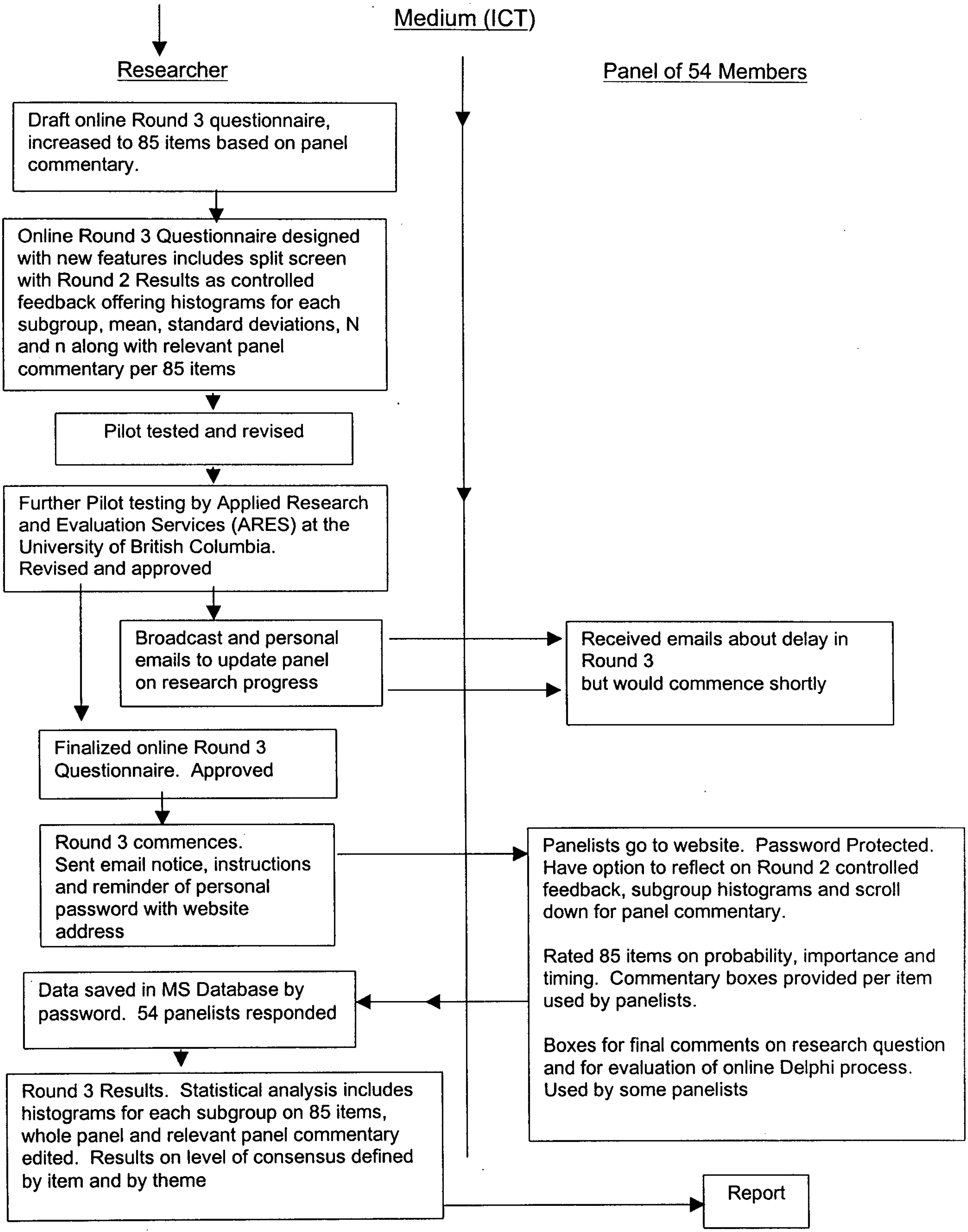


Figure 4. Round 3 - Quantitative (and Qualitative) Phase



CHAPTER FIVE

RESULTS

Synopsis

The research design is illustrated in Figures 1 to 4. According to Twiss (1992) a forecast will be ambiguous without four essential elements in a Delphi questionnaire series: (1) Qualitative [Round 1] --what to forecast; (2) Quantitative [Rounds 2 and 3]—a numerical expression of performance levels; (3) Time --when it will occur, and (4) Probability --to represent the uncertainties. All the above requirements are operationalized in this research. As well, 'importance' is added as an additional criterion since this characteristic will be relevant in setting priorities among the choices/outcomes used in decision making.

In Round 1, of a three-round survey, the panelists were asked to provide one, or possibly more, short statements about the impact of ICT use which they considered likely to change higher education institutions during the period 2005 to 2015. A total of over 800 items were recorded, analysed to avoid duplication, then synthesised into 81 items and used for construction of the web-based Round 2 questionnaire. On the second questionnaire, respondents rate 81 items for their probability, importance and timing on a five-point scale, as well, they provide any commentary as to rationales on ratings and/or as supplements to the issues. Findings from Round 2 include panelists' commentary on ambiguous items they suggested modifications to improve clarity. Such modifications were used in constructing the final Round 3 questionnaire of 85 items. The web-based

Round 3 questionnaire includes the results from Round 2 in graphic form as the controlled statistical feedback and identifies areas of consensus and disagreement among the 3 subgroups of the panel: Academics, Educational Administrators, and IT Professionals. As well, edited panel commentary is included to inform panelists before they respond to the Round 3; however this is an option whether or not to access the Round 2 data.

Rounds 2 and 3 Instruments, instructions, and their results are provided on the CD-ROM. Analysis of the Round 3 data is used in arriving at the findings set out in Chapters 5, 6, and 7. Findings will help to inform educational theorists, policy makers and decision makers about potential long-term issues, events, and probable outcomes related to Information Technology and Internet use. Based on these data the study arrives at a perspective of how the academy might be transformed because of ICT.

Brief Review of Procedures for Analysis

Dichotomies

For the sake of simplicity in reporting, a set of tables has been prepared presenting a concise analysis of the level of consensus achieved in panel ratings on the probability, importance and timing of each item within a theme. To achieve clarity, dichotomies were established (Table 4.3). The "highly probable" and "probable" responses for each item were collapsed for data analysis purposes and renamed as *high probability*. Also collapsed were the data for "highly improbable" and "improbable" responses, which were renamed as *low probability*. Responses on importance were similarly collapsed: "highly important" and "important" into a unit renamed *high importance*, and "of little importance" and "not at all important" into a unit renamed *low importance*. The results of panel forecasts of timing based on five-year increments were also collapsed for simplicity in reporting. The timing dichotomies became *sooner*, which represents "before 2005" and "2005 to 2010" and *later*, represents "2010 to 2015" and "Beyond 2015."

The use of ICT forms a continuum from its beginnings through the present into an unpredictable future and, although timing is important, the distribution of panel opinion as to when, precisely, a particular item is likely to happen does not appear to be crucial in answering the research question. That the panel had difficulty in forecasting timing within a narrow time frame is a finding of the research. For example, based on the original five-year increments only six of the eighty-five items achieved a consensus on timing in Round 3; therefore, broader definitions of the timing categories were collapsed into two categories: *sooner* and *later*.

Where no level of consensus is achieved, the percentage of panelists who rating an item is probability of occurrence as *high probability* or *low probability* is also given. Panel commentary broadens and enriches quantitative results, as it presents rationales and explanations that elaborate panel ratings. *Importance* ratings were solicited as to whether items are "highly important" or "important"; these data identify panel priorities and may be useful in informing policy. With two exceptions, all items were viewed as "important." The two items rated "unimportant" (Items 3 and 6) have been dropped from analysis.

Means of Themes

Data are provided for each of the fourteen themes in Tables 5.1 (a) - 5.1 (n). These tables provide the sums of the scores within the theme for each item rated for probability, importance, and timing. The sum of the scores was divided by the number of respondents (N) taken to calculate the means. A 2.5 score is the balance point between "improbable/probable" and "unimportant and important" and, on timing, between" before 2010" and "after 2010." The means analysis is used to double-check the results from the analyses of levels of consensus.

Table 5.2

Means of Theme

	High Probability	High Importance	Timing Later
	4	4	4
	3	3	3
Balance Point 2.5			
	2	2	2
	1	1	1
	Low Probability	Low Importance	Timing Sooner

Medians and Means

These tables are in the appendices, in item number order, which give the mean and median rating data by subgroup and panel. Subgroup 1 is for academics, Subgroup 2 for administrators, Subgroup 3 for IT professionals, and Total is for the entire panel. There are separate tables for Probability (Table 5.3, in appendix), Importance (Table 5.4, in appendix) and Timing (Table 5.5, in appendix).

Limitation of Scope

The CD-ROM provides the raw data to supplement and elaborate the results on the 85 items, with a series of histograms for each subgroup. This CD-ROM provides all the web-based documentation used in this research. The results from Rounds 2 and 3 can be viewed on the CD-ROM, but only Round 3 results are used in the data analysis reported here. The index of statements for Round 3 is in appendix (Appendix V).

In further research, it would be possible and perhaps useful to explore these items in light of various other sets of themes. Other variables could also be analysed, for example, US versus Canada, Academics versus Administrators, IT Professionals versus Academics, and/or IT Professionals versus Administrators, female versus male, Presidents versus Professors, and so on, but that research is beyond the scope of this dissertation.

Introduction

The conceptual framework for the analysis clusters the items that have similar areas of influence into fourteen themes (Appendix U). These fall under broad categories of *Institutional* issues, *Faculty and Staff* issues, and *Educational* issues. The views of this panel on institutional, faculty and staff, and educational changes expected in higher education from 2005 – 2015 will inform our understanding of how these important issues may evolve.

Under the broad category of Institutional Issues, items were clustered into the following themes (Appendix U):

- Government Issues
- Organization and Infrastructure Issues
- Funding and Efficiency Issues
- Competitive Market Conditions Issues
- Globalisation/Internationalism Issues

"Competitive Market Conditions" and "Globalisation/ Internationalism" do overlap somewhat, but were separated to allow a clearer focus on influences that will occur in regional and global markets.

Government Issues

Here I investigate areas where government policy may be influenced by the use of ICT in higher education. Five things stand out from the data in Table 5.6. (1) There is a minimum level of consensus (75 percent) that Federal/Provincial/State governments will change existing funding arrangements in order to encourage public/private partnerships for international missions, probably before 2010. This issue has "high importance." (2) Governments are not expected to 'get out of the way' in response to market pressures to deregulate (80 percent consensus). (3) There is not a consensus on governments' funding policies and strategies for universities and colleges which favour internationalization and Globalisation. Opinion on probability is split 54 percent versus 46 percent. (4) There are consensuses on the three items within this theme as likely to be considered soon (before 2010). (5) All items within this *government* theme are rated with "high importance." A median panel rating of 3.00 confirms that these government issues are important (Table 5.4 in appendix).

Table 5.6.

Level of Consensus – Government Issues

		Probability			Importance			Timing**		
			%	%		%	%		%	%
Item	Statement	N	Low	High	N	Low	High	N	Soon	Late
55	Federal/Provincial/State governments will change funding arrangements to allow public/private partnerships to adopt and develop international missions.	44	25	75	39	8	92	40	73	27
71	Governments' funding policies and strategies will favour internationalisation and globalisation; so politicians will allocate funds to those institutions with the best economic models.	43	54 *	46	41	22	78	33	76	24
73	Governments will 'get out of the way' in response to market pressures to deregulate higher education.	44	80	20	42	12	88	32	72	28

Notes.

* = Does not meet criterion for consensus
Strong Consensus = 90% to 100
Consensus = 80% to 89%
Minimum Consensus = 70% to 79%

**Soon = Before 2010
Late = 2010 or after

Federal/Provincial/State governments will change funding arrangements to allow public/private partnerships to adopt and develop international missions [Item 55]. Panelists expect government funding will change funding arrangements to allow the adoption and development of public/private international missions with a (75 percent) minimum consensus. Faced with current problems over funding, however, administrators do not wholly support this result, as twenty-nine (29) percent rate a "low probability."

Thirty-three (33) percent of IT professionals also rate this item a "low probability", but only 8 percent of academics rate "improbable" (CD-ROM). Governments in both the US and Canada may want to avoid obligations to undertake missions in global higher education, but both governments may be under international pressure. US State governments are not interested in educational international missions. A US panelist views State governments as parochial and uninterested in international education missions.

> ....I don't think State governments are very interested fundamentally in international missions and I don't see that changing dramatically. I've worked in IT in six different States, and they are all very parochial in this regard....In fact, the legislature in my current State is upset that so many graduates of the public institutions find work in neighboring States. I also don't see the Federal government changing dramatically...what it already encourages in this regard... [IT # 13, US]

In Canada, some provinces already have international missions.

> ...in some Canadian Provinces this was already occurring. [Adm # 5, Canada]

> This was already happening in BC's [British Columbia'] public post secondary institutions. [Adm # 14, Canada]

> Governments have been slow and uncreative with their funding arrangements. Changes in funding arrangements will be among the last of environmental changes [made] to accommodate a new environment. [Acad # 5, Canada]

<u>Governments' funding policies and strategies</u> will favour internationalisation and globalisation; so politicians will allocate funds to those institutions with the best economic models [Item 71]. The panel is split on whether or not government's funding policies and strategies will favour internationalisation and globalisation and allocate funds to institutions with the best economic models. Diversity among the subgroups

reinforces this lack of consensus [54 percent versus 46 percent (CD-ROM)]. Academics were most likely to give this item a "probable" rating (median 3.00), and administrators to give it an "improbable" rating (median 2.00) (Table 5.3, in appendix). Based on commentary, Canadian governments are seen as not likely to change funding policies and strategies to favour internationalisation and globalisation; so politicians will allocate funds to those institutions with the best economic models.

> The best economic models are seldom the rationale for the political allocation of resources to educational institutions--I doubt this is going to [alter] significantly or quickly. [IT # 19, Canada]

> Not in the short and medium terms. Politicians have to respond to local constituencies to get elected. [Adm #5, Canada]

> This is true in part but international and global students don't vote--locals do; politicians will not forget the voter. [Acad # 3, Canada].

> No, politicians act politically, not rationally. [Adm #6, Canada]

> Politicians are elected locally and will be more apt to pay attention to regional and national issues. Canadian educators were skeptical about Canada's politicians taking a progressive role [in] the international dissemination of higher education. [IT # 8, Canada]

There is mixed commentary from other countries:

> Depends on which government. I answer from a U.S. perspective. Australia and Singapore are already doing this. U.S....has no industrial policy and will not likely do this. [Adm # 13, US]

> ...I think it is highly improbable that governments will favor internationalization and globalization. Second, I don't know what an institution's economic model has to do with allocating funds....Perhaps university economic modeling is a Canadian concept. I'm not aware of any American colleges or universities constructing institutional economic models. [IT # 13, US]

> This is happening already, at least in Europe. [Acad #4, Other]

> Here, federal funding policies are pushing the universities to serve offshore students better than onshore. However, I don't think this is due to any overall government bias toward internationalisation and globalisation, but to shortsighted university funding models [Acad # 14, Other]

<u>Governments will 'get out of the way'</u> in response to market pressures to deregulate higher education [Item 73]. In Canada more than in the USA, government is not expected to get out of the way in response to market pressure to deregulate higher education. US panelists do not see federal or state control as an issue. The panel gives a low probability that governments will "get out of the way" in response to market pressures to deregulate higher education, with an 80 percent consensus; there are also median panel and subgroup ratings of 2.00, "improbable" (Table 5.3, in appendix). Governments are expected to hang on to control, particularly in Canada:

> Governments say they want to deregulate, but they are unable to give up control. The forms of control will just change, as we see happening today under the guise of accountability. [Acad # 5, Canada]
>
> ...If it has economic benefit the government won't part with it. [Acad # 3, Canada]
>
> Intellectual sovereignty will always be raised as a reason for governments to keep supporting at least national institutions." [Adm # 9, Canada]
>
> American higher education is fortunately not regulated where it counts: curriculum development and delivery. I don't think existing regulations for American higher education will change significantly.... [IT # 13, US]

<u>Means</u>

Table 5.1(a). shows academics score the items in this theme as "probable" (Means, 2.73), but administrators and IT professionals do not (Means; 2.38, 2.41). Note

that on the three items within this theme, the entire panel scores “important” (Means, 3.02). Administrators expect the issues to be addressed soon (Means, 1.98) while the IT professionals expect this to happen later, after 2010 (Means, 2.38).

Table 5.1 (a)

Means - Government

Subgroup	Ratings	Sums of Scores	N	Means
Academics	Probability	90	33	2.73
	Importance	91	29	3.14
	Timing	62	29	2.14
Administrators	Probability	152	64	2.38
	Importance	181	60	3.02
	Timing	93	47	1.98
IT professionals	Probability	82	34	2.41
	Importance	96	33	2.91
	Timing	69	29	2.38
Entire Panel	Probability			2.47
	Importance			3.02
	Timing			2.13

Organization and Infrastructure Issues

Here I investigate the influences ICT will have on the organization and infrastructure of higher education institutions. This includes physical learning spaces on- and off-campus, class scheduling, administrative functions and ICT connectivity. Seven things stand out from the data in Table 5.7. (1) Many panelists (83 percent) rate it "probable" that ICT will challenge class scheduling [Item 18]. (2) There is a strong consensus (92 percent) that residential colleges and/or universities will continue to be an important component of the higher education landscape [Item 27]. (3) Most panelists (98 percent) rate it a "high probability" that mobile and wireless technologies will affect the design of learning spaces [Item 59]. (4) The panel rate a "high probability" (86 percent) that university faculty members will be unreceptive to fundamental, dramatic and rapid change [Item 62]. (5) The majority (65 percent) thinks it "probable" that most institutions will restructure in response to ICT and that the rest will decline in scope and reach [Item 63]. (6) ICT connectivity will be incorporated into campus infrastructures [Items 67 and 70]. (7) All issues achieve a "high importance" and most are viewed as likely to be relevant before 2010.

Table 5.7 - Level of Consensus – Organization and Infrastructure

Item	Statement	Probability N	Probability % Low	Probability % High	Importance N	Importance % Low	Importance % High	Timing** N	Timing** % Soon	Timing** % Late
18	Online education will challenge the maintenance of conventional class scheduling (semester, quarters, etc.).	52	17	83	49	12	88	50	94	6
27	Residential colleges and/or universities will no longer be an important component of the higher education landscape.	52	92	8	47	13	87	31	52 *	48
59	Mobile and wireless technologies will affect the design and structure of learning spaces both on- and off-campuses.	49	2	98	45	4	96	47	83	17
62	Universities' faculty members will be unreceptive to fundamental, dramatic and rapid change; and so their administration will NOT be nimble in a fast-paced educational market.	49	14	86	48	8	92	41	98	2
63	Most post-secondary institutions will restructure to take advantage of new technologies; the rest will decline in scope and reach.	49	35	65 *	45	13	87	42	76	24
67	Quick, easy, seamless Enterprise Resource Planning (ERP) computing systems (an administrative portal) will facilitate a "virtual campus" experience, dovetailing with existing enrollment, records, financial and other systems.	44	9	91	41	7	93	43	86	14
70	New methods of connectivity and access will alter the way in which polytechnics, colleges and universities are operated.	47	15	85	42	9	91	42	81	19

Notes.

* = Does not meet criterion for consensus
Strong Consensus = 90% to 100
Consensus = 80% to 89%
Minimum Consensus = 70% to 79%

**Soon = Before 2010
Late = 2010 or after

Online education will challenge the maintenance of conventional class scheduling (semester, quarters, etc.) [Item 18]. There is a consensus and a median panel rating of 4.00 over the assertion that online education will challenge the maintenance of conventional class scheduling and affect the design of work, and learning spaces. As well, panelists think that within a decade conventional class scheduling will be challenged due to online education. Only the administrators' median rating of 3.50 is slightly less than "highly probable." Some panelists see conventional scheduling as essential.

> I believe conventional, on campus courses will continue to revolve around a semester or quarter, or some such standard....It is too difficult for a physical community of scholars and learners to interact otherwise.... [IT # 13, US]

> ....At our institution, online students study within the semester system. Assignment completion dates and examination schedules reflect the time constraints of the on campus offering.... [Adm # 1, Canada]

Such a change may happen over time according to these panelists.

> There will be some lag but once learners experience the options, they will make greater demands to challenge traditional scheduling. [Adm # 9, Canada]

> After learners have experienced how flexible scheduling can be, it will be hard to get them to acquiesce to rigid scheduling. [Acad # 5, Canada]

Residential colleges and/or universities will no longer be an important component of the higher education landscape [Item 27]. Panelists see a strong role for the traditional residential university and do not believe this will be threatened by the adoption of ICT though panelists' comments indicate some impact:

> Of course, residence will continue to be important for many students, but the proportion for whom it is important will gradually but continually

> decrease....At some point residence will cease to be a norm for a good undergraduate education - as is the case pretty much now in urban Canada. [Acad # 5, Canada]
>
> Administrators will look for money to sustain the IT infrastructures, but the student demand for the on campus experience and non-traditional marketing opportunities will result perhaps in reduced 'roomage'. Hard to tell: the times they are a' changing too much! [Acad # 8, Other]
>
> They will continue to be important for full-time undergraduate students. But fewer students will be able to afford this experience for more than a couple of years. [Acad # 14, Other]
>
> These will continue to draw those people who find this type of learning fulfilling. Liberal Arts and Science and faith-based institutions will continue to exist for a long time. [Adm # 5, Canada]
>
> I don't see a big loss in the role for residential colleges. The prime market for this education may shrink is size, but it is going to continue. [IT # 19, Canada]

Young people want a traditional collegial experience for a variety of reasons, some of which have little to do with their studies. The panel has a strong consensus that residential colleges would not become redundant due to ICT. Panelists do not predict a decline in the need for university level tutorial support or in face-to-face teaching. On the other hand, some panelists do hold the view that students will not be able to afford the cost of residency and that online study may become their only option.

Mobile and wireless technologies will affect the design and structure of learning spaces both on- and off-campuses [Item 59]. There is a strong consensus (98 percent) and a median panel rating of 4.00 over the assertion that mobile and wireless technologies will affect the design and structure of learning spaces both on- and off-campuses. However, the median academic rating of 3.00, achieves "probable."

Commentary includes the following:

> Limited by the amount of brick and mortar already in place, even though that can be modified somewhat. It will have to modify teaching/learning patterns first. [Acad # 14, Other]

> ...we have just received funding in this year's budget for a capital expansion of a learning technology commons and we are looking at the "wireless" future...and what this will mean for this new expansion at the [our] Campus. [Adm # 14, Canada]

> Starting to happen right now--will accelerate. [IT # 19, Canada]

Universities' faculty members will be unreceptive to fundamental, dramatic and rapid change; and so their administration will NOT be nimble in a fast-paced educational market [Item 62]. There is a consensus, 86 percent of participants and a median panel rating of 3.00 over the assertion that university faculty members will be unreceptive to fundamental, dramatic and rapid change; and so their administration will not be nimble in a fast-paced educational market; yet some faculty members identify administrators as the culprit. No doubt we can expect academic ferment over the use of ICT to continue during the next decade.

> This is almost certain to be true generally--it is both the strength and weakness of traditional higher education. But there will always be exceptions which try new things, often fail, but eventually show the way....[IT # 19, Canada]

> Overall I think this will be true. But with some exceptions....Every institution will have some faculty who will welcome change and new challenges....and faculty in private colleges will be very receptive to change. But large public institutions will be conflict ridden between those who want to change and those who are resistant. [Acad # 5, Canada]

> Maybe will take another generation, but then things will move fast. [Adm # 6, Canada]

> Universities don't change quickly. However, the high level of turnover in the academy during the next decade will accelerate the changes. [IT # 8, Canada]

> Administrations can be worse than faculty members here. Many academics are happy to use new tools and have better interactivity with remote students. Administrators are reluctant to spend the money, make radical departures from traditional delivery schedules and modes, etc. These are not typically risk takers! [Acad # 14, Other]

> Not all faculty have to be receptive in order for a university to be nimble. For decades universities have been at the forefront of scientific research and engineering, and in many ways have driven the technology innovations....Now we are saying faculty are unreceptive to change? I believe that is a myth. Faculty will not change...but faculty are actually often frustrated with administrators who cannot fund the latest technology or scientific equipment. They are not unreceptive to fundamental, dramatic, and rapid change. [IT # 13, US]

One administrator puts the blame on unions as inhibitors of change.

> We have already seen collective agreements brought [in] to stifle the growth of new tech-based delivery systems. We're in for some turmoil in academia! [Adm # 5, Canada]

Most post-secondary institutions will restructure to take advantage of new technologies; the rest will decline in scope and reach [Item 63]. There is a 35/65 division and a median panel rating of 3.00 over the statement that most post-secondary institutions will restructure to take advantage of new technologies; the rest will decline in scope and reach. IT Professionals are the only subgroup with a median panel rating of 2.00 doubting that most post-secondary institutions will restructure to take advantage of ICT; while the remainder will decline in scope and reach. Although two-thirds of the panel (65 percent) rates it as necessary; it is uncertain whether institutions which do not restructure will decline in scope and reach. The lack of a clear consensus on this item is probably due to double-barreled issues.

> I think restructuring is overrated. Institutions with the right policies can take advantage of new technology without restructuring. [Acad # 5, Canada]

Whether an institution declines depends, in part, on the quality of that institution and how it chooses to define its market.... I can see a place for institutions that claim to be and are, in fact, providers of quality face to face teaching. [Adm # 1, Canada]

No. Few will rise to the challenge. Many without strong alternative markets and branding will disappear. [Acad # 14, Other]

...it has been true in general that those institutions that survive are those that are able to adapt to change, but I don't think adapting to technology is necessarily more of a challenge than other adaptations institutions have had to make in order to survive. It's also amazing to me how resilient higher education institutions are....Not many decline and very few close, certainly compared to the business sector that touts its management acumen....[IT # 13, US]

Change will only be effective and efficient if higher education hires management/business experts rather than amateurs (i.e. faculty) into administration decision making positions. [IT # 15, US]

Quick, easy, seamless Enterprise Resource Planning (ERP) computing systems (an administrative portals) will facilitate a "virtual campus" experience, dovetailing with existing enrollment, records, financial and other systems [Item 67]. New methods of connectivity and access will alter the way in which polytechnics, colleges and universities are operated [Item 70]. There is a strong consensus 91 percent and a median panel rating of 4.00 over the claim that quick, easy, seamless ERP computing systems will facilitate a "virtual campus" experience, dovetailing with existing enrollment, records, financial and other systems. Administrators' probability median rating of 3.00 view the ERP or administrative portals more cautiously. There is also a consensus, 85 percent, and a median panel rating of 3.00 over the contention that new methods of connectivity and access will alter the way in which academia is operated. As well, panelists think that within a decade that both ERPs new methods of connectivity and access are expected to become an integral part of the campus infrastructure. Some panel commentary is:

> See JASIG uPortal or PeopleSoft and other ERP vendors. May take a couple of more years to hit its stride but the portal will be an important development in making sense of the web experience at an institution. [IT # 8, Canada]

> Developing quickly. [IT # 9, Canada]

> This kind of convenience is coming for sure, but it is only that--a convenience, not some qualitatively different kind of experience. [IT # 19, Canada]

> I am unaware of any ERP's that are either "quick" or "easy", but I do agree strongly with what I think is the sense of the statement. [IT # 13, US]

> We will be moving to a campus portal this year...we are moving to on totally line registration...(no other options) this year. [Adm # 14, Canada]

> The technologies aren't there yet - especially outside the US, but they're coming along. Will depend on the university's willingness to invest. [Acad # 14, Other]

As to new methods of connectivity and access [Item 70]:

> This is so stated as to be obviously true--even now. [IT # 19, Canada]

<u>Means</u>

Table 5.1(b) shows that academics are slightly more positive about the probability of change in organization and infrastructure (Means, 3.07) than are other subgroups (Means, 2.97, 2.87); though the others still score this as "probable," differences are narrow. IT professionals expect these issues to occur before 2010 (Means, 1.52), others somewhat later (Means, 2.08, 1.85). These scores reaffirm findings of the data in Table 5.7.

Table 5.1 (b)

Means - Organization and Infrastructure

Subgroup	Ratings	Sums of Scores	N	Means
Academics	Probability	264	86	3.07
	Importance	237	73	3.25
	Timing	158	76	2.08
Administrators	Probability	481	162	2.97
	Importance	486	151	3.22
	Timing	259	140	1.85
IT professionals	Probability	270	94	2.87
	Importance	295	93	3.17
	Timing	122	80	1.52
Entire Panel	Probability			2.97
	Importance			3.21
	Timing			1.82

Funding and Efficiency Issues

In this theme I investigate influences of ICT that may affect the funding of higher education institutions and/or their efficiency of operations. Six points stand out from the data in Table 5.8: (1) There is a strong consensus (92 percent) that cost of innovation in ICT will challenge higher education funding [Item 58]. (2) There is also a strong consensus (94 percent) that online higher education will not become elitist [Item 38]. (3) There is a strong consensus (96 percent) that more business-like behaviour will be required and ICT data banks will be used in administration [Item 72]. (4) There are low participation rates as to the timing of some items [Items 38, 61, 64] an indication of uncertainty. (5) Two of the seven items -- a two-tiered education system [Item 61], and opting out of ICT [Item 64] -- do not achieve a consensus on probability. (6) All items within this theme are viewed as "important."

Table 5.8

Level of Consensus – Funding and Efficiency

		Probability			Importance			Timing**		
			%	%		%	%		%	%
Item	Statement	N	Low	High	N	Low	High	N	Soon	Late
38	Online higher education will become elitist, because of the costs to individuals of hardware, software, and access.	47	94	6	43	14	86	28	96	4
58	The financial burden of continuing innovations in hardware, software, and networks will challenge higher education institutions' funding.	49	8	92	47	2	98	45	98	2
61	A two-tiered education system will evolve, one elite, high cost, offering face-to-face instruction and a collegial experience, the other will be a lower cost system via the Internet.	44	66 *	34	44	20	80	28	65 *	35
64	Some universities and colleges will flourish online; many post-secondary institutions will view the cost of IT and a de-emphasis of traditional values as too high.	49	35	65 *	44	11	89	38	92	8
68	Higher education institutions will have available data banks of student information to both decide on admissions and how to best serve students.	47	4	96	45	2	98	46	91	9
72	More business-like behaviour will be required of the academy in the administration and marketing of technology-based services.	50	4	96	47	6	94	48	94	6
81	Higher education institutes offering high quality online courses globally will achieve attractive economies of scale with lower marginal costs per learner.	46	30	70	45	7	93	41	66 *	34

Notes.

* = Does not meet criterion for consensus
Strong Consensus = 90% to 100
Consensus = 80% to 89%
Minimum Consensus = 70% to 79%

**Soon = Before 2010
Late = 2010 or after

The financial burden of continuing innovations in hardware, software, and networks will challenge higher education institutions' funding [Item 58]. There is a strong consensus, 92 percent, and a median panel and median administrators rating of 4.00 while other subgroups' medians are slightly less certain, but still "probable" (3.00) over the claim that the financial burden of continuing innovations in hardware, software, and networks will challenge higher education institutions' funding. Hard experience with budgeting for rising capital costs of innovation may account for administrators' greater concerns. Some commentary is:

> Resources and government's desire to assist will be very important. Governments may argue for internal reallocation or increasing private sector partnerships. However, trying to maintain parallel systems will not be financially palatable. [Adm # 5, Canada]
>
> They are always challenged by something: those that can shift resources appropriately will do better. [Adm # 6, Canada]
>
> Yes, and they will be up to the challenge. [Acad # 5, Canada]
>
> ...new "must haves" keep appearing just as previously expensive technology gets more reasonable in price. [IT # 19, Canada]
>
> I would like to think higher ed will find new ways to fund technology but I just don't have the confidence that it will happen on a broad scale for most institutions..... [IT # 13, US]
>
> Moreover, in the increasingly important area of Learning Technology (LT), it is imperative...to locate LT support staff close to the professors they are there to support....[IT #8, Canada]

Online higher education will become elitist, because of the costs to individuals of hardware, software, and access [Item 38]. There is a strong consensus, 94 percent, on the low probability and a median panel rating of 2.00 over the assertion that online higher education will become elitist, because of the costs to individuals of hardware, software and access. Administrators' median panel rating is 1.00 "highly improbable" over the contention that online higher education in North America will become elitist due to costs. Some panel comments reconfirm this:

> The truth is just the opposite. It lowers the cost of education to the individual and makes it possible for people to complete programs that they wouldn't be able to afford in the conventional model. [Acad # 5, Canada]
>
> Access will be no more costly than access to television, which has no class boundaries. [Adm # 13, US]
>
> No way. Today, Internet access is a cost of living, not a cost of education. Barriers to education that would prevent disadvantaged people from attending university would not be significantly affected by the costs of technology, particularly in the future as costs continue to drop and access improves. [IT # 8, Canada]
>
> Financial aid will be available to online education as well as traditional. And, in my opinion, most online learning will be continuing education that employers will fund....[IT #13, US]
>
> Not if we maintain our open universities. [T]echnology doesn't create elitism: policies and attitudes do. [Adm # 6, Canada]

More business-like behaviour will be required of the academy in the administration and marketing of technology-based services [Item 72]. There is a strong consensus, 96 percent, and a median panel rating of 4.00 over the issue that more business-like behaviour will be required of the academy in the administration and marketing of technology-based services. The administrators' median rating of 3.00, "probable" is the lowest median. More business-like behaviour of the academy is "important" with a median panel rating of 3.00. Some commentary reconfirms this need for more business-like behaviour:

> [I]f you mean by 'businesslike' being cost-effective and innovative. [Acad # 8, Other]

> It's no different than good business behaviour in any activity.
> [Adm # 6, Canada]
>
> Already here....The number of choices to be made is way up and so are the costs. This forces a bit more economic rationality on the decision process and gives the business-minded members of the academy more clout. [IT # 19, Canada]
>
> A modest move in this direction would be helpful. It will be supported in some institutions and vehemently resisted in others. [Acad # 5, Canada]
>
> But I regret it.....Is that what those advocating more business like behavior would like to see? I think one must take the bad with the good when proposing to apply such models to education. Education does not operate on a profit basis....If we really were going to maximize profits and customer satisfaction, we would give every student 'A' grades and not make them do any work....[IT # 13, US]

This panel supports the view that academia will become more businesslike. Unlike businesses, most academies do not operate for-profit. Business with its failures and occasional corrupt practices cannot be held up as a model. Nor can business executives claim to be more skilled and capable than university administrators. On the other hand, the most successful of US corporations do have an annual cycle through which a corporate plan is built up from the "grass roots," starting with departments. These plans take time and experience, and are stressful to prepare, but they serve to keep corporations in touch with the changing economic and human environment in which they operate. Some, but not all, higher education institutions already use this model. Perhaps this kind of approach is what panelists are looking for when they achieve consensus on the thorny issue of being businesslike.

<u>A two-tiered education system will evolve</u>, one elite, high cost, offering face-to-face instruction and a collegial experience, the other will be a lower cost system via the

Internet [Item 61]. There is a 66/34 division and a median panel rating of 2.00 over the allegation that a two-tiered education system will evolve, one elite, high cost, offering face-to-face instruction and a collegial experience, the other will be a lower cost system via the Internet. Approximately sixty-six (66) percent of the panel rate it a low probability that a two-tier system would occur in North America. Panelists do not accept the inference that online implies a lower quality than face-to-face education, but most panelists recognise the importance of an on-campus experience; yet there is no consensus when and if, this may occur. The academics' median rating of 3.00 is "probable," though only a majority, (60 percent) rate the item as "probable" (CD-ROM). Other subgroups' medians are "improbable," (2.00) (Table 5.3). Some of the panel commentary shows conflicting views over this issue; clearly the question of tiers is not a central issue, but is complex.

> The majority of institutions will have elements of both face-to-face and online; some face to face will be low status and some online will be high status. So the reality will be more complex and variable than suggested by the simplistic depiction in the question. [Acad # 5, Canada]

> There are many tiers to education already. I do not see the clean split implied by the question unless the lower cost system is "job training" rather than what we think of as a university education. [IT # 8, Canada]

> I think this is a false dichotomy. The lower cost [online] system can be equally collegial and high quality. [Acad # 9, Canada]

> [T]he elite one will be based more on tech applications. [Acad # 8, Other]

> IT isn't the issue here: if there is going be differentiation, it will happen for other reasons. [Adm # 6, Canada]

> The elite/mass distinction will remain with us for the foreseeable future, but it won't just be a face-to-face/on-line contrast. [IT # 19, Canada]

> [N]ot in publicly funded institutions...government policy will prohibit this from happening. [Adm # 14, Canada]

> ...most students seeking a degree in four years of full time study will prefer a campus experience. The same range of choices regarding cost, areas of study, and geography as exist now will be necessary to accommodate these needs. Internet learning will take place at the continuing education and, in some cases, the graduate degree level....[IT # 13, US]

A report by Lundin (1998) on the University of Queensland, Australia describes such a change using ICT to serve a non-elite mass market.

Some universities and colleges will flourish online; many post-secondary institutions will view the cost of IT and a de-emphasis of traditional values as too high [Item 64]. There is a 35/65 division, a median panel rating of 3.00, over the claim that many academies will view the cost of IT and a de-emphasis of traditional values as too high. IT professionals' panel rating is 2.00, "improbable" (Table 5.3).

Higher education institutions will have available data banks of student information to both decide both on admissions and on how to best serve students [Item 68]. The use of data banks in the administration of student information achieved a "strong probable" consensus, is rated "important" and will occur soon. Appropriately, there were concerns about privacy of information. All subgroups and panel medians ratings are consistent (Medians, 3.00) as "probable" and "important." Although accepting data banks as likely, panelists caution about ethical considerations.

> [D]epends too on how that info is gathered and kept secure and ethically used. [Acad # 8, Other]

IT panelists confirm the use of the databanks:

> We intend to have that within the next 2 years. [IT # 8, Canada]

> This is happening in small ways now--it will be a few more years before we have the systems and experience to make best use of the available data. [IT # 19, Canada]

<u>Higher education institutes offering high quality online courses globally</u> will achieve attractive economies of scale with lower marginal costs per learner [Item 81]. There is a minimum consensus (70 percent) and a median panel rating of 3.00 over the idea that global education can offer economies of scale, and achieve a lower marginal cost per student. As well, all subgroup medians (3.00) on this item are "probable" and "important," but there is a 66/34 division whether timing will happen soon, yet the timing median panel rating of 2.00 reflects that within a decade economies of scale will be achieved. Many panelists, are not, however, in their commentary convinced about the marginal cost rationale:

> It is difficult to know about the long term costs until at least ten-fifteen years of online education has been experienced. [Acad # 3, Canada]

> Yes, this is the theory, and to a certain extent it must be true, but economies of scale and declining marginal costs are tricky business—they seldom run forever. [IT # 19, Canada]

The influence of unions appears to be a barrier for larger class size:

> Strong provincial unions will be able to keep online class sizes at low levels therefore prohibiting lower costs per learner. [Adm # 14, Canada]

On the other hand, high quality courses may require more teachers and/or tutors.

> [H]igh quality [online] courses require lots of tutors so that it is a fine line between fees and tutor costs--too much and it is too elite, too low and it is not quality. [Acad # 4, Other]

> High quality online courses require instructor interaction....Online teaching was much less efficient in this respect than face-to-face teaching [IT # 13, US]

> ....if higher ed institutions are committed to providing student-faculty/tutor ratios that permit the interaction that online teaching is reputed to provide....economics of scale may not be realized as anticipated. Also, one needs to take into account the regularity with which developed courses need to be revised to maintain their currency – both with regard to content and delivery option. [Adm # 1, Canada]

The UK experience has demonstrated that a lower marginal cost per student did occur when student enrollment increased sharply; butt it appears, so too did a drop in the quality of teaching. Whether these two issues are irrevocably intertwined is still open to debate.

Means

As shown in Table 5.1 (c) five of the seven items within this theme have levels of consensus. There are no striking differences in overall scores between subgroups. All the means show the agreement that the issues are "probable," "important" and will occur soon.

Table 5.1 (c) - Means - Funding and Efficiency

Subgroup	Ratings	Sum of Scores	N	Means
Academics	Probability	242	83	2.92
	Importance	260	78	3.33
	Timing	139	72	1.93
Administrators	Probability	455	161	2.83
	Importance	475	151	3.15
	Timing	224	131	1.71
IT professionals	Probability	241	88	2.74
	Importance	276	86	3.21
	Timing	121	71	1.70
Entire Panel	Probability			2.83
	Importance			3.21
	Timing			1.77

Competitive Market Conditions Issues

Under this theme I examine the competitive situation faced by universities and colleges in a global education market, and how this situation may be influenced by online competition and the use of ICT in higher education. Eight things stand out from the data in Table 5.9: (1) There is a strong consensus (94 percent) that consortia of universities/corporations will dominate larger sectors of the online education market [Item 49]. (2) One hundred (100) percent of the panel rates it "important" that strong corporate/publishing partnerships will develop and market virtual textbooks. (3) The panel considers it a low probability (73 percent) that online education will be dominated by the 'for-profit sector' at the expense of brick and mortar campuses. (4) There is a strong consensus (90 percent) that higher education institutions will be obliged to respond to industry's demand for training at the workplace and 'just-in-time' online employee training [Item 12]. As well, there is minimum consensus (73 percent) that corporate certification will compete favorably with university degrees in employment applications [Item 74]. (5) There is a strong consensus (90 percent) that many universities and colleges will face serious online competition in their home territories [Item 77]. (6) There is a strong consensus (96 percent) that on-campus degree programs will thrive despite other options [Item 19]. (7) There is a consensus (80 percent) that global consortia will not threaten sound pedagogical values [Item 9]. (8) All items within this theme are viewed as "important" and are expected to occur before 2010.

Table 5.9 - Level of Consensus – Competitive Market Conditions

		Probability			Importance			Timing**		
Table 5.9			%	%		%	%		%	%
Item	Statement	N	Low	High	N	Low	High	N	Soon	Late
9	Higher education provided online by large global institutions, consortia, and/or corporations will threaten sound pedagogical values.	46	80	20	42	20	80	42	88	12
12	Universities and colleges will be obliged to respond to industry's (commerce) demand for training at the workplace and "just-in-time" online employee training.	50	10	90	48	10	90	49	100	0
19	On-campus, full-time undergraduate degree programs will thrive despite the availability of other options that will be principally online.	52	4	96	51	2	98	43	70	30
34	Major textbook publishers and online learning software developers will build strong corporate partnerships for the marketing of virtual "textbooks" integrated with instructor-customized course material.	48	2	98	47	0	100	48	92	8

		Probability			Importance			Timing**		
Table 5.9			%	%		%	%		%	%
Item	Statement	N	Low	High	N	Low	High	N	Soon	Late
45	Market analysis of online higher education and training programs will be essential where public and for-profit organizations compete aggressively.	49	0	100	46	0	100	46	96	4
46	Online education will be dominated by the 'for-profit' sector of higher education at the expense of brick and mortar campuses.	48	73	27	47	11	89	36	78	22
49	Large universities and corporate competitors with high brand recognition or demonstrated "value-added" services and assessment models will dominate large sectors of the online educational market.	50	6	94	46	6	94	47	74	26
50	Public and private institutions will retain a competitive advantage over commercial (for-profit) providers in offering high quality, pedagogically sound online programming.	48	38	62 *	45	13	87	40	80	20
74	Corporate certification will compete favorably with university degrees in many job applications.	48	27	73	46	15	85	44	75	25
77	Many colleges, universities and polytechnics will face serious competition in their home territories from 'outside' institutions offering online education.	50	10	90	50	12	88	48	92	8

Notes.

* = Does not meet criterion for consensus
Strong Consensus = 90% to 100
Consensus = 80% to 89%
Minimum Consensus = 70% to 79%

**Soon = Before 2010
Late = 2010 or after

Large universities and corporate competitors with high brand recognition or demonstrated "value-added" services and assessment models will dominate large sectors of the online educational market [Item 49]. There is a consensus (94 percent) and a median panel rating of 3.00 over the claim that large universities and corporate competitors with high brand recognition or demonstrated "value-added" services and assessment models will dominate large sectors of the online educational market. As well, panelists think that within a decade, this will occur. A median panel and subgroup rating of 3.00 confirms this item important (Table 5.4). However, 23 percent of IT professionals rate this item as "improbable" (CD-ROM). Some IT panelists comment on this different view:

> I think cost, quality, convenience, and the education offerings desired, will drive this market more than name recognition.... [IT # 13, US]
>
> When one looks at e-business today, success is to a large extent due to customer service. Universities will need to pay more attention to customer service for online learning or the student (customer) will go elsewhere.... [IT # 15, US]

On the other hand, other panelists' comments confirm the probability and importance of high brand recognition or demonstrated "value added" services and assessment models [Item 49]:

> Brand has always been important in education....Would anyone *prefer* to graduat[e] from University of Phoenix if Berkeley offered the same program at the same price and in the same format? [IT # 8, Canada]
>
> Name recognition will confer a significant market advantage. Some organizations, without it will likely crack this market by offering superior products and excellent service, but they will be the minority. [Acad # 5, Canada]
>
> This could happen if they really want to do this...get it right, are financially competitive and are more open with respect to admissions etc.

> There's a lot of things that would have to be in place for them to dominate though. [Adm # 6, Canada]

Major textbook publishers and online learning software developers will build strong corporate partnerships for the marketing of virtual "textbooks" integrated with instructor-customized course material [Item 34]. There is almost unanimous strong consensus and a median panel rating of 3.00 over the statement that major text publishers and online learning software developers will build strong corporate partnerships for the marketing of virtual textbooks integrated with instructor-customized course material. IT professionals' median is 4.00 rating this outcome "highly probable;" the other subgroups' medians are "probable" (3.00) (Table 5.3). All the panelists rate a high importance and believe this will occur within a decade.

> Already being done. But instructor is generally reduced to being warm-ware since text provides, plans, tutorials, quizzes, even talk to the author--and if quiz is multiple choice then even marking is done. [Acad # 8, Other]

> This is likely to happen once publishers and others figure out a sustainable business model. The collapse of the [dot].com "banner ad" model is a problem today, but someone will figure out a way to make this work. [IT # 8, Canada]

Online education will be dominated by the 'for-profit' sector of higher education at the expense of brick and mortar campuses [Item 46]. There is a minimum consensus (73 percent) that it is "probable" online education will not be dominated by the 'for-profit' sector of higher education at the expense of brick and mortar campuses [Item 46]. There is much commentary on this, and a few comments confirm that brick and mortar campuses will not be undermined:

> There may be a slight shift in the relative prominence of on-line for profit education, but it's sheer hysteria to think that it will dominate brick and mortar campuses in the foreseeable future. [Acad # 5, Canada]

> ...I agree that Online will be dominated by for-profits. I do not think this will undermine brick and mortar. [Adm # 13, US]

> Just do not see this happening. Technology innovation is one thing, but no one really knows whether education-for-profit is a viable or sustainable thing. [IT # 8, Canada]

> [I]mprobable' for degree programs, but this may become an increasingly small fraction of the total education market. [Acad # 7, Canada]

> Those universities that succeed at online do it along a "for profit" economic model. The "for profit" sector right now is very young and un-developed. A mix of for profit online and for profit community learning centres is developing rapidly in India and other parts of Asia as the only affordable vehicle for mass higher education. [Acad # 14, Other]

> There are barriers to entry for for-profits and the hope is that the public sector will respond with good quality online offerings. [Adm # 9, Canada]

Universities and colleges will be obliged to respond to industry's (commerce) demand for training at the workplace and "just-in-time" online employee training [Item 12]. Although there are strong consensuses on the probability and importance (90 percent) and median panel ratings of 3.00 (on probability and importance) over the claim that universities and colleges being obliged to respond to industry's demand for training at the workplace. As well, fourteen (14) percent of administrators are the only respondents to rate this "improbable" (CD-ROM); yet they have the median timing to occur before 2005 (1.00) (Table 5.5, in appendix), unlike other subgroups with median timing of 2.00. There is considerable anxiety expressed in commentary.

> ....If by 'colleges' you mean community colleges then I see a difference between colleges and universities in this question. This is not what universities are good at, nor should they try to become good at it. Universities should concentrate on what they do best and what almost no one else does: basic, long term, foundational inquiry and education. But for community colleges the story is different....at least for many, for whom this is a proper role. [Acad # 5, Canada]
>
> If they don't feel so obliged to meet their learners where the learners are, they'll miss some lifelong learning opportunities. [Acad # 8, Other]
>
> It depends on the market niche a particular institution seeks to attract and retain. Research universities won't be obliged to respond. Community colleges and primarily undergraduate teaching universities will feel market pressure in this direction. [Acad # 14, Other]
>
> To remain competitive, industry will need to ensure continuous re-skilling of its workforce. Technology affords the best means of doing that. [Adm # 5, Canada]
>
> This is certainly happening and obviously is discipline related based on industry trends and demands. [IT # 8, Canada]
>
> [A]nd many won't, so there'll be an increasing role for private trainers. [IT # 19, Canada]
>
> Training instead of additional academic degrees is what employees need after their undergraduate degree. If Universities and Colleges do not provide this training, it will be provided elsewhere. This is true today and will become more of a need in the immediate future. [IT # 15, US]
>
> Administrators express their doubts:
>
> Colleges have been more responsive to demands and needs of industry but overall universities have been very slow to meet these kinds of needs. Other providers, likely private sector ones and some colleges, will address this major need. [Adm # 9, Canada]

> ....[T]he use of the term "training" is revealing. Universities are in the business of "educating." Training and education are not one and the same. Universities will need to decide what their core business is and the extent to which some of the traditional values of the academia are to continue to be valued....and, to the extent they are, find a balance between that and the "just in time. [Adm # 1, Canada]
>
> I'm not sure: this is something universities can choose to do or not through their extension areas. IT skills will certainly be demanded from all grads of universities. [Adm # 6, Canada]

Corporate certification will compete favorably with university degrees in many job applications [Item 74]. There is a minimum consensus (73 percent) and median panel and subgroup ratings of 3.00 that corporate certification will probably compete favourably with university degrees in job applications. As well, this is already happening according to some panelists, yet the panel thinks that this will occur within a decade, but others assert that certification will not compete with universities degrees but rather will complement them. However, 25 percent of academics, 25 percent of administrators, and 33 percent of IT professionals rate it "improbable" (CD-ROM). Some commentary emphasizes the distinctions:

> ....If they want short-term skills then certification is best, if they want educated creative people then choose university educated--some students already seek both to best their chances. [Acad # 3, Canada]
>
> I can't see a technical certificate holding the same weight as an undergraduate degree....Certificates could compete with some graduate degrees, however. Even so, many graduate degrees (and a lot of undergraduate degrees) such as art history, mathematics, and psychology for example, will not have equivalent corporate certificates....[IT # 13, US]
>
> There is a strong move in this direction already in the United States in the community college sector...where employers are distrustful of the value of a degree given by a college and prefer certification of specific skills and knowledge. I think this movement will extend to universities as

> employers feel that the kind of knowledge valued in the university is often what they regard as essential for their employees. [Acad # 5, Canada]
>
> This is happening already, at least in Europe. [Acad # 4, Other]

Many colleges, universities and polytechnics will face serious competition in their home territories from 'outside' institutions offering online education [Item 77]. There is a strong consensus (90 percent) and a median panel rating of 3.00 over the affirmation that many colleges, universities, and polytechnics probably will face serious competition in their home territories from "outside" institutions offering online education. The academics' median on this is "highly probable" (4.00), while the other subgroups' median is "probable" (3.00). The largest disagreement on probability occurs among the administrators, with 17 percent rating this as "improbable" (CD-ROM). In some countries this has already happened. As a Canadian IT professional comments:

> I think outside competitors will do best where they have a non-competing product or where the local product is weak. This is a gain for students and perhaps even ultimately the local institution. [IT # 19, Canada]

On-campus, full-time undergraduate degree programs will thrive despite the availability of other options that will be principally online [Item 19]. There is a strong consensus on the probability (96 percent) and the importance (98 percent) that on-campus, full-time undergraduate degree programs will thrive despite the availability of online options. Administrators attain the strongest consensus on the importance on this issue (median 4.00), IT professionals' median is 3.5 and academics' median is 3.00. As well, panelists believe that on-campus, full-time undergraduate degree programs will continue to thrive. Some commentary:

> This is part of the transition process - the inevitable mix of cultures. [Adm # 5, Canada]
>
> On-campus and online are NOT mutually exclusive! [Adm # 16, Canada]
>
> There are many important benefits of on-campus programs for this target learner group including the social life of campus and their growing independence. They may want to take a portion of their courses online for convenience. [Adm # 9, Canada]
>
> ...[T]hrive may be an overstatement, but this form of learning will certainly continue to appeal to many and will coexist with on-line...part-time learning; many will combine the two at their convenience. [Acad # 5, Canada]
>
> Full-time undergraduate study is already only the domain of the economic elite. Online solutions [were] adopted by governments as a way of providing universal H.E...access will exacerbate this situation. [Acad # 14, Other]
>
> I don't see on-campus, full-time u-grad programs being massively threatened by online for the foreseeable future... [IT # 8, Canada]
>
> Thrive may be too strong, but I certainly expect them to survive and serve a distinct role (<10 yrs). [IT # 19, Canada]

Higher education provided online by large global institutions, consortia, and/or corporations will threaten sound pedagogical values [Item 9]. There is a consensus (80 percent) and a median panel and subgroup ratings of 2.00 that global consortia will not threaten sound pedagogical values. Seventy-three (73) percent of academics, 81 percent of administrators, and 78 percent of IT professionals rate this item as "improbable" (CD-ROM). Some panel commentary address this issue as not probable:

> Overall I think that the underlying premise of traditional universities good and new providers of education like corporations and consortia bad is baseless. . . .quick profit may initially attract some fly-by-nighters and it will take a few years to shake them out...Then I think that there won't be much correlation between quality and form of ownership. [Acad # 5, Canada]

. . . . 'Sound pedagogical values' rarely make it into practice, no matter what the technology or the provider. Some will be very good, and some will be very routine. At the same time that we are seeing the rise of 'constructivist' principles, we're still in the grip of "back to basics" in the schools, and many online or home schooling programs are very lockstep. I question how many corporations will find it worth their while to offer university level courses. I think assessment and professional certification will be more marketable (the case so far). So, I think sound assessment principles might come into play more than other specific pedagogical values. I do think online H[igher E[ducation] threatens the traditional maturational student development role of education providers.
[Acad # 14, Other]

These organizations will have the resources to create high quality products thus making competition with existing institutions a non-issue. In other words, existing institutions will not have the resources to compete.
[Adm # 5, Canada]

Pedagogy won't be threatened, but some institutions may be.
[Adm # 6, Canada]

I don't believe there has been evidence to date that offerings by these providers are of inferior quality in terms of the pedagogy. If the quality is poor, learners will vote with their feet/wallets. [Adm # 9, Canada]

Quite the contrary. These institutions are likely to enhance pedagogical values. [Adm # 13, US]

I expect there will be more emphasis on sound pedagogical values than there is now in traditional education. Some of the advantages of face-to-face and locally mediated education will be lost, but that doesn't mean there can't be lots of sound pedagogy in big-time on-line higher education.
[IT # 19, Canada]

I believe that, to be successful, alternate providers will have to provide sound pedagogical courses. [IT # 13, US]

By contrast, some panelists believe that global consortia will threaten sound pedagogical values.

There will be more of this, but I think the focus will be more on "training" for job-related skills (but increasingly advanced and complex skills).
[IT # 8, Canada]

> Large or small - neither are necessary indicators of the quality of learning experience. . . ..the institution provides. So much depends on what the institution prides itself on. If a large institution is committed to providing students in large courses with access to tutors on a manageable tutor to student ratio, there is no necessary reason to expect that the learning experience will suffer. . . .(or not). Small or large is not the issue - the commitment to providing students with the resources that predict success will determine the "threat" factor. [Adm # 1, Canada]

Public and private institutions will retain a competitive advantage over commercial (for-profit) providers in offering high quality, pedagogically sound online programming [Item 50]. There is 38/62 division (no consensus) and a median panel rating of 3.00 on the belief that public and private institutions will retain a competitive advantage over for-profit providers in offering high quality pedagogically sound online programming. Only sixty-two (62) percent of panel considered this "probable." There is disagreement within subgroups also; for instance, academics have a 50/50 division in "probable" versus "improbable," confirmed by the (2.50) median. The panel's and other subgroups' medians are "probable" (3.00) (Table 5.3). As well, fifty-four (54) percent of the IT professionals and seventy-four (74) percent of the administrators believe it to be "probable." Administrators achieve a minimum consensus among them (CD-ROM). Commentary gives some reasons for such an advantage:

> The advantage existing institutions have over commercial providers is the tremendous investment already made in the infrastructure of learning and administering education, and the legitimacy that experience conveys....[IT # 13, US]

> Name recognition will confer some advantage, but consumers will not care whether the provider is a profit or not for profit organization.... [Acad # 5, Canada]

Other panelists qualify their reasoning:

> Only if they work on maintenance of client-relevant quality and research status" Only employees of the not for profit sector are obsessed with that distinction. Acad # 8, Other]

> No. I don't think that non-profit institutions necessarily have a lock on good pedagogy. [IT # 8, Canada]

> Some commercial providers already excel. There is nothing to suggest they must be second rate--although some will. [IT # 19, Canada]

Market analysis of online higher education and training programs will be essential where public and for-profit organizations compete aggressively [Item 45]. There is unanimous agreement and a median panel rating of 4.00 over the declaration that market analysis for online higher education is "probable," "important" and will become essential when public and for-profit organizations compete aggressively. This prediction confirms Noble's (1998) fear of a "commodification" through ICT. In some cases this has already occurred, yet one individual comments:

> As cost to produce and support declines, this might become less important. Right now, most institutions have a hard time coming up with meaningful market projections. [Acad # 14, Other]

Means

Nine of the ten items reach a consensus. The entire panel scores these items as "probable," "important" and likely to happen soon. The differences between subgroup scores are small. IT professionals had the earliest expectation on timing (1.65) but all score before 2010.

Table 5.1(d)

Means - Competitive Market Conditions

Subgroup	Ratings	Sum of Scores	N	Means
Academics	Probability	350	123	2.85
	Importance	333	114	2.92
	Timing	204	118	1.73
Administrators	Probability	640	232	2.76
	Importance	638	223	2.86
	Timing	344	202	1.70
IT professionals	Probability	359	134	2.68
	Importance	369	131	2.82
	Timing	203	123	1.65
Entire Panel	Probability			2.76
	Importance			2.86
	Timing			1.70

Summary on Competitive Market Conditions

In sum, the focus of a higher education institutions,' mission will remain within traditional settings and regions of influence, but institutions can expect increased web-based competition from a global online market. Some panelists assert that some Provincial/State higher education institutions are already competing beyond their traditional regions (some globally), but others contend that any 'dream' of extra dollars from a global market will be short-lived. Geographic reach alone will not define market competition during 2005 to 2015; universities and colleges will have to face competition as to price and quality in a global arena interconnected by the web. Some (not all) universities and colleges will provide skill employment education for the workforce. But universities will have to defend the freedom to pursue long-term, foundational inquiry and education in the face of government's increasing demand for a focus on economic goals. Participants agree that full-time on-campus degree programs will thrive in competition with online education and certificate granting systems. The on-campus collegial experience is recognized as a transition for learners, providing a social life and a move towards a growing independence. Residency may become too expensive for most students and full-time residency may be reduced to one or two years. Panelists expect heavy competition from online university/corporate consortia but do not anticipate a lack of quality in this online education. Strong tutorial support is seen as crucial.

Globalisation/Internationalisation Issues

In this theme I explore the influences of ICT in the global arena of higher education. These items address whether the reach of universities will expand internationally because of ICT. Six findings stand out from the data in Table 5.10: (1) Three of the eight items do not achieve any level of consensus on the issues of higher education operating globally [Items 10, 47, 48]. (2) There is a strong consensus (96 percent) that, faced with competition at home, enterprising higher education institutions may market specialty programs globally [Item 51]. (3) There is strong consensus (98 percent) that ICT will challenge the mandates of institutions as to how far geographically their mission extends [Item 85]. (4) There is a strong consensus (96 percent) that trans-national agreements on software and telecommunication standards probably will emerge [Item 60]. (5) Most of the issues on the globalising influences of ICT will happen soon, before 2010. (6) All topics are seen as "important"; two achieve a 100 percent consensus [Items 60, 85].

Table 5.10 - Level of Consensus – Globalisation/Internationalism

		Probability			Importance			Timing**		
			%	%		%	%		%	%
Item	Statement	N	Low	High	N	Low	High	N	Soon	Late
10	Higher education provided online by large global institutions, consortia, and/or corporations will undermine the stability of many traditional higher education institutions.	48	54*	46	43	16	84	42	79	21
47	Well-financed university consortia, operating globally, will seriously challenge individual institutions.	49	35	65*	47	15	85	40	68*	32
48	Eventually those institutions that hold back from competing internationally in online education will be forced to respond, high overheads notwithstanding.	45	62*	38	40	22	78	32	69*	31
51	Facing competition for their core business, enterprising higher education institutions will organize and market their specialty programs worldwide via the Internet using linkages with other institutions and organizations.	50	4	96	48	4	96	47	89	11
54	The educational market will be global; educators will be more inclined to think of competing beyond provincial/state or regional markets.	50	6	94	47	4	96	47	79	21
60	Trans-national agreements on software and telecommunication standards will emerge.	47	4	96	44	0	100	47	83	17
65	Some institutions will overreach to serve large international markets, and then will not have the resources to service students well.	46	17	83	40	12	88	39	97	3
85	Online higher education will challenge the mandate of colleges and universities about how far geographically their mission extends.	46	2	98	44	0	100	45	93	7

Notes. * = Does not meet criterion for consensus

Higher education provided online by large global institutions, consortia, and/or corporations will undermine the stability of many traditional higher education institutions [Item 10]. There is a 54/46 division and a median panel rating of 2.00 over the notion that higher education provided online by large global institutions, consortia, and/or corporations will undermine the stability of many traditional higher education institutions. The jury is still out; only 54 percent of the panel rate this "improbable." Administrators' and panel medians (2.00) are also "improbable;" however, academics' and IT professionals' medians are "probable" (3.00) (Table 5.3, in appendix). There is a consensus (79 percent) on timing before 2010, confirmed by the medians (2.00) (Table 5.5, in appendix). Several points of view are expressed in the commentary:

> This is starting to happen already, and self-examination (even if comes from a threat) is not a bad thing. [IT # 19, Canada]

> The threat may well be from other 'traditional' institutions (MIT, Stanford) which encourage more online learning than those threatened. [Adm # 16, Canada]

> I'm not sure I'd say "many" institutions will be undermined, but some will. One might argue that the global corporations are but one of several threats to those universities. [IT # 8, Canada]

> I'm in a "wait and see" mode on this point....Factors that I would be taking into account if I were a student choosing an institution: cost; reputation of the institution; employability of graduates; acceptance in graduate programs....[Adm # 1, Canada]

> The increased competition will impact institutions, particularly ones that do not have a name brand or other clear advantage and do not adapt. [Adm # 9, Canada]

> [S]tability is likely to be built on more that[n] *sic* flexibility—important though it is—likely service and name will win out.

Some panelists believe there will be a mix of online and face-to-face education. However one panelist believes successful online programs will be developed by consortia.

> The timeframe here is important. The word now is for a mix of on-line and campus-based. As we move forward, on-line will capture more and more learners. [Adm # 5, Canada]

> Count on a mix of some [percent] of young students wanting the campus experience, some inertia and some status criteria! [Acad # 8, Other]

> ...I believe that the traditional higher education institutions will continue to provide primarily face-to-face programs and courses, and will continue to serve most of the group of learners that they currently serve. Currently, many of these traditional institutions are offering some courses and programs online on a "pilot" basis. I believe that most of these pilots from "traditional" institutions will end up either failing, or developing into consortia in which many traditional institutions collaborate to provide a single online "face." [Adm # 10, Canada]

Finding an online market niche will be necessary.

> ...many traditional institutions may have difficulty during a transitional period until institutions find their own niches in a new market structure, and some may not survive. [Acad # 5, Canada]

By contrast, one panelist believes there will be an increased demand for traditional on-campus education.

> I believe that for the foreseeable future there will continue to be a steady, if not increasing, demand for traditional, on campus higher education. The niche for online learning will be primarily graduate study....(which will continue to be heavily provided by traditional institutions, perhaps in collaboration with alternate providers)....[IT # 13, US]

<u>Well-financed university consortia, operating globally, will seriously challenge</u> individual institutions [Item 47]. There is a 35/65 division and a median panel rating of 3.00 over the contention that well-financed university consortia, operating globally, will seriously challenge individual institutions. A majority of panelists (65 percent) rate it as

"probable" that global online consortia will seriously challenge individual institutions, but no consensus is attained. Disagreements occur within and between subgroups: Academics split 50/50, while 67 percent of administrators and 54 percent of IT professionals rate this as "probable" (CD-ROM). Some panel commentary on this challenge by consortia to universities and colleges is:

> Such [online] consortia will add an option and may make significant contributions in a few situations, but overall will not be a major factor [Acad # 5, Canada]
>
> Improbable if you're talking about consortia of traditional universities. Very probable if you're talking about consortia of for-profit organisations. Universities have so far been too protective to collaborate effectively. [Acad # 14, Other]
>
> These consortia may be useful for specific markets, but not generally in North America. [Adm # 6, Canada]
>
> Will threaten SOME individual institutions. [Adm #13, US]
>
> Coming soon--the trick will be to see how local institutions interface with and use and add value to what the consortia offer. [IT # 8, Canada]
>
> Geez. The University of Canada versus the University of the USA. Who will win? [IT # 19, Canada]
>
> I don't think universities will be able [to] collaborate that fully together. A consortia will presumably offer online courses collectively and, again, I believe online courses will not threaten solid individual institutions. [IT # 13, US]

<u>Eventually those institutions that hold back from competing internationally</u> in online education will be forced to respond, high overheads notwithstanding [Item 48]. There is no consensus and a median panel rating of 2.00 on the probability that when institutions hold back from competing in online internationally, they will be forced to respond eventually, but sixty-two (62) percent of the panel rate this "improbable." There

is a consensus that this issue has "high importance" and will be relevant before 2010. Administrators and IT professionals agree on the median ratings "improbable" (2.00), but academics' median is "probable" (3.00) (Table 5.3). However, only 55 percent of the academics rate the outcome as "probable." By contrast, only 25 percent of IT professionals and only 36 percent of administrators rate it "probable" (CD-ROM). IT professionals achieved an "improbable" consensus among them. Some commentary from administrators and IT professionals expresses their doubts.

> But, they may respond in unanticipated ways such as wanting to market and sell the idea that existing models of education are far superior forms of education than on-line models. [Adm # 5, Canada]

> Some institutions will find other niches and excel in those. [Adm # 6, Canada]

> Keyword is "internationally." I don't think all institutions will compete beyond regional borders. Adding online to traditional approaches is inevitable, but going global isn't....[IT # 19, Canada]

Academics make similar points:

> ...Not everyone will have to get into this market. The point will be to do it well on a substantial scale or concentrate on other markets. [Acad # 8, Other]

> [I]f they earned and currently keep a good enough share of the overall 'market' to survive well, that may be enough to deal with. [Acad # 5, Canada]

> It depends. If an institution is well positioned in a high-touch niche market for on-campus learning, it should be able to continue in that mode...though for an increasingly financially elite market. Not every institution has unique content or pedagogical strengths to offer, and as online becomes more scalable, the number of competitors in that market is bound to coalesce down to a few big international providers. [Acad # 14, Other]

<u>Facing competition for their core business</u>, enterprising higher education

institutions will organize and market their specialty programs worldwide via the Internet using linkages with other institutions and organizations [Item 51]. There is a consensus (96 percent) and a median panel rating of 3.50 that faced with competition for their core business, it is "probable" that enterprising higher education institutions will organize and market their specialty programs online. Academics' median rating of 4.00 concur this item "highly probable." Canadian panelists see this as current practice and assume it will accelerate, but there is skepticism.

> Yes, but so few universities are sufficiently enterprising -- especially in these new commodities. [Adm # 6, Canada]
>
> This is a more likely role for the traditional sector! [Acad # 14, Other]
>
> Some will, but most will eventually realize that tending to their core business on which they have a competitive advantage will be their most important priority. [Acad # 5, Canada]
>
> Online learning will not threaten the core business of higher education, no more than the introduction of business college programs threatened liberal arts colleges. [IT # 13, US]

<u>Online higher education will challenge the mandate of colleges and universities</u> about how far geographically their mission extends [Item 85]. Before 2010, universities and colleges mandate will be challenged about how far the geographical reach of their missions extends [Item 85]. Academics' believe this will occur before 2005 (Table 5.5, in appendix). This forecast achieves 100 percent consensus on "high importance" and a 98 percent consensus on "high probability." The panel and subgroup medians are "highly probable" (4.00), except for administrators, who are slightly more cautious and rate a wider geographical mission as "probable" (median 3.00). The difference may reflect administrators' hard experience with influential stakeholders, e.g., politicians. Two

comments reflect the current situation in Canada.

> Already the case. [Adm # 6, Canada]
>
> ....just look at BC [British Columbia] and the blurring of the mandate of OLA [Open Learning Agency] when many more public post secondary institutions are offering on line higher education....[Adm # 14, Canada]

Trans-national agreements on software and telecommunication standards will emerge [Item 60]. There is a strong consensus, 96 percent, and a median panel rating of 3.00 that trans-national agreements on software and telecommunication standards probably will emerge before 2010. This item achieves a 100 percent consensus on "high importance." Academics' median is "highly probable" (4.00) and IT professionals' median (3.50) almost as high. There are organizations which have been established to encourage adoption and application of international Internet standards.

> The Standards Council co-ordinates the work of two prominent voluntary international standards development forums - the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). These two bodies publish standards in a wide variety of fields, including information technology. ISO and IEC standards are often adopted by countries as voluntary standards, or included in national rules and regulations. Many trade agreements, including the World Trade Organization (WTO), call upon signatories to adopt international standards wherever possible. The Standards Council encourages the adoption and application of international standards.[4]

At the technical and developmental level, Internet standards are developed by the Internet Engineering Task Force and ultimately promulgated by the Internet Society as international standards.[5] Yet, with over 150 organizational and 6,000 individual members in over 100 countries, reaching agreement on anything will be a challenge!

The educational market will be global; educators will be more inclined to think of competing beyond provincial/state or regional markets [Item 54]. There is a consensus (94 percent) and a median panel rating of 3.00 for a "high probability" that educators will be inclined to think of competing beyond provincial/state or regional markets when the educational market is clearly global. IT professionals consider the proposition as "highly probable" (median, 4.00), while the other subgroups consider it "probable" (median, 3.00). The difference in rating may be explained by the fact that IT professionals have become accustomed to thinking of ICT use in global terms whereas administrators are faced with the reality of budgets. Panelists confirmed that competing beyond provincial/state or regional markets has already happened.

> True right now. [Adm # 6, Canada]
>
> Already happening in significant ways. This is not all to do with being on-line, but that has its own role to play. [IT # 19, Canada]
>
> Continuing studies today. [IT # 8, Canada]

Two academics have some doubts.

> This assumes that the world is waiting for the American dream; instead localization and the realities of different and complex cultures will make this dream of $$s short-lived. ...Colleges may look to a single program in a single place but we have yet to develop local cooperation so that going abroad when you haven't secured your local turf will be a problem. [Acad # 3, Canada]
>
> We have yet to see the impact of failures or unwanted difficulties in going global especially with smaller institutions. [Acad # 8, Other]

Some institutions will overreach to serve large international markets, and then will not have the resources to service students well [Item 65]. There is a consensus (83 percent) and a median panel and subgroup ratings of 3.00 it is "probable" that some institutions will overreach to serve large international markets, and then will not have the resources to service students well. As well, this issue is rated (3.00) "important" thus the panelists and subgroups think within a decade some institutions will overreach to serve large international markets, and then will not have the resources to service students well. Here is some panel commentary on overextending in the market:

> I think this is a natural tendency in post-secondary education. And to a great extent funding mechanisms encourage this behaviour.
> [Acad # 5, Canada]

> Governmental bodies, as in the UK, are beginning to audit these ventures to ensure degrees from their institutions represent quality.
> [Acad # 14, Other]

> Not likely to be a significant problem; however, some will certainly overextend their reach. [Adm # 1, Canada]

> ...highly important that institutions NOT overextend! [Adm # 5, Canada]

> There is some danger that this will happen. [Adm # 6, Canada]

> Sure we are going to see failures to make a go in this area, but so what--this is nothing new. [IT # 19, Canada]

> The marginal cost of serving large international markets need not be high; therefore, students should be no worse off than without an international market. [IT # 13, US]

<u>Means</u>

Five of the eight items within this theme attain a consensus. The panel and subgroups scores these items as "probable," with academics (means, 3.21) scoring slightly higher probability than the IT professionals' "probable" means of 3.04. All subgroups and panel scores are "important," and likely to occur within a decade. The academic subgroup has the highest mean on importance (3.21). The timing scores were similar, but IT professionals' score timing slightly later yet before 2010.

Table 5.1(e)

Means of Theme - Globalisation/Internationalism

Subgroup	Ratings	Sum of Scores	N	Means
Academics	Probability	315	98	3.21
	Importance	286	89	3.21
	Timing	177	90	1.97
Administrators	Probability	545	180	3.03
	Importance	543	170	3.19
	Timing	316	159	1.99
IT professionals	Probability	230	103	3.04
	Importance	293	94	3.12
	Timing	183	90	2.03
Entire Panel	Probability			3.08
	Importance			3.18
	Timing			1.92

Summation on Globalisation/Internationalism

Panelists expect that there will be serious challenging competition from national and global consortia in online education; corporations and institutions will be involved. However, panelists do not anticipate that institutions with a solid reputation will be undermined or that on-campus face-to-face education will lose its attraction for young people. Nevertheless, competition from large well-financed institutions or consortia is seen as a potential threat, and some weaker institutions may fail financially. There is skepticism about a university attempting to attract a large enough student body to make a global market a profitable source of revenue. There is agreement that challenges by online consortia in higher education will probably happen sooner, before 2010. Trans-national agreements on ICT standards will emerge and are "important."

There is a strong consensus among the panel that global, online education will challenge universities and colleges about how far their missions extend geographically. When faced with competition for their core business, enterprising higher education institutions will organize to market their specialty programs worldwide. The panel reached consensus (94 percent) that, when the market is global, educators may be inclined to think beyond provincial/state or regional markets. On the other hand, there is commentary that educational institutions are not all that enterprising. In Canada, panelists consider it "improbable" that international programs will get government funding. There are sharp differences about whether or not large online consortia will undermine the stability of many higher education institutions. A slim majority holds that as unlikely, but the threat is not discounted; panel commentary held that only those institutions not solidly grounded in fundamentals, their specialty, or their reputation will be undermined. No consensus exists that those institutions which hold back from online education eventually will have to compete.

A reluctance to compete and operate globally will prevail in academia despite the probability that the educational arena will be global and interconnected by the web. After all, the advantages of the collegial experience and tradition cannot be replicated on the web. However, large, reputable universities will have to decide soon whether or not to join in the formation of an online consortium with other universities and possibly one or more corporate partners.

CHAPTER SIX: RESULTS

FACULTY AND STAFF ISSUES

Under this Faculty and Staff section I clustered items under the following themes:

- Job security and rewards
- Roles of faculty and staff
- Intellectual Property

Job Security and Rewards

In Chapter 1, I described the context in which this research is set. I outlined the stress that occurred in business as it changed to meet the challenges of a knowledge-based economy. There were abrupt layoffs of workers who had every reason to expect continued employment. Academia faces the same problem. Possibly it can limit some of the damaging consequences experienced by business, but to do so will require long-range planning and careful management. Two factors, both unplanned, may work in the academy's favour: a greying professoriate and an increasingly internet-savvy student population. As to the first, US universities are now faced with the retirement of two-thirds of their existing faculty by 2009 (Chronister & Truesdall, 1991; Bowen & Schuster, 1986). As to the second, as outlined by Hackman (1992), a more diverse, well-educated, technologically savvy, doctoral level student body could fill the vacated faculty positions. They would provide an upcoming Internet-savvy young professoriate and, in due course, new leadership in academia. Long term planning of retirement and recruitment policies may lead to streamlining and updating of educational institutions without stress on faculty and staff. This is not to say that "techies" will predominate, far from it. Scholarship is crucial and will remain at the core of universities.

Six things stand out from the data in Table 5.11: (1) All items in this theme achieve levels of consensus on importance and these ratings are reconfirmed by medians of 3.00 (Table 5.4). (2) The concern that job loss would result from ICT is rated "improbable" (82 percent), but there is a consensus that this issue is "important" and needs to be addressed [Item 39]. (3) There are strong levels of consensus on probability (95 percent), importance (95 percent) and timing that ubiquity of the Internet will protect users against vulnerability to control by any group [Item 37]. (4) There is no consensus as to whether or not ICT will help professors in remote colleges overcome a sense of isolation [Item 69]. (5) Issues concerning improved rewards for teaching online receive a minimum consensus (73 percent) on probability, but much skepticism is expressed in commentary [Item 28]. (6) All items achieve a level of consensus on timing before 2010, except on the loss of important staff members to no-name schools [Item 41].

Table 5.11

Level of Consensus – Job Security and Rewards

		Probability			Importance			Timing**		
			%	%		%	%		%	%
Item	Statement	N	Low	High	N	Low	High	N	Soon	Late
23	IT skills needed to design and produce electronic-based learning (elearning) will be highly valued and well rewarded within higher education institutions	48	27	73	46	6	94	44	89	11
24	A global shortage of qualified IT personnel will call for extended training in IT for both faculty and staff.	50	30	70	43	23	77	41	95	5
28	Improved rewards (financial, tenure, and other perks) will entice well-qualified academics to teach online.	52	27	73	48	15	85	46	87	13
37	Our vulnerability to control of IT and Internet technology by any group, will be mitigated by the Internet's ubiquity.	41	5	95	40	5	95	29	100	0
39	Faculty at public institutions will experience job loss due to a shift to online education.	49	82	18	47	30	70	28	71	29
41	Public institutions will lose important staff members when the mean salaries of faculty employed by "no name" online schools, grow to exceed the salaries and perks of "first tier" institutions.	47	72	28	42	24	76	31	65 *	35
69	Universities and colleges in remote locations will retain high quality faculty because IT and the Internet will help professors overcome a sense of isolation.	41	39	61 *	37	13	87	33	85	15

Notes.

* = Does not meet criterion for consensus
Strong Consensus = 90% to 100
Consensus = 80% to 89%
Minimum Consensus = 70% to 79%

**Soon = Before 2010
Late = 2010 or after

Faculty at public institutions will experience job loss due to a shift to online education [Item 39]. There is a consensus that it is "improbable" that faculty at public institutions will experience job loss due to a shift to online education:

> This will likely be rare. Online education will handle some of the growth in demand. [Acad # 5, Canada]
>
> ....[I]t's highly important that job loss NOT be the consequence. Good online teaching requires the input of good faculty. [Adm #1, Canada]
>
> Shift in job definition is likely e.g., becoming content providers and less involved in actual teaching. [Adm # 5, Canada]
>
> Quite the reverse. New opportunities breed opportunities. [Adm # 6, Canada]
>
> There will be some shifts among institutions and providers but overall with the looming faculty shortages, faculty will continue to be employed. [Adm # 9, Canada]
>
> [I]n ...[2001] the provincial common agreement with faculty in BC's [British Columbia's] public Colleges/Institutes/ University Colleges, there was a clause negotiated in the provincial agreement ensuring that there would not be any job loss due for faculty in BC's public institutions due to online course delivery...so with strong provincial unions I don't see this happening. [Adm # 14, Canada]
>
> Job loss or attrition? If the former, no. Can you imagine professors [not] being hired because we can replace them with the web?....Remember that most faculty do research as their primary function, so reduced teaching load could be a bonus, not a reason to get fired. [IT # 8, Canada]

By contrast, non-North American panelists have a different view.

> More 'gypsy' tutors who are cheaper and more flexibly employed (part-timers) will be sought. [Acad # 8, Other]
>
> This will happen at first -- later the shift will result in increase of jobs, but new skills and abilities will be claimed. [Acad #4, Other]

Our vulnerability to control of IT and Internet technology by any group, will be mitigated by the Internet's ubiquity [Item 37]. There are strong consensuses on the probability (95 percent) and importance (95 percent) and timing (100 percent) for the claim that the Internet's ubiquity mitigates our vulnerability to control of IT and Internet technology by any group. Almost all panelists agree that ubiquity of the Internet will mitigate against its control; respondents see the net's freedom as an essential feature.

> I agree. . . .It is a great strength of the Internet. . . .It reminds me of Orwell's comment about how democratic the introduction of the repeating rifle was. In contrast to the previous technology, the single shot musket, which was very centralizing, the repeating rifle made it possible for individuals or small groups to defend themselves. Similarly, IT makes it possible for individuals and small groups to maintain their independence. [Acad #5, Canada]

> As we become dependent on a technology, our vulnerability (economic, etc) to its loss increases. In the case of the Internet, it's not so much an issue of 'control by any group' as it is vulnerability to technological failures that might occur at key hubs and/or widely due to anything from more potent viruses to natural disasters. [Acad # 14, Other]

This last comment strikes at an important and current issue, as a vulnerability to technological failure does exist now.

Universities and colleges in remote locations will retain high quality faculty because IT and the Internet will help professors overcome a sense of isolation [Item 69]. There is no consensus, but a majority of sixty-one (61) percent rate it probable that universities and colleges in remote locations will retain high quality faculty because ICT will help professors overcome a sense of isolation. Disagreements between subgroups are reflected in the medians; IT Professionals believe this "improbable" (median, 2.00), but academics and administrators think it "probable" (median, 3.00) (Table 5.3).

> That may have been the case a few years ago, but ...connectivity is such an expectation any more that I don't think it's viewed by faculty as anything special. I don't think a faculty member is going to go to Podunk just because he can get on the web there. The Internet may help small

departments attract faculty more than it helps large departments in remote locations. [IT # 13, US]

Doesn't sound like a recruiting ploy that will work. [Acad #3, Canada]

When you get up from your computer you still crave interesting surroundings, people and amenities, . . .and the [I]nternet won't substitute for that. [Acad # 5, Canada]

. . . .In the poor countries, remote institutions will become still more remote and isolated, because they don't have the facilities to buy expensive IT stuff or connect to the Internet . . .(either due to high costs, or bad lines that are much too expensive to be modernized.)
[Acad # 4, Other]

[W]hether faculty can be retained in remote locations will depend, in part, on quality of life issues. . .(cultural opportunities, educational opportunities for children, and so forth). [Adm # 1, Canada]

Depends on how remote. Generally, people do not like 'remote'.
[Adm # 5, Canada]

There are other reasons that will offset the impact of the Internet on their sense of isolation that will mean faculty shortages in remote areas.
[Adm # 31, Canada]

Happening right now. [Adm # 6, Canada]

Public institutions will lose important staff members when the mean salaries of faculty employed by "no name" online schools grow to exceed the salaries and perks of "first tier" institutions [Item 41]. There is a minimum consensus (72 percent) and a median panel rating of 2.00 on the contention that public institutions will not lose important staff members to "no name" online schools. All subgroups agreed this is "improbable." Again, there is much commentary from the Canadian educators:

All indicators show this is true of higher education in general--so IT is making everything democratic and cheap? [Acad #3, Canada]

This is unlikely because first tier institutions have the greatest market advantage in the competition that is likely to occur. . . Possibly a few no name schools will be able to pay a lot but this will be the exception rather than the rule. [Acad #5, Canada]

It is conceivable that high quality consortia will be created and attract star faculty to increase credibility, legitimacy and assure high quality learning. [Adm #5, Canada]

Then public institutions have to show the benefit of working there. [Adm #6, Canada]

I don't think that public institutions will lost staff members, but many of their staff members will be moonlighting for online institutions. . . .(To some extent, they already are). [Adm #10, Canada]

Not all online institutions will look alike according to one panelist.

I have seen no compelling evidence that online schools will earn that much more money than traditional institutions. . . . In addition, this statement implies that all online schools will be of equal profitability when it is much more likely that the range of quality and revenue [of online schools] will be as varied as traditional higher education. I have no idea what online schools will look like, but I'm 100% certain they won't all look alike. [IT # 13, US]

Self-worth is a factor too.

[S]elf-esteem needs play out here. [Acad #8, Other]

It would take a lot of money to attract a *good* academic from a prestigious institution to Matchbook U. Sure, we all have our price, but we also have pride. [IT #8, Canada]

This is happening already. [Acad #4, Other]

<u>IT skills needed to design and produce electronic-based learning (elearning)</u> will be highly valued and well rewarded within higher education institutions [Item 23]. There is only a minimum consensus (73 percent) that IT skills for electronic-based learning will be highly valued and well rewarded within higher education institutions. IT professionals' median rating of 2.00 is "improbable" but academics and administrators, with a median rating of 3.00, view it as "probable" (Table 5.3). IT professionals appear

to have a lower expectation of satisfactory rewards than do other panelists. Perhaps the salary differential between the educational sector verses the business sector plays a role. (see CD-ROM for subgroup ratings). Commentary shows differences and concerns that these issues needs addressing now:

> True now. [Adm #6, Canada]

> [A]lready happening. Try persuading someone of the skills needed for quality audio productions! [Acad #8, Other]

> My guess is that this will be more or less true within the 2005-2009 timeframe. [IT #8, Canada]

> ...To date, most institutions in Alberta have recruited people with various baccalaureate backgrounds and some technical skill--pedagogy is not on the list, it is time it was;--being well-rewarded ...is a bit like technology specialists for 2002 --not until they are deemed essential.
> [Acad # 3, Canada]

> It's more the instructional design ...(pedagogical) than the IT skills that are increasingly in demand. The IT skills ...required are limited to using various software packages, and are relatively easy to acquire. Well-rewarded, hmm. Well, rewarded ...as well as regular academic work, anyway. Importance has to do ...with the importance of the shortage of people with these skills. [Acad #14, Other]

> Again, there is question as to whether existing institutions will have the resources to transit to this new environment. It is more likely that these will develop in partnership with corporations. [Adm # 5, Canada]

> I suspect some tendency in this direction, but universities are not prone to reward support skills very well. [Acad #5, Canada]

> Highly valued - yes. Highly reward[ed] - that's an issue universities need to address! NOW! [Adm # 1, Canada]

> IT skills ...are not going to compete at the upper echelon. Academic class structures will remain intact. [IT #19, Canada]

> The skills will be valued but not necessarily well remunerated. [IT #1, Canada]

....Highly probable that skills will be highly valued, but highly improbable that they will be well rewarded -- higher ed[ucation] never rewards anyone well. [IT # 13, US]

The preceding comments confirm that this issue is "important" and needs to be tackled now. Yet only a minimum consensus is achieved that these skills will probably be rewarded. The IT professionals have the greatest doubts that they will be well-rewarded.

A global shortage of qualified IT personnel will call for extended training in IT for both faculty and staff [Item 24]. There is a minimum consensus (70 percent) that a global shortage of qualified IT personnel probably will call for extended training in IT for both faculty and staff, and medians for the subgroups and panel of 3.00 (Table 5.3). There are more differences within the IT subgroup than in the other subgroups. Only sixty (60) percent of the IT professionals rate this outcome as "probable." By contrast, eighty-five (85) percent of the academics and seventy-one (71) percent of the administrators rate it as "probable" (CD-ROM). There is a strong consensus that a shortage of skilled personnel is likely to occur "before 2005" (median, 1.00) (Table 5.5, in appendix).

I'm not sure there will a problem. [P]eople and institutions adapt. [Adm #6, Canada]

As time progresses, more and more faculty and staff will have foundational IT skills and the IT products will be easier to use with less training. [IT # 8, Canada]

The supply of skills is responding to the demand (after all, the basic training is often only a two-year diploma). And software improvements are making the learning curve. . .easier and the production values better even for novices. Some training. . .is no doubted needed for those without IT expertise, but not 'extended.' [IT # 19, Canada]

> This is the case already in [my country], especially with personnel qualified in technical skills! [Acad # 4, Other]

> Let's define that word 'extended' first; as a grad level teacher I don't want to be trained in the minutiae of software, but DO give me access to a good IT person. [Acad # 8, Other]

> Like most shortages of skilled workers, if this one occurs market forces will result in its correction. [Acad # 3, Canada]

> Now by IT staff you mean? Ones with pedagogical skills or technical skills, or both? I wish it meant the first but I think the second is what will catch on--useful but uses the generalist vs. specialist model of instructor for a best done by teams assignment. [Acad #5, Canada]

> If we are short qualified IT personnel, ..it is highly unlikely that higher education will be able to (or would want to) train faculty and staff to take the place of qualified IT personnel. I think it is more likely the tasks will be outsourced at that point . . . [IT # 13, US]

> We're seeing more of this than we'd like to. . . I don't think it's "the" answer to the problem. The "shortage" is, in large part, due to the puny wages most universities pay IT and other technical specialists (And if the shortage is that severe, it is likely that many retrained faculty).
> [Acad # 14, Other]

<u>Improved rewards (financial, tenure, and other perks</u>) will entice well-qualified academics to teach online [Item 28]. There is a minimum consensus (73 percent) and median panel and subgroup ratings of 3.00 on "probability" and "importance" over the question of whether improved rewards (financial, tenure, and other perks) will entice well-qualified academics to teach online. Timing is rated to be soon (before 2010). Commentary expresses some differences on this issue:

> Well-qualified academics will teach online because they choose to do so because they like to, not because of improved rewards. Don't believe they will improve enough to make a difference. . . [IT # 4, US]

> I am not optimistic that universities will seriously recognize ANY contribution to teaching (as opposed to research). (Sorry to be pessimistic on this one). [Acad # 7, Canada]

> Right the opposite. Just as the best researchers can "buy" their way out of teaching now, research will continue to be the most rewarded academic activity. . . [Acad # 14, Other]

> I don't think the profitability is there to compensate online faculty more. My experience is that quality online courses are more expensive to deliver. . . .While we sometimes have lecture halls of 100 or 200 students, we have not found a way to have one professor handle 100 or 200 Internet students very effectively. Perhaps it's possible, but I haven't seen it. I don't think the improved rewards is that important because I've seen faculty enjoy this type of teaching as much or more than traditional teaching. . I've been fortunate never to have to lack faculty desiring to try this mode of delivery as long as I provide them with the requisite training and support.
> [IT # 13, US]

> Rewards will be necessary because online teaching is a lot of work and has fewer satisfactions for teachers than in person teaching. But it can be lucrative for institutions, and they will pay more for it if they have to in order to get good (and some well known) faculty to do it.
> [Acad # 5, Canada]

> There could be some real financial rewards for some stars, but on-line teaching will become normal. And you don't expect special rewards around what is normal. [IT # 19, Canada]

A skeptical comment from an administrator:

> Will depend on the institution. Where there are no rewards for teaching now, that will likely continue, no matter what the medium.
> [Adm # 6, Canada]

Means

Table 5.1(f). shows a considerable difference between the subgroups in scores on these faculty and staff issues. The IT professionals score the only "improbable" (means, 2.41), but academics (means, 2.84) and administrators (means, 2.67) attain "probable." All subgroups score this theme as "important," but IT professionals have a slightly lower importance score (means, 2.90). Subgroups respond that the items within this theme will happen sooner rather than later: academics (means, 1.76), administrators (means, 1.83) and IT professionals (means, 1.93).

Table 5.1(f)

Means - Job Security and Rewards

Subgroup	Ratings	Sum of Scores	N	Means
Academics	Probability	224	79	2.84
	Importance	225	72	3.13
	Timing	111	63	1.76
Administrators	Probability	414	155	2.67
	Importance	420	140	3.00
	Timing	218	119	1.83
IT Professionals	Probability	227	94	2.41
	Importance	264	91	2.90
	Timing	135	70	1.93
Entire Panel	Probability			2.64
	Importance			3.00
	Timing			1.84

Roles of Faculty and Staff

Here I investigate the influences of ICT in changing the roles of faculty and staff. Eight things stand out from the data in Table 5.12: (1) Six of the eight items within this theme attain a level of consensus. (2) All issues in this faculty and staff area are considered "important" and the majority of panelists rate time of occurrence before 2010. (3) There is no consensus that changing clientele will break down the notion of a community of scholars offering face-to-face education on-campus [Item 20]. (4) There is a 50/50 division over the probability that Internet-savvy professors will dominate instruction in most large universities [Item 26]. (5) A virtual global community of scholars in which time and space barriers having been eliminated is seen as already thriving due to ICT, there is 100 percent level of consensus on its probability [Item 21]. (6) Course content will be web-based and students will expect individualized tutorial support sooner (before 2010) [Item 11]. (7) Surprisingly, there is a strong level of consensus on the probability (99 percent) that ICT funding and training will be given priority within higher education institutions [Item 29]. (8) Not so surprisingly, there is a consensus that ICT will cause major professional and cultural change for faculty [Item 30].

Table 5.12 - Level of Consensus – Roles of Faculty and Staff

		Probability			Importance			Timing**		
			%	%		%	%		%	%
Item	Statement	N	Low	High	N	Low	High	N	Soon	Late
7	Internet-savvy professors will teach via the World Wide Web, but will rely on other professionals to re-design 'instructional' resources.	53	9	91	48	2	98	52	98	2
11	Course content will be web-based but students will expect individualized tutorial support, if needed.	53	6	94	50	2	98	52	100	0
20	The changing clientele of higher education will break down the notion of a community of scholars who offer face-to-face education on-campus.	51	59 *	41	45	22	78	40	68 *	32
21	A 'virtual' community of scholars will thrive due to IT and the Internet where time and space barriers will be eliminated.	52	0	100	52	4	96	51	82	18
25	Many IT and Internet savvy virtual professors will divide their time and energy among a variety of universities, consortiums, corporations and companies.	48	21	79	40	10	90	44	91	9
26	Internet-savvy professors will dominate instruction in most large universities.	50	50 *	50	44	25	75	37	65 *	35
29	IT and the Internet funding and training will be a priority within higher education institutions.	49	1	99	47	4	96	47	94	6
30	The use of IT and the Internet will result in major professional and cultural change for faculty (with respect to roles, teaching methods, work processes, avenues for recognition, and research opportunities).	51	6	94	49	2	98	48	85	15

Notes.

* = Does not meet criterion for consensus
Strong Consensus = 90% to 100
Consensus = 80% to 89%
Minimum Consensus = 70% to 79%

**Soon = Before 2010
Late = 2010 or after

The changing clientele of higher education will break down the notion of a community of scholars who offer face-to-face education on-campus [Item 20]. There is a 59/41 division and a median panel rating of 2.00 on the question of whether or not the changing clientele of higher education will break down the notion of a community of scholars who offer face-to-face education on-campus. The panel also does not reach consensus on timing. The panel reaches a minimum consensus (78 percent) that this issue is "important." However, a community of scholars is primarily concerned with research. The subgroups have internal disagreements. Sixty-nine (69) percent of the academics, 54 percent of the administrators, and 57 percent of the IT professionals rate this item "improbable," but no subgroup achieves a consensus on probability (CD-ROM). Commentary is as follows:

> The traditional notion of the campus community of scholars is already a changing concept. Communities of scholars are more and more internet-based and less and less campus-based. [Adm #5, Canada]
>
> And will be replaced in some cases by communities of scholars online etc. [Adm #6, Canada]
>
> [W]e still have a very small minority of students who prefer learning solely on line. . . .most like the combination of on line and classroom based. [Adm #14, Canada]
>
> Scholars already have a defined community that exists outside campus boundaries. This is not because of a changing clientele, however, but because American historians have more in common with other American historians than with biologists or even European historians. [IT # 13, US]
>
> Depends of meaning of breakdown: the scholars have a lot to protect! [Acad # 8, Other]
>
> What is a community of scholars that offers teaching?--Communities are built around research /scholarship interests. . .Whether there is face-to-face teaching is a different question. [Acad #3, Canada]

> Technology will facilitate the development of small communities of scholars with common interests; the down side of this will likely be segregation of learners into groups made up exclusively of like minded peers with reduced opportunity for exchange between people with differing viewpoints and perspectives. [Acad # 5, Canada]

> Communities of scholars tend to be more along discipline lines, and worldwide, already, rather than campus-based.... 'On-site research teams will continue to exist where special equipment is required, but will link with other sites. It has nothing to do with any sense of "changing clientele" because the "community of scholars" is defined more by research activity than by the teaching role. [Acad #14 , Other]

Internet-savvy professors will dominate instruction in most large universities [Item 26]. There is a (50/50) division and a median panel rating of (2.50) on the assertion that Internet-savvy professors will dominate instruction in most large universities. As well, panelists think that within a decade most professors will be well informed (if not savvy) about ICT, but scholars will continue to be at the centre of education in universities. The academics and IT professionals concur with the median "probable" (3.00), but the administrators' median is "improbable"(2.00) (Table 5.3, in appendix).

> This will become true simply through attrition as the "old guard" retires. [Acad #14, Other]

> Instruction will continue to be dominated by people who have expertise in their subjects. Increasingly these people will have some Internet expertise too. [Acad # 5, Canada]

> Driven by students who want greater flexibility, and professors who want less instructional time (more research time). Does dominate mean predominate—i.e. lots in numbers, or be in control? I doubt the latter. [Acad # 3, Canada]

> Probably about 10 years out. Probably inevitable. [IT # 8, Canada]

> Everyone will soon be internet-savvy. Will the most savvy of the savvy then dominate? Probably not. [IT # 19, Canada]

> To me this doesn't mean that they will be teaching online courses, but simply that I think it unlikely that most professors will not be Internet savvy. [IT #13, US]

> . . . .Will they dominate within the next five years - probably not. Will universities (should universities) be looking for this kind of background in future hiring ... yes. [Adm #1, Canada]

> Existing institutions have been slow to recognize the importance of these people. It's more likely that they will find greater success outside the institutions. [Adm #5, Canada]

> . . .depends on what you mean by "dominate": they will be one sector, and will likely push others to reconsider their approaches, and so may dominate the agenda to some degree. [Adm # 6, Canada]

> Large universities have been the slowest to change so this will take much time. [Adm # 9, Canada]

<u>A “virtual” community of scholars in which time and space barriers will be eliminated</u> will thrive due to IT and the Internet [Item 21]. There is a unanimous consensus that a “virtual” community of scholars in which time and space barriers will be eliminated will thrive due to IT and the Internet (Table 5.12).

> This was one of the first effects of the net. [IT # 19, Canada]

> This has already happened. [IT #13, US; Acad #8, Other; & Adm # 6, Canada]

> ....This has already happened. The speed and convenience of e-mail communication has made academic collaboration with partners around the world as easy as collaboration with colleagues at the same institution, with an office down the hall. [Adm # 10, Canada]

> Already required in most granting proposals. [Acad # 3, Canada]

> Certainly happening now to an extent, likely to increase in future, and generally a good thing. [IT # 8, Canada]

> Not eliminated, because other factors may make face-to-face interaction extremely difficult, and some of that is also needed. Perhaps "counter-

balanced" would be a better way of expressing the effect of the Internet on professional isolation. [Acad # 14, Other]

> This will have both good and bad consequences. The latter will include increasing fragmentation within the academy. But this is a strong trend which IT will accelerate. [Acad # 5, Canada]

Course content will be web-based but students will expect individualized tutorial support, if needed [Item 11]. There is a strong consensus (94 percent) that much course content will be web-based and that students will expect individualized tutorial support if needed. There is 100 percent consensus that this will happen before 2005, if not already (N=52). IT professionals' median is highly "probable" (4.00); other subgroups' medians are "probable" (3.00) (Table 5.3, in appendix). On its probability and importance, the panel achieves consensuses (Table 5.12).

> Sure, though some of the individualized tutorial support may itself be delivered on the web. No reason why not. [IT # 8, Canada]

> Much will depend on the course and the fees. Some real tutorial support is usually better, but whether people will expect it or pay for it is unclear. [IT #19, Canada]

> This suggests a mass tutorial model along the lines of the original factory schools. Students want individualized attention but not necessarily as tutorial support for given content. [Acad #3, Canada]

> Initially there will be a strong need for this. However, as learners become more used to web-based learning they will become more self-reliant ...which includes finding other avenues to getting their problems solved besides going to their course provider. I think that much the same has happened in regard to use of vendor help lines for computers. I know that in my case initially I used these help lines often, but now I can usually find ways to solve the problems myself. [Acad # 5, Canada]

> . . . .I'm interested in. . . the balance between a student's expectation of receiving the kind of learning experience he/she would have at a prestigious university (with prestigious university fees . . . a Cambridge, for instance) BUT wanting that experience for a fee structure that was put in place for "mass" education. There needs to be a balance between the

amount of individualized support that can be provided and the fees that students are willing/able to pay. [Adm #1, Canada]

But individualized tutorial support can be built in to the on-line process. [Adm #5, Canada]

If the course is self-paced, the individualised tutor support is crucial. If it is paced, individualised attention is one dimension that needs to be covered. [Adm # 6, Canada]

Students don't expect this support in face to face teaching but will want to have access to the teacher or a tutor when they encounter difficulties. [Adm # 9, Canada]

<u>ICT funding and training will become a priority within higher education</u> institutions [Item 29]. There is a strong consensus (99 percent) on probability and on importance (96 percent) that ICT funding and training will become a priority within higher education institutions. The timing will be sooner, before 2010 (Table 5.12). In fact, this is already true according to a number of panelists.

This is already true. It is expensive to just keep up with the pack, let alone lead it. [Acad # 8, Other and IT #19, Canada]

True right now, since there is lot of money out there to be accessed. [Adm #6, Canada]

Funding to meet increasing IT infrastructure costs and the high costs of developing/adapting ERP's will continue to make IT a major budget priority and issue at most universities for at least the next several years. [Acad # 14, Other]

Some panelists believe ICT funding will be inadequate for business reasons and there are doubts about training.

....Existing institutions are not doing well in the transition. Most of the budget support existing activities. What little discretionary resources are available are redirected to IT. However, the amounts are minimal as an overall percentage. [Adm # 5, Canada]

Not just for "e-learning" but for business process reasons. [IT #8, Canada]

> ....I believe it is highly probable that IT and Internet funding will be a priority in higher education, but I think it is improbable that training will be a priority, although I think that is a grave mistake. [IT # 13, US]

The use of IT and the Internet will result in major professional and cultural change for faculty (with respect to roles, teaching methods, work processes, avenues for recognition, and research opportunities) [Item 30]. There is a strong consensus (94 percent) that the use of ICT will result in major professional and cultural change for faculty (N=51), with the timing before 2010 (Table 5.12). Panel and subgroup medians concur on this probability (3.00) (Table 5.3, in appendix), on its importance (3.00) (Table 5.4, in appendix), and on its timing (2.00) (Table 5.5, in appendix). Panel commentary confirms a change but suggests it will be gradual.

> It will likely not be revolutionary but evolutionary. Cultural change happens slowly. [IT # 19, Canada]
>
> There have been changes in this area during the last half century, so change itself in these area is not so new or starting. [Adm # 13, US]
>
> Yes, but gradually. . .in a while. [IT # 8, Canada]
>
> It will depend on how institution workload and staff development policies and faculty politics play out. [Acad # 8, Other]
>
> This will depend on each university and faculty and individual. These factors have already affected all of our lives in many ways, . .so the statement is true, but does reveal much. [Adm # 6, Canada]
>
> There will be major changes in teaching methods and schedules, but not enough change in reward structures. [Acad # 14, Other]
>
> Perhaps some slight movement in this direction will occur, but the academic profession is resistant to change. [Acad # 5, Canada]

Internet-savvy professors will teach via the World Wide Web, but will rely on other professionals to re-design 'instructional' resources [Item 7]. There is a strong consensus (91 percent) and median panel ratings of 3.00 over the assertion that Internet-savvy professors will teach via the World Wide Web, but will rely on other professionals to re-design 'instructional' resources. This is likely to happen before 2005, if it has not already occurred (medians, 1.00) (Table 5.5, in appendix).

> Currently happening. [Acad #14, Other]
>
> . . . .This too is already happening, certainly for distance courses. The role of the IT course designer is likely to expand over time. As we move beyond the "Lone Rangers" or early adopters, and into the mainstream of faculty, the latter group will want professional help in any areas that are not directly related to the pedagogy. . .There will be exceptions, but I think this will be the general trend. [IT #8, Canada]
>
> Yes, this is the way it should be! [Adm #4, Canada]
>
> The longer institutions delay in developing good designs for learning the less likely they will be providers of online learning. . .Unfortunately, students have had a lot more experience than instructors--and as customers they will vote with their swipe card. [Acad #3, Canada]
>
> I suspect that the market will drive things in this direction, i.e. there will be a role for design professionals in order to make courseware more marketable, and efficiency considerations will require an appropriate combination of content and delivery expertise. [Acad # 5, Canada]
>
> . . . .time and effort efficiencies will have a big impact here. For the early and later majority adopters. Let each specialization do its own best work. [Acad #8, Other]
>
> This will depend a lot on the persona and the institution. [Adm #6, Canada]
>
> Some good basic internet resources will emerge, such as learning object repositories, but as the tools to design on the web become more easier *[sic]* to use and professors move up the learning curve, they will not rely as much on other professionals. [Adm #9, Canada]

> An internet savvy professor at the institution with which I am associated commented recently that while he had figured out how to do all the mechanics himself, and while that was an intellectually gratifying experience, he's ready for someone else to take on this task. . . ."internet-savvy" is not necessarily synonymous with "well versed in instructional design issues." [Adm #1, Canada]

> I think many faculty want control of the presentation of the resources they develop, and many enjoy learning and working with the tools i.e., I think we'll see the same syndrome as with adoption of word processing. [IT #9, Canada]

> It is hard to keep up with everything. [IT #19, Canada]

Many IT and Internet savvy virtual professors will divide their time and energy among a variety of universities, consortia, corporations and companies [Item 25]. There is a consensus (79 percent) that many IT and Internet-savvy virtual professors will divide their time and energy among a variety of universities, consortia, corporations and companies and a median panel rating that the timing of this will be before 2010 (Table 5.5, in appendix). Panelists comment that for professors to divide their time among a variety of universities, consortia and corporations is not unusual but there were reservations:

> [G]o where the market is if your own institution lets you roam around and still keep a home base . . .may be the new motto. [Acad # 8, Other]

> This has been happening for some time now. [IT # 1, Canada]

> This is just an extension of trend[s] that were evident before the advent of IT and the net. [IT # 19, Canada]

> Nothing new here, nor particularly 'internetish' about the practice. Faculty do it now, but I think the technology will accelerate the trend. [IT # 8, Canada]

By contrast, the doubters speak up.

> ....If you removed the word "universities" I would rate this highly probable since they already do that in many instances. I do not think that many

universities will want to have many faculty working for other universities. I also still believe most universities will continue to provide predominantly traditional, campus-based instruction which will also preclude many faculty from dividing their time since they will [be] playing a traditional role even if they are IT and Internet savvy.
[IT # 13, US]

...[W]hile this has been going on for some time despite contracts, instructors who totally freelance may well become the norm --but then we already have sessionals doing this. For professors whose reputation (re research) is institutional, this is improbable. [Acad #3, Canada]

The issue will not be whether "stars" will move around, but whether a significant number of professors will. . . .Tenure is being discredited, as universities find ways to reduce staff when they have to. A related issue is ownership of courses, materials, etc. Not so bad if someone teaches for various institutions, but if they take with them the expensive online course they created with your organization, then you've got a problem.
[Acad # 14, Other]

Employing institutions may begin to demand exclusivity.
[Adm # 9, Canada]

Not if they want to get tenure! [Acad # 7, Canada]

Means

Academics and administrators agree on the probability of occurrence (means 3.15, 3.09, respectively), but the IT professionals' score on probability is just slightly lower (means, 2.90). On importance, academics and administrators score 3.22 and 3.29 respectively, but IT professionals score a somewhat lower importance. The panel agrees on timing before 2010 [Table 5.1(g)].

Table 5.1(g)

Means - Roles of Faculty and Staff

Subgroup	Ratings	Sum of Scores	N	Means
Academics	Probability	318	101	3.15
	Importance	299	93	3.22
	Timing	171	94	1.82
Administrators	Probability	572	185	3.09
	Importance	550	167	3.29
	Timing	218	166	1.31
IT Professionals	Probability	351	121	2.90
	Importance	343	115	2.98
	Timing	144	111	1.30
Entire Panel	Probability			3.05
	Importance			3.18
	Timing			1.44

Summation on Faculty Roles

In summary, almost all panelists expect that the roles of faculty will change before 2010 because of ICT, but see the change as being evolutionary, not revolutionary. Most panelists expect ICT savvy professors to teach on the web, and many agree they will rely on other professionals to re-design "instructional" resources. During 2005 to 2015 the design professionals (or teams) will assist in the development of online course material, but there will be some professors who will prefer to be 'lone rangers.' However, panelists point out that, by attrition, most professors will be Internet-savvy within a decade. Some also expect that as software improves and becomes simpler to operate many professors will want to control their own material. Instruction will continue to be dominated by people who have expertise in their subject. There is not a consensus, however, on whether or not Internet-savvy professors will dominate instruction in most large universities. Some panelists draw a distinction between the mass tutorial model used in early 'factory' schools and the individual tutorial support now provided at universities. Panelists acknowledge that some self-paced tutorial support may be built into sophisticated web based programs but that when students encounter difficulties, they will want access to a teacher.

There is a strong consensus that ICT funding will become a priority in higher education. This is confirmed in the Campus Computing Project (2000). But some panel commentary contradicts this and refers to a minimal funding allocation to ICT and training. The web-based community of scholars is seen as likely to expand through ICT, but as a community largely concerned with research as it facilitates global discourse between professional peers. These scholars are the intellectual core around which a university is centred, but their interest may have little to do with teaching. Panelists do not see it as unusual for ICT savvy professors to divide their time between a variety of institutions, consortia and corporations; however, if these professors want to obtain tenure or to work in prestigious research universities, a dispersion of their attention will be poorly received. Academic # 14, who is employed outside North America, warns that if an expensive online course created with a specific organisation's resources is taken to another institution(s), there will be a problem.

Intellectual Property

In this theme I focus on issues regarding the ownership of intellectual property (IP). Six things stand out from the data in Table 5.13: (1) Panelists share a strong consensus that all of these issues are "important." (2) There is a strong consensus that electronic business payment models will make possible the routine delivery of copyrighted material [Item 32]. (3) There is not a consensus that new intellectual property rules will favour institutions over professors [Item 31]. (4) A consensus is attained that revised copyright rules will encourage intellectual property owners to share their creations [Item 33]. (5) Timing for resolution on these intellectual property matters is expected to occur sooner (i.e., before 2010) rather than later. (6) The participation rates are fairly good. The panel median ratings are 3.00 on probability and on importance, as are the subgroups' median ratings. Sixty-seven (67) percent or two of the three theme items, have a level of consensus.

Table 5.13

Level of Consensus – Intellectual Property

		Probability			Importance			Timing**		
		N	Low	High	N	Low	High	N	Soon	Late
Item	Statement		%	%		%	%		%	%
31	New rules on professors' intellectual property will favor the institutions over intellectual property creators.	40	37	63 *	41	7	93	40	100	0
32	Electronic publishing, and business/payment models will make possible the routine delivery of content protected by copyright.	47	2	98	43	2	98	46	85	15
33	New intellectual property payment models, revised copyright rules and new legislation will encourage scholars to share intellectual property.	46	20	80	44	2	98	42	88	12

Notes.

* = Does not meet criterion for consensus
Strong Consensus = 90% to 100
Consensus = 80% to 89%
Minimum Consensus = 70% to 79%

**Soon = Before 2010
Late = 2010 or after

Electronic publishing, and business/payment models make possible the routine delivery of content protected by copyright [Item 32]. There is a strong consensus (98 percent) and a median panel rating of 3.00 on the claim that e-publishing and business/payment models will make possible the routine delivery of content protected by copyright. As well, panelists think that this will happen before 2010.

> Copyright protection is already doomed. It's more important to get your material out and to market it well. You can make it hard to get access and to copy, but even now it's really impossible to prevent infringement, and unrealistic to expect revenue from every use of material. Indeed, the high

cost of copyright fees is already a major barrier to scholarship and to teaching from primary print sources - a factor that will just accelerate the development of non-copyright ways of valuing work products. [Acad #14, Other]

[M]uch 'content' may be free on the net. [Adm #16, Canada]

Knowledge management and the semantic web, the next big thing. [IT #8,Canada]

New rules on professors' intellectual property will favor the institutions over intellectual property (IP) creators [Item 31]. There is no consensus, with a 37/63 division, yet there is a median panel rating of 3.00 on the assertion that IP will favor the institutions over the IP creators.

You own the content but not the format--a [S]olomon-esque decision. Lots of disagreement likely. . .so organizations will forgo legal clarification as long as possible. [Acad #3, Canada]

Faculty unions will prevent changes in IP that are adverse to faculty. [Acad #5, Canada]

. . . .Judging from the diverse panel answers there is considerable confusion about this issue. Interestingly, I've seen a slight reversal lately in which institutions are being less hard nosed and trying to [find a] way to use financial incentives to motivate faculty use and development of resources, . . .whereas 2 years ago they were all hep to acquire all rights and roll in the dough! [Acad #6, Canada]

IP issues will get greater visibility and may finally be resolved in a more equitable way. Faculty won't do it if the institution gets all the benefit. [Acad # 7, Canada]

If work is done in institutional time the case is stronger. [Acad # 8, Other]

. . . .Not new for institutions to own instructional materials; however, this is being clarified. Many universities are distinguishing between ownership and revenue sharing. . .The question is too broad as stated, because of the differences between educational resources and research publications. [Acad # 14, Other]

> . . .if you look right now at IP laws etc., institutions have far more rights over IP that they pay for than they think they do. [Adm # 6, Canada]

> . . . .I have replied "no option" because this is a difficult to question to respond to. Questions emerge for me: what does "intellectual property" refer to. . .the ideas? the product in which those ideas are encased (e.g., using more traditional distance education terminology by way of example .. the course manual). The ideas, conceptualizations must belong to the faculty member ... the format in which they are articulated - especially if developed with university resources - is another issue. . .There is an argument to be made for the university to have some claim on the latter. [Adm #1, Canada]

> I think the trend is more toward "fairness" rather than institutions thinking that faculty IP is an easy gravy train. Recent IP policies at Harvard, Chicago, and elsewhere would support this view. . .I think. [IT #8, Canada]

> . . . .I believe this will vary greatly from institution, not unlike the relative value of teaching, scholarship, and service in tenure decisions or even if the institutions awards tenure. It also depends on whether the intellectual property was expressly created to fulfill a contractual obligation and whether other University resources such as programming and media staff assisted in the creation. It is simply not a simple yes/no answer. [IT #13, US]

> An important question, but the jury is still deliberating. My guess is that creators will end up doing all right in the end. . .I don't see big changes from the present situation. [IT #19, Canada]

<u>New intellectual property payment models, revised copyright rules</u> and new legislation will encourage scholars to share intellectual property [Item 33]. There is a consensus (80 percent) and a median panel and subgroup ratings of 3.00 (Table 5.3) that, within a decade, IP payment models, revised copyright rules and new legislation will encourage scholars to share IP. As well, panelists think that within a decade these new IP payment models and rules will encourage scholars to share IP. However, there are concerns and differences expressed in the commentary:

. . .Depends--I doubt the rapid development of new models. [Acad #3, Canada]

Our society is becoming so litigious that scholars will not have sufficient confidence in such protection to take a chance; and they will revert to more cautious non-sharing behaviour. [Acad #5, Canada]

I share already and adherence to copyright is not 100% now anyway. But I don't hold my breath. [Acad # 8, Other]

...My sense of the copyright changes in the US encourage ownership and sales of intellectual property which I do not think is conducive to sharing...though many faculty still choose to share rather freely their intellectual property. I think new generations of faculty will use Bill Gates and his Windows O/S for their model rather than Bell Labs and UNIX. [IT #13, US]

Means

According to Table 5.1(h) the entire panel agrees that this theme's items are "probable" and "important." There is not much variance between subgroup scores. Interestingly, the IT professionals score the highest probability and importance (means, 3.05, and 3.30, respectively) and the soonest to happen (means, 1.67) (Table 5.1(h).

Table 5.1(h)

Means - Intellectual Property

Subgroup	Ratings	Sum of Scores	N	Means
Academics	Probability	99	33	3.00
	Importance	106	33	3.21
	Timing	54	31	1.74
Administrators	Probability	190	63	3.01
	Importance	190	58	3.28
	Timing	110	61	1.80
IT Professionals	Probability	113	37	3.05
	Importance	122	37	3.30
	Timing	60	36	1.67
Entire Panel	Probability			3.02
	Importance			3.27
	Timing			1.75

Summation on Faculty and Staff Issues

All items in this theme are considered "important" and likely to be applicable before 2010. There is a minimum consensus that a shortage of teachers skilled in the use of ICT will make them valued and well-rewarded. There is much skepticism that teachers (as opposed to researchers) will be well rewarded. There is only weak support for the notion that a global shortage of ICT skills will call for the extensive training of faculty. Academics are resistant to being drawn into the minutiae of technology; they see improvements in the ease of ICT use and well-skilled staff support as making such training unnecessary. The panel sees it as "improbable" that a shift towards online education will cause job loss for faculty, and nor does it expect a serious loss of faculty to no name schools.

Issues around intellectual property (IP) are considered "highly important" and 100 percent of the panel expects a solution before 2010; having faith in the strength of tradition, many panelists believe that faculty will not be vulnerable to a loss of intellectual property because of ICT. However, ICT will make intellectual property creators increasingly vulnerable to piracy. Intellectual property can be downloaded, altered and used anywhere in the world. In some countries legal redress may be prohibitively expensive and uncertain. The cost and time taken in lawsuits may be beyond the resources of individual professors or even of institutions.

There is no consensus on the assumption that new legislation will favour institutions over the creators of intellectual property, and some faculty members are concerned that this issue will not be resolved fairly. The IT professionals achieve a consensus (72 percent) within their subgroup that IP will favor the institutions over the IP creators. There is a likelihood of continuing conflict between scholars and administrators over IP rulings.

There is a strong consensus that the electronic publishing industry will develop new business/payment models, allowing routine delivery of content protected by copyright. As well, a consensus is achieved that these payments models, coupled with new legislation and rules, may encourage scholars to share intellectual property.

CHAPTER SEVEN: RESULTS

EDUCATIONAL ISSUES

In this educational chapter I clustered items under the following themes:

- The Widespread Use of the Web
- Degree, Certification, Accreditation
- Learner Focus
- Online Learning Tools
- Student Access/Equity
- Educational Values

The Widespread Use of the Web

Here I investigate the areas in higher education where the use of ICT may become influential. Highlights of the data collection results are set out in Table 5.14. Three things stand out: (1) Most panelists are fully engaged with items that relate to the widespread use of the web in higher education, but participation rates drop when they makes forecasts about the technological probability of Internet classification systems and the use of rich data banks. (2) The levels of consensus on the probability and importance of ICT use are unusually high (some items 100 percent). These results reinforce the probability that intensive use of ICT on- and off-campus will occur. (3) The panelists forecast that widespread use of ICT will occur before 2010. This result is somewhat surprising when considered against the slow incremental rate of technology adoption expressed in the literature. Yet considering this historical context against the phenomenal rate at which ICT have spread throughout society during the last decade, the forecast of widespread use of ICT in higher education before 2010 is entirely credible. One hundred (100) percent of items in this theme achieve a level of consensus.

Table 5.14. - Level of Consensus – Widespread Use of the Web

		Probability			Importance			Timing**		
			%	%		%	%		%	%
Item	Statement	N	Low	High	N	Low	High	N	Soon	Late
1	Many learners will expect courses and programs to be delivered on the web	53	6	94	52	2	98	53	98	2
22	Learner participation in pioneering research and education programs will be facilitated through high-speed web connections.	53	4	96	51	2	98	49	85	15
35	The Canadian (and American) Associations of Research Libraries, EDUCAUSE and others will design and develop Internet classification systems designed to verify the reliability of information found on the web.	40	25	75	40	10	90	38	70	30
44	As wireless and broadband networks merge, rich data banks will become an important extension of our brain.	43	9	91	42	7	93	41	51 *	49
56	IT and the Internet will be critical components of the post-secondary institution's strategies.	50	0	100	48	0	100	47	96	4
57	IT and Internet access and use will become universal and ubiquitous in higher education institutions.	49	0	100	48	0	100	47	94	6
66	The use of the web by colleges, universities and polytechnics will become essential to the educational experience.	49	4	96	47	0	100	46	96	4
80	In online higher education English will remain the dominant language.	49	2	98	43	30	70	42	67 *	33

Notes.

* = Does not meet criterion for consensus
Strong Consensus = 90% to 100
Consensus = 80% to 89%
Minimum Consensus = 70% to 79%

**Soon = Before 2010
Late = 2010 or after

In online higher education English will remain the dominant language [Item 80]. A strong consensus (98 percent) (Table 5.14), and a median rating of "highly probable" (4.00) (Table 5.3, in appendix) confirm that English will remain the dominant online language in higher education institutions. In Canada this may have complex outcomes because of our bilingual obligations. The academic subgroup median of "highly probable" (4.00) is somewhat higher than the other two subgroups' median of "probable" (3.00). There is not a consensus on the timing: 67 percent of the panel expects English dominance to be maintained until 2010 while 33 percent of the responses claim it will continue after 2010. A panelist with English as her/his second language comments:

> In order to trade and have international communications, we all have to learn English already now. [Acad #4, Other].

By contrast, a US panelist states:

> ...machine translations will make language moot, and enable people to maintain their own language and still communicate with anyone in the world. [IT # 13, US].

IT and Internet access and use will become universal and ubiquitous in higher education institutions [Item 57]. There is a 100 percent consensus and a median panel rating of 4.00 that in western countries ICT access will become universal and ubiquitous. Panel means and median ratings (Tables 5.3 to Table 5.5, in appendix) reinforce the 100 percent consensus. The mean of this item ranked third for the panel (Table 5.25). A panelist qualifies his/her opinion on the ubiquity of ICT in higher education institutions:

> ...if we speak of the Western (rich) world and omit the poorer parts of the world, the claim was highly probable, but if we count the poor countries with less possibilities to put their scarce resources on the Internet and IT, then it was a different answer altogether. [Acad #4, Other]

Panelists caution not to expect learning via the web to replace face-to-face teaching. For instance:

> ...My sense is that a "mixed mode" approach is likely to dominate programs that were not being offered as distance education courses....many (not most and not all) learners will expect courses and programs to be delivered on the web as well as some face-to-face meetings. [IT # 8, Canada]

Another individual reinforces this view:

> ...many will want a combination of real and delayed time and actual and virtual presence. [Acad # 8, Other]

Extremes in commentary range from an administrator who comments:

> This seems to confirm the centrality of online learning for the future: the only questions is: how soon? [Adm # 6, Canada]

To a contrary view:

> ....It will be important for the post-secondary system to address the needs of these new learners, but not at the expense of serving the majority who are much better served by face-to-face methodologies. I also believe that serving web-learners will require institutions to collaborate in ways that they haven't been challenged to collaborate to date. [Adm # 10, Canada]

The Canadian (and American) Associations of Research Libraries, EDUCAUSE and others will design and develop Internet classification systems designed to verify the reliability of information found on the web [Item 35]. There is a minimum consensus (75 percent) (Table 5.14) and a median panel rating of 3.00 (Table 5.3) on the claim that the Canadian (and American) Associations of Research Libraries, EDUCAUSE and others will design and develop Internet classification systems designed to verify the reliability of information found on the web, before 2009. There are differences among panel subgroups. The academics' median is "improbable" (2.00) while all others medians are "probable" (3.00) (Table 5.3). Only 33 percent of the academics rate this item "probable"; by contrast, ninety-one (91) percent of IT professionals and 85 percent of the administrators rate it as "probable" (CD-ROM). But much diversity in panel commentary; some commentary follows from those panelists who believe this to be "not probable":

> Nice idea but an impossible task. But if you think about developing generic assessment criteria, it's already been done. [Acad # 8, Other]

> I think this is a losing proposition . . . .No one would have the time to keep up with the amount of information and its tremendous rate of growth. And one of the principal values of the Internet is its currency and dynamic nature. . . . [IT #13, US]

Academics reject the notion that such systems will be developed within their domain. As one academic states,

> . . .perhaps some professional associations might take this on.
> [Acad # 14, Other]

Conversely, an IT professional states:

> Lots of work happening on this already (CNI, NLII for instance).[1] Finding stuff on the web, and verifying its authenticity, is one of the requirements of the next leap in the web. [IT # 8, Canada]

Internet classification systems in the "Internet Age" may occur through the work of the private sector, or in cooperative partnerships with universities. Or perhaps progress will be made on the Semantic Web.

As wireless and broadband networks merge, rich data banks will become an important extension of our brain [Item 44]. There is a strong consensus (91 percent) that wireless and broadband networks will merge with rich data banks and become an important extension of the brain. But of those who make comments on this item, none like the metaphor. All subgroup medians (3.00) ratings confirm the probability that these technological advances will occur (Table 5.3). Eighty-nine (89) percent of administrators, 83 percent of IT professionals, and 100 percent of academics rate this as "probable" (CD-ROM). The diversity between subgroups is small, but one individual comments on the metaphor:

> 'extension of our brain' seems too strong a metaphor but there is no doubt we will have more and easier access to better data better analyzed and presented" [IT # 19, Canada]

However, there are sharp differences on timing, with 51 percent of the panel expecting the merger of these network/data banks technologies to happen before 2010 and 49 percent expecting it after 2010 (Table 5.14). Sixty-seven (66) percent of academics and 55 percent of the IT professionals rate this as likely to happen before 2010, but administrators have a 50/50 split on timing for either before or after 2010 (CD-ROM).

<u>IT and Internet access and use will become universal and ubiquitous</u> in higher education institutions [Item 57]; <u>IT and the Internet will be critical components</u> of the post-secondary institution's strategies [56]; and the <u>use of the web</u> by colleges, universities and polytechnics <u>will become essential to the educational experience</u> [Item 66]. There is 100 percent consensus and a median panel, and subgroup, ratings of 4.00 over the affirmation that ICT will be critical components of the post-secondary institution's strategies. This item ranks 1st of the panel probability means (Table 5.25). ICT access and use will become universal and ubiquitous in higher education institutions

ranks 3rd on the panel's probability ratings and the claim that the use of the web by colleges, universities and polytechnics will become essential to the educational experience ranks 2nd. These three items will happen before 2010.

Means

Panel means of scores in this theme attain a strong probability (means, 3.47). The academic subgroup has the highest rating (means, 3.54) between "probable" and "highly probable," closely followed by the IT Professional subgroup (means, 3.41) [Table 5.1(i)]. Except on the question of whether English will remain the dominant language in online higher education [Item 80], the panelists also agree that items within this theme are all "highly important." Interestingly, the means indicate significant differences of opinion on timing. IT professionals (means, 1.69) and administrators (means, 1.81) expect these items to occur sooner (before 2010); by contrast, the academic subgroup (means, 3.12) scores timing after 2010. One explanation of this difference on timing could be that IT professionals and administrators are more directly aware of the accelerating rate of development in the capabilities of ICT.

Table 5.1(i).

Means - Widespread Use of the Web

Subgroup	Ratings	Sums	N	Means
Academics	Probability	350	99	3.54
	Importance	303	90	3.37
	Timing	287	92	3.12
Administrators	Probability	629	181	3.48
	Importance	598	174	3.44
	Timing	311	172	1.81
IT professionals	Probability	365	107	3.41
	Importance	356	107	3.33
	Timing	171	101	1.69
Entire Panel	Probability			3.47
	Importance			3.39
	Timing			2.11

Summation on the Widespread Use of the Web

The panel considers all items in this theme to be "probable" and "important." Panelists give a clear-cut opinion that, in North America, learning via the web will be widely used, access will become universal and ICT will be essential to the post-secondary experience. However, panelists caution that online learning will not replace face-to-face teaching. A dual mode -- online and face-to-face -- is predicted as likely to emerge for on- and off-campus learners as the distinctions between these groups blur. There is a minimum consensus (75 percent) that an Internet classification system will be designed and developed to help verify the reliability of information found on the web, but according to panelists this will not be done within academia. Though most items are seen to occur before 2010, there is roughly a 50/50 split on whether rich data banks and broadband and wireless systems would merge by 2010.

Degrees, Certification and Accreditation

Here I investigate degrees versus certification and accreditation. The highlights of how these might be influenced by ICT are set out in Table 5.15. Five points command attention: (1) Most panelists agree that acceptance by employers of private certification will force universities and colleges to compete online before 2009 [Item 52]. (2) There is a strong consensus (90 percent) on the importance of certification and degree credentials being established at national, trans-national, or global levels, but no consensus as to when this might occur [Item 75]. (3) A consensus (74 percent) believes that, through ICT, the processes of assessment and accreditation will be carried out by a variety of international providers [Item 76]. (4) One-hundred (100) percent of the items in this theme achieve a level of consensus. (5) There is a low participation rate (N=38) on Item 76; it appears some panelists may be unwilling to address the processes of assessment and accreditation to be carried out by a variety of international providers.

Table 5.15.

Level of Consensus – Degrees/Certification/Accreditation

		Probability			Importance			Timing**		
			%	%		%	%		%	%
Item	Statement	N	Low	High	N	Low	High	N	Soon	Late
52	Acceptance by employers of private certification will force universities and colleges to compete online.	48	23	77	43	23	77	42	86	14
75	Certification and degree credentials will be established at national, trans-national or global levels despite resistance by faculty unions and university administrations.	46	24	76	41	10	90	42	55 *	45
76	Through IT the processes of assessment and accreditation will be carried out by a variety of international providers.	38	26	74	38	18	82	33	70	30

Notes.

* = Does not meet criterion for consensus
Strong Consensus = 90% to 100
Consensus = 80% to 89%
Minimum Consensus = 70% to 79%

**Soon = Before 2010
Late = 2010 or after

Acceptance by employers of private certification will force universities and colleges to compete online [Item 52]. There is a minimum consensus (77 percent) that acceptance by employers of private certification will force universities and colleges to compete online; this is expected to occur before 2010. Panel and subgroups' medians are "probable" (3.00) (Table 5.3). Seventy-five (75) percent of IT professionals and 70 percent of administrators rate this a "probable;" however 100 percent of academics rate it "probable." Academics involved in continuing professional education would recognize this trend. For example, one individual states:

> It is already forcing universities and colleges to partner with private certification program vendors, and to integrate certification training and

> testing into their academic programs. I don't think this has any special flavor with regard to online competition. [Acad # 14, Other]

> Employers are dominated by those who are normally more conservative than the higher education sector. This may happen in some areas, but not generally. [Adm # 6, Canada]

> Never underestimate the power of the forces of continuity, especially in institutional contexts, and most especially in higher education institutions. [Adm # 30, US]

<u>Certification and degree credentials will be established at national, trans-national</u> or global levels despite resistance by faculty unions and university administrations [Item 75]. That the panel reaches a minimum consensus (76 percent) and a median panel, and subgroup, ratings of 3.00 that despite objection from faculty unions and university administrations, certification and degree credentials will be established at national, trans-national or global levels is a surprise to me. Favouring this outcome is a high level of expectation about the enhanced interconnectivity between countries operating on the web, as national boundaries became increasingly transparent. There is a strong consensus (90 percent) that certification and degree credentials are "important." However there is a division on whether this will happen before or after 2010. This is reconfirmed in the timing medians: 55 percent rate the timing to be sooner, the rest say after 2010 (Table 5.15). Only the IT Professionals' median (3.00) rates this for a later occurrence; other median panel, and subgroups, rate the timing before 2010 (median, 2.00) (Table 5.5, in appendix).

The panel's and subgroups' medians concur it is "probable" (median 3.00) (Table 5.3) that certification and degree credentials will be established at national, trans-national or global levels. Differences exist among the subgroups. IT professionals do not attain a consensus, as 46 percent rate this item "improbable;" however only 17 percent of academics and 14 percent of administrators rate it "improbable" (CD-ROM). Two skeptical IT professionals state:

> This outcome seems a real stretch given what we have seen so far. [IT #19, Canada]
>
> I don't think private sector education deliverers will be able to get together and compromise any better than higher education...although higher ed in America has the accreditation process that provides some level of quality assurance at least at the bottom. I think the best place for these certificates to be judged anyway is by employers, not some national or international group...Each culture has its unique needs and approaches to education that are best left as local decisions. I believe that variety is one of the great strengths of the American higher education system. [IT # 13, US]

However, other panelists feel that this is already happening, but only in some areas:

> It has happened in Europe. [Adm # 5, Canada]
>
> This will be a prominent movement except in Canada where little coordination can occur at a national level in education because of provincial rivalries. [Acad # 5, Canada]
>
> Certification is normally handled by supra-university bodies; degree credentials (requirements) are, and will continue to be, an institutional responsibility. [Acad # 7, Canada]

<u>Through IT the processes of assessment and accreditation will be carried out</u> by a variety of international providers [Item 76]. Although the panel attains a 74 percent consensus, there are major disagreements among the IT professional subgroup on whether or not the processes of assessment and accreditation will be carried out by a

variety of international providers. IT professionals have the only median slightly less than "probable" (2.50) (Table 5.3, in appendix). Within the IT professional subgroup, 54 percent rate the claim "improbable;" by contrast, only 10 percent of academics and 22 percent of administrators rate "improbable" (CD-ROM). Some of the reasons for these differences of opinion appear in the academics' comments.

> It is not that lucrative--but if it were, then yes--having minions to do the hack work is always cheaper. But credit banks and accreditation--yes this is one a government can make money on. [Acad #3, Canada]
>
> There is a vacuum here that needs to be filled. [Acad #5, Canada]
>
> This is happening already, at least in Europe. [Acad #4, Other]

An IT professional comments:

> ....US accreditation...is carried out by regional associations....I cannot imagine [accreditation] being conducted by international providers. [IT #13, US]

Means

There are minor differences among the subgroups, [Table 5.1(j)], but panel and all subgroups score these items "probable" and "important." IT professionals have the lowest scores on probability (mean, 2.67) and the lowest on importance (mean, 2.84).

Table 5.1(j)

Means - Degrees-Certification-Accreditation

Subgroup	Ratings	Sums	N	Means
Academics	Probability	111	34	3.26
	Importance	97	30	3.23
	Timing	62	30	2.07
Administrators	Probability	179	62	2.89
	Importance	178	60	2.97
	Timing	130	56	2.32
IT professionals	Probability	96	36	2.67
	Importance	91	32	2.84
	Timing	72	31	2.32
Entire Panel	Probability			2.92
	Importance			3.00
	Timing			2.26

Summation on degrees and certification and accreditation

All three items achieve a minimum consensus (74 percent to 77 percent) on probability (Table 5.15). According to panel commentary, degrees will continue to offer greater weight in employment applications than will certification because degrees are founded on deeply entrenched educational values. Credit banks and accreditation are recognized as important and certification has begun to spread from colleges to universities, but it is not seen as a major threat. Variety is a strength of the American higher education system but there may be a vacuum that needs to be filled. Panelists are divided and somewhat uncertain about the role of international providers, and some did not respond on these issues. There are differences between subgroups over timing and in panel commentary. The academic debate over certification versus degrees may continue for some time, and provincial/state rivalries, and faculty unions may inhibit change (American Federation of Teachers Report, 1996). Although certification is seen as adequate qualification for employment, panelists comment that degrees will remain the prime indicator of a sound higher education.

Learner Focus

In this theme I investigate the issues of learner centred online education. Five things stand out from Table 5.16: (1) All items have a consensus (98 percent to 100 percent) on the importance of a learner focus in education. (2) There is a high participation rate and a consensus (96 percent) on probability that online learners will have more choice and control over their learning experience [Item 2]. (3) There is a consensus (92 percent) that online learners will demand pedagogically sound, technologically-mediated courses compatible with their learning styles [Item 4]. (4) There is a consensus (79 percent) that most universities will change their overall approach to pedagogy in response to Internet-savvy learners [Item 14]. (4) There is a consensus (79 percent to 96 percent) that all these issues will occur before 2010.

Table 5.16.

Level of Consensus – Learner Focus

Table 5.16.		Probability			Importance			Timing**		
			%	%		%	%		%	%
Item	Statement	N	Low	High	N	Low	High	N	Soon	Late
2	Online students (learning via the Internet) will have more choice and control over the timing, location and format of their learning agendas than will exist on-campus.	53	4	96	50	2	98	51	98	2
4	Online learners will demand pedagogically sound, technology-mediated courses compatible with their learning styles.	52	8	92	50	0	100	51	94	6
14	Most universities and colleges will change their overall approach to pedagogy to support a "new generation" of Internet-savvy learners who will demand more than a "stand-and-preach" lecturing format.	53	21	79	51	2	98	48	79	21

Notes.

* = Does not meet criterion for consensus
Strong Consensus = 90% to 100
Consensus = 80% to 89%
Minimum Consensus = 70% to 79%

**Soon = Before 2010
Late = 2010 or after

Online students (learning via the Internet) will have more choice and control over the timing, location and format of their learning agendas than will exist on-campus [Item 2]. The item stating that online students will have more control over the timing, location and format of their learning agendas than will exist on-campus achieves a strong consensus (96 percent) (Table 5.16). This finding is confirmed by a "high probability" median (4.00) for the panel and two subgroups, though for IT professionals the median is "probable" (3.00) (Table 5.3, in appendix). In addition, the timing forecast of the panel and all subgroups, except IT professionals, is that this will occur before 2005 (median 1.00) (Table 5.5, in appendix). Panel commentary identifies some implications and concerns on this issue. The boundaries between on-campus and off-campus online students are blurring according to panelists.

> The distinction between online "external" students and on-campus students is diminishing, as people enroll in a mix of experiences. [Acad # 8, Other]
>
> You group students as either online or on-campus. The reality is that we have students, too, who chose courses delivered in a combination of delivery formats. . . . [Adm # 6, Canada]
>
> The choices already exist, they will widen as many more providers join in. [Adm # 4, Canada
> On-campus students will also have still on-line options—the advantage will still be with students who. . . take courses on-campus, because they can do both. [IT # 19, Canada]

Another panelist makes the distinction between distance education and distributed learning:

> . . .I think it is important to distinguish between distance education and distributed learning. In the case of the former, where there is typically little if any "face time. . . . A distributed learning environment includes on-campus students as well as distance students. . . . I still foresee rapid changes (before 2005) that will provide the kind of choice and control described in the question. [IT # 8, Canada]

Another panelist states an advantage of online courses:

> [A]lready true; generally, on-campus students aren't given detailed course outlines describing class format until the course has begun – leaving little choice for learners who want a different format. . .whereas for online courses, detailed format info is generally available up front. [IT # 9, Canada]

By contrast, another panelists points to the disadvantages of online courses:

> . . . .Control over timing is not a given. In a recent mini student survey conducted at the institution where I work, students indicated that online courses sometimes interfered with the reasons they had enrolled in a

distance education course (i.e., they were looking for independence and lack of constraints ... time and otherwise...that are imposed by group work, for instance). [Adm # 1, Canada]

Online learners will demand pedagogically sound, technology-mediated courses compatible with their learning styles [Item 4]. There is a strong consensus (92 percent) and a median panel rating of 3.00 on the assertion that online learners will demand pedagogically sound, technology-mediated courses compatible with their learning styles. However, the administrators' median is a slightly higher probability median (3.50) (Table 5.3). There is some skepticism in commentary about learners being able to recognise either pedagogical sound materials or their own learning styles.

> ....The extent to which an institution may be able to provide this type of individualization may be determined by . . .the extent to which it is able to charge fees that are commensurate with this type of personalized learning experience. [Adm #1, Canada]
>
> Traditional students seem to be quite passive about the quality of the teaching they are exposed to: as more life longers join in, we can expect higher expectation and lower tolerance for poor pedagogy. Also, people are bolder on-line, and we can expect students to be more "vocal" on these matters. [Adm # 6, Canada]
>
> In face-to-face classrooms, most learners do not make these demands and I'm not sure if increasing choices and a greater number of more mature students will change this by 2005. [Adm # 9, Canada]
>
> They'll demand it if they have one good experience followed by a bad one, i.e., if they become aware of "soundness" and if they are concerned about the quality of their own time spent learning. . .[T]ech tends to exacerbate poor practice and enhance the good, so an "it depends". . . issue is always present. [Acad # 8, Other]
>
> In this country, there is less demand for quality pedagogy and technology use than for proof that graduates get well-paying jobs .- either via the Web or classroom. I expect that trend will continue in the online market . . . I think the design, visual appeal, navigability, etc. of the online materials and the quality of human-to-human interaction built into the online

process will be a market factor. . .however, I'm answering this question just in terms of the pedagogical aspect. [Acad # 14, Other]

I'm a bit conservative on this one because my sense is that most students would not have strong opinions on pedagogy. They will have strong opinions on course interest and stimulation, but that would hold constant across both technology enabled courses and "traditional" modes. [IT #8, Canada]

I think it is improbable that online learners will "demand" courses compatible with their learning styles (although I do think educators will develop them). I do think, however, they will demand "pedagogically sound" courses. [IT # 13, US]

This is difficult because answering the questions depends on believing that learning styles can be reliably identified and also that it is important to offer courses compatible with them . . . the point of an education is to increase students' range of learning styles and make them versatile learners. [Adm # 33, Other]

[A]lready some evidence from students who have taken online programs that they expect more that they receive in terms of better pedagogical design—and individualized. [Acad #3, Canada]

Technology-mediated learning allows for greater customization of the learning experience. [Adm # 5, Canada]

Most universities and colleges will change their overall approach to pedagogy to support a "new generation" of Internet-savvy learners who will demand more than a "stand-and-preach" lecturing format [Item 14]. There is a minimum consensus (79 percent) and a median panel, and subgroup ratings of 3.00 on the notion that most universities and colleges will change their overall approach to pedagogy to support a "new generation" of Internet-savvy learners. The disagreements are mainly among IT professionals, of whom only 69 percent rate this "probable"(CD-ROM). Panel medians are "highly important" (4.00) (Table 5.4, in appendix). The probability of a change in overall approach to pedagogy attracts some cautionary comments.

> Yes, but that change is going to happen rather gradually and again may occur on a discipline by discipline basis. [IT # 8, Canada]

> It will take some time: most likely when the universities are dominated by the same internet-savvy generation as faculty: with all the retirements coming up that may be sooner than we think. [Adm #6, Canada]

> It will take some time to change expectations of learners and response by institutions but it will happen. [Adm #9, Canada]

> Whether they will have the wherewithal to do this is another matter. Their financial structure will have to be rethought. [Adm # 5, Canada]

> Some will, but unlikely that most will within the foreseeable future; community colleges more likely to than universities, because community colleges are more market driven and consumer responsive.
> [Acad # 5, Canada]

> [G]etting those learners in place and willing to protest will be the keys.
> [Acad # 8, Other]

> The extent to which change occurs will be determined, in part, by the extent to which a given university or college truly values quality teaching and puts protocols in place that explicitly encourages faculty to perfect their instructional skills. . . As we undergo these changes, I would hope that the "new generation" will also be encouraged to value the valued role of the "teacher". . . . I can recall from my university experiences memorable "stand and preach" experiences that I will never forget because they were so rich. Let's not denigrate the value of a quality lecture simply because the lecture approach is so often poorly implemented.
> [Adm #1, Canada]

According to one panelist, this has already happened.

> [A]t our [College] this is already happening with over 100 courses offered [in 2001] using a combination of on-line and classroom based instruction.
> [Adm #14, Canada]

<u>Means</u>

Academics and administrators agree on the probability of a learner-focused pedagogy (Means, 3.44); IT professionals are somewhat less confident (Means, 3.02).

All subgroups score the issues as "important" and likely to happen before 2010. IT professionals expect the occurrence the soonest (1.60), [Table 5.1(k)].

Table 5.1(k)

Means -· Learner Focus

Subgroup	Ratings	Sums	N	Means
Academics	Probability	134	39	3.44
	Importance	131	38	3.45
	Timing	65	38	1.71
Administrators	Probability	248	72	3.44
	Importance	246	69	3.56
	Timing	117	69	1.70
IT professionals	Probability	142	47	3.02
	Importance	142	44	3.23
	Timing	69	43	1.60
Entire Panel	Probability			3.32
	Importance			3.44
	Timing			1.67

Online Learning tools

In this theme I explore the influences of the tools and resources that will be available to learners in an ICT environment. There is not much consensus about the probability of claims, but all subgroups score items in this theme as "important," [Table 5.1 (l)]. Seven findings from the Table 5.17 are noteworthy: (1) There is a consensus (84 percent) that online learning will be based on constructivist principles as well as on new models [Item 8]. (2) Half of the items within this theme have no consensus on probability, but on importance all items achieve a consensus. (3) On half of the items, panelists see timing as before 2010. (4) There is a consensus (86 percent) that it is "improbable" that standardized course materials delivered through ICT will de-personalize education and lower standards [Item 15]. (5) There is no consensus, but the majority (67 percent) rates it "improbable" that a dependency on ICT makes us susceptible to any person or groups that may gain control of the technology [Item 36]. (6) The panel do not reach a level of consensus, but a majority (61 percent) agree that it will be easy to find specialized topics online; as well, there is no consensus, but a majority (58 percent) rate it "probable" that virtual reality will compete with books [Items 13 and 16, respectively]. (7) There is a consensus (76 percent) that Artificial Intelligence computer chips will change the online learning environment in significant ways [Item 43].

Table 5.17.

Level of Consensus – Online Learning Tools

		Probability			Importance			Timing**		
			%	%		%	%		%	%
Item	Statement	N	Low	High	N	Low	High	N	Soon	Late
8	Online teaching and learning will be based on constructivist principles using collaborative learning, problem-based learning, as well as innovative new models for learning and knowledge building.	49	16	84	47	6	94	47	87	11
13	It will be easy to find good quality online courses on specialized topics that span national boundaries, like comparative law, rare languages, uncommon parts of history, and preservation of diverse cultures.	51	39	61 *	47	11	89	49	53 *	37
15	Standardised course material will de-personalize education and lower standards.	49	86	14	45	29	71	27	89	11
16	Experiential virtual reality systems will compete with books (even electronic ones).	48	42	58 *	43	30	70	38	45	55 *
36	A dependency on technology makes electronic learning (e-learning) susceptible to any person or group that gains control of the technology. [modified]	43	67 *	33	37	24	76	22	91	9
43	The use of computer-embedded artificial intelligence chips will change the computing and online learning environment significantly.	37	24	76	30	13	87	32	63 *	37%

Notes.

* = Does not meet criterion for consensus
Strong Consensus = 90% to 100
Consensus = 80% to 89%
Minimum Consensus = 70% to 79%

**Soon = Before 2010
Late = 2010 or after

Online teaching and learning will be based on constructivist principles using collaborative learning, problem-based learning, as well as innovative new models for learning and knowledge building [Item 8]. There is a consensus (84 percent) and a median panel, and subgroups rating of 3.00 on the claim that online teaching and learning will be based on constructivist principles using collaborative learning and problem-based learning, and on innovative new models for learning and knowledge building. Also the panel rates this as "important" (94 percent) and likely to occur before 2010. All medians are "probable" (3.00) (Table 5.3). Seventy-seven (77) percent of the academics rate this item as "probable." Other subgroups achieve slightly higher levels of consensus; as 86 percent of the administrators and 87 percent of IT professionals rate it "probable" (CD-ROM). Some panelists express serious doubts about a reliance on constructivist principles in online teaching and learning, preferring to let the desired learning outcomes determine the methodology.

> I think this to be touted but improbable--instructors are becoming somewhat more learning-centred but they still control instruction using instruction-centred models--and while we still have evidence-centred evaluation it is unlikely that the individual-oriented model of instruction will disappear. [Acad # 3, Canada]

> Yes to innovative new models for learning and knowledge building IF such new models come along, which is debatable since the emergence of genuinely new models of learning - as opposed to old wine in new bottles - is quite rare. But no to constructivism, which along with its parent, postmodernism, is due to crash as people realize its emptiness and mischievousness! [Acad # 5, Canada]

> Well...if adequate staff development is provided and if students give enough helpful feedback to better train tutors in helping adults to learn and if most tutors/teachers eschew transmission models of teaching, then we'll know what constructivism means in general practice. [Acad # 8, Other]

> Only if it is essential for a competitive edge in the market. Not very likely for most technical training. Some will be constructivist, but it's hard to imagine most or all would be. [Adm # 14, US]

> Qualifier ... where the field of study and the desired learning outcomes render these approaches appropriate. Not all learning that may take place in the online environment may lend itself to constructivism, collaborative or problem-based learning. Let the desired learning outcomes determine the methodology. [Adm # 1, Canada]

> We'll see the same variations in approach that we do now on campus. The pedagogical approach will not be the determinant of quality. [Adm # 6, Canada]

> This is the hope, that networked learning will encourage innovation and use of new learning models. [Adm # 9, Canada]

> I think we're already there, though some disciplines (health sciences for instance) are further along than others. [IT # 8, Canada]

> But much will be rather traditional. And that is not so bad. Variety is good. [IT # 19, Canada]

<u>Standardised course material will de-personalize education and lower standards</u> [Item 15]. There is a consensus (86 percent) and a median panel rating of 2.00 on the assertion that standardised course material is not expected to de-personalize education nor to lower standards. As well, there is a minimum consensus (71 percent), Table 5.17, and a median panel rating of 3.00 that this issue is "important" (Table 5.4). A consensus (89 percent) is achieved on timing before 2010, Table 5.17. The medians for the entire panel and subgroups indicate that lower standards viewed as "improbable" (2.00) (Table 5.3, in appendix).

Some comments stress that standardisation does not necessarily equate with poor design.

> In many realms of human endeavor, standardization is considered a sign of progress and a key factor in quality assurance. It is a mark of arrogance

and self-centeredness among some educators that they associate standardization with lower standards. [Acad # 5, Canada]

Standardization does not necessarily equate to poor design.
[Acad # 8, Other]

Some expect an improvement in quality through online learning.

Technology-based and object programming approaches will increase customization not standardization, although some standardization will be necessary especially for introductory courses. [Adm # 5, Canada]

I expect more diversity of course materials in time and I don't see any necessary connection to lower standards. I like what I see so far.
[IT # 19, Canada]

Standardisation hasn't happened in face-to-face teaching.

I don't think course material will become standardized, but if it did, I believe it is highly probable that it will de-personalize education and lower standards. I don't think it's very different from the level of standardization brought about by the introduction of college textbooks...There are so many from which to choose and so many ways to use them that standardization has not occurred. I believe online courses will be similar in this regard.
[IT # 13, US]

This hasn't happened with face-to-face classrooms that use a common textbook. [Adm # 9, Canada]

Standardization in technical programs is good, and leads to certification that employers trust. I don't see online learning causing more standardization than other modes. [Acad # 14, Other]

Do we believe that the introduction of textbooks LOWERED academic standards? [Adm # 13, US]

Faculty benefits from preparing distance education coursework.

. . . .The extent to which standardized course material lowers (or increases!) instructional standards will be determined by the quality of the input (as measured by the team of professionals who work in partnership with the faculty member to develop and deliver a quality course. Based on faculty comments I've been privy to. . .the development of standardised course material may have the effect of enhancing face-to-face teaching. It's not unusual to hear faculty members comment that their on-campus teaching has benefited from the preparation of their distance education course (done in partnership with a distance education team). [Adm # 1, Canada]

A dependency on technology makes electronic learning (e-learning) susceptible to any person or group that gains control of the technology [Item 36]. There is a majority (67 percent) rate such control by person or group a *low probability*, but 91 percent believe this issue is likely to cause concern before 2010. Academics have the only "probable" median (3.00), the remaining subgroups rate "improbable" (medians 2.00) (Table 5.3, in appendix). Administrators have the only consensus (71 percent) and rate *low probability*. Sixty-nine (69) percent of IT professionals rate a *low probability*, with no consensus, and only 40 percent of academics rate this item a *low probability* (CD-ROM). Commentary gives an insight into rationales for differences.

This is happening already! [Acad # 4, Other]

This issue happens with each technology, especially when the people are early adopters with little knowledge of anything past software interests. [Acad # 8, Other]

Mostly true in terms of the charges for use of bandwidth, and who gets access to bandwidth and who doesn't. Hopefully, market forces will be able to overcome any level of "control". Probably most important in less democratic countries where state-controlled transmission channels exist. [Acad # 14, Other]

By and large the technology for information and learning does not support monopolies." [Acad #2, US]

We must be vigilant not to let this happen. If it does, it would be short term, since the Web cannot be so easily controlled. [Adm # 6, Canada]

Well, yeah, if you control technology (or media) you control access to a lot of resources. [IT # 8, Canada]

Ask totalitarian governments if they like e-learning and the Internet. Everyone can be a publisher and everyone has access to virtually

> everything everyone else wishes to post. This is not a prescription for centralized control. The Internet, by its nature, defies control by a single person or group. [IT # 13, US]

It will be easy to find good quality online courses on specialized topics that span national boundaries, like comparative law, rare languages, uncommon parts of history, and preservation of diverse cultures [Item 13] draws disagreement. There is a majority rating (61 percent), but not a consensus, and a median panel rating of 3.00 on the opportunity that it will be easy to find good quality online courses on specialized topics that span national boundaries on the Internet. Examples of such topics might be comparative law, rare languages, uncommon parts of history, and preservation of diverse cultures. However, the academics' median (2.00) on this is "improbable," while other subgroups' medians are "probable" (3.00), Table 5.3. Just slightly over half of the academics (54 percent) rate this item *low probability*. By contrast, slightly under half of the IT professionals (47 percent) rate it *low probability*. Administrators are the exception on this item; they achieve a consensus that it is a *high probability* (81 percent) (CD-ROM). Commentary expresses some of these differences.

> I think such courses will exist, but I don't think they will be very easy to find. I don't think it's of great importance, because I think good courses in these fields can also be developed by scholars within national boundaries . . . as I think they now are predominately done. [IT # 13, US]

> There are relatively few of these courses even in the traditional modes. I do not think that technology will have a big impact on changing that. [IT # 8, Canada]

By contrast, this individual is optimistic.

> This is coming fast, and it is one of the REALLY BIG advantages of the web. Who really cares about a PSYC 101 course on-line, but specialty topics are a whole new opportunity for most people. [IT # 19, Canada]

Experiential virtual reality systems will compete with books (even electronic ones) [Item 16]. No consensus exists on whether experiential virtual reality (VR) systems will compete with books (even electronic ones). Only fifty-eight (58) percent of the panel believes it is "probable." Academics are the most skeptical and rate it a *low probability* median (2.00), but other subgroups and the panel median (3.00) rate it "probable" (Table 5.3). Only fifty-five (55) percent of administrators and seventy-three (73) percent of IT professionals rate VR competition as "probable" (CD-ROM). Commentary favours VR in appropriate cases:

> This will depend on the field--virtual reality may replace books for some learning experience, but books will continue to have their own value for a long time to come. [IT # 19, Canada]
>
> VR experiences will dramatically enhance learning. However, not all information lends itself to or would be particularly enhanced by VR delivery. . . There will continue to be a mix in many subjects. [Acad # 14, Other]
>
> I wish! Even electronic books are cheaper than these. . In some courses I bet this will be the case, but not for most courses. [Acad # 3, Canada]
>
> Only if they allow the same levels of mobility and ease of operation and if they are really necessary. [Acad # 8, Other]
>
> There will be examples of this, but not ubiquitous. [Adm # 6, Canada]
>
> Books whether printed or electronic will always have a place and virtual reality systems will be one more teaching tool to add to the repertoire of instructors in some discipline areas. [Adm # 9, Canada]
>
> Compete with books, yes. Replace books, no. [IT # 8, Canada]

There are drawbacks to VR according to this panelist.

> I believe there is a lot more to books than can be developed in virtual reality. From experience, I find that virtual reality, or any experiential learning for that matter, usually takes more time than other means of learning. I believe the learning that takes place can be deeper and leave a

> longer lasting impression . . . but it is not very efficient to use for teaching concepts. . . . [IT #13, US]

The use of computer-embedded artificial intelligence chips will change the computing and online learning environment significantly [Item 43]. There is a minimum consensus (76 percent) and a median panel, and median subgroup, ratings of 3.00 that the use of computer-embedded artificial intelligence (A.I.) chips will change the computing and online learning environment significantly. However, at least a dozen respondents did not rate this item (usually an indication of uncertainty). There is no consensus as to when the use of A.I. chips will occur. This issue is rated "important" (medians 3.00) by the panel and subgroups, Table 5.4. Academics achieve the lowest probability consensus of 70 percent (n= 10) (CD-ROM). There is much speculation and, in all fairness to the panel, no clear definition of where we are going with A.I.

> University of Southern Queensland is already experimenting with "generation 5" automated course development and response systems, which could both cut costs and reduce use of staff. [Acad #14, Other]

> I'm not sure it matters. [IT # 8, Canada]

> [H]umans are too smart for that to take off. [Acad #8, Other]

> Much is still to come. Much. [IT # 19, Canada]

> I don't see this technology having any more (and in many cases less) significant impact on the environment than growth in other technologies. [IT # 13, US]

Means

All subgroups' scores are "probable" (Means, 2.62 – 2.55), even though half the items within this theme do not achieve consensus on probability. All subgroups score this area "important." The timing score is to occur before 2010 [Table 5.1 (1)].

Table 5.1(l)

Means - Online learning tools

Subgroup	Ratings	Sums	N	Means
Academics	Probability	180	70	2.57
	Importance	182	60	3.03
	Timing	132	57	2.32
Administrators	Probability	322	123	2.62
	Importance	324	107	3.03
	Timing	178	86	2.07
IT professionals	Probability	214	84	2.55
	Importance	231	82	2.82
	Timing	160	72	2.22
Entire Panel	Probability			2.58
	Importance			2.96
	Timing			2.20

Summary of discussion and commentary

The panel agrees (86 percent) that there is a *low probability* that standardised ICT course material will de-personalise learning and they reject the notion that online education will have lower standards. The panel does accept that constructivist principles will be used in the development of some material, but not in all online teaching and learning. There is much skepticism expressed about constructivism in the commentary, but respondents hope that networked learning will encourage innovative thinking in the design of learning systems. There is divergence of opinion about the probability of online systems improving accessibility to good specialty courses, but a majority (61 percent) thinks access will be improved by ICT. Panelists are doubtful that Virtual Reality (VR) textbooks will seriously challenge existing books; only 58 percent rate this "probable." However, one panelist comments that a VR learning experience can be deeper and leave a longer lasting impression. There are differences as to the vulnerability of online education to control. Some see this as happening already, through media companies, others say that the Internet is by its nature free and not responsive to totalitarian control. There is generally a wait and see attitude about artificial intelligence chips, though 76 percent rate this "probable".

Student Access-Equity

In this theme the research focuses on items related to student access to online learning and issues of equity in higher education. Six things stand out from Table 5.18: (1) There is one-hundred percent consensus on the probability that (in North America) online access to higher education learning resources will be available 24/7/365 before 2005 [Item 5]. (2) There is no consensus as to whether the cost of broadband ICT access will be passed on to poor students, but 100 percent agree this question will be resolved before 2010 [Item 42]. (3) There is a consensus (71 percent) that it is probable that wireless ICT will cut across the cultural divide between rich and poor nations [Item 78]. (4) There is a consensus (87 percent) that wireless ICT will give students in developing countries increased access to higher education, but no consensus is achieved on timing [Item 82]. (5) That convergence of data networks and portable phones, palmtop computers, e-texts, and so on. will increase the accessibility of higher education receives a 94 percent consensus [Item 83]. (6) Four of the five items in this theme achieve some level of consensus.

Table 5.18.

Level of Consensus – Student access-equity

		Probability			Importance			Timing**		
			%	%		%	%		%	%
Item	Statement	N	Low	High	N	Low	High	N	Soon	Late
5	Online access to higher education learning resources will be implemented 24 hours/day, 7 days/week, 365 days/year.	53	0	100	52	2	98	53	96	4
42	The costs of broadband telecommunication connections will NOT be passed on to students, in order to eliminate the digital divide between the "haves" and the "have nots."	39	67 *	33	40	5	95	33	100	0
78	Online higher education, offered globally, and using advanced wireless technology, will help cut across the cultural divide between rich and poor nations.	49	29	71	47	2	98	42	60 *	40
82	The availability of widespread wireless communication will give students in developing countries an increased access to higher education.	47	13	87	46	4	96	45	58 *	42
83	Convergence of data networks, portable phones, palmtop computers, e-texts, etc., will increase the accessibility of higher education.	49	6	94	48	4	96	47	87	13

Notes.

* = Does not meet criterion for consensus
Strong Consensus = 90% to 100%
Consensus = 80% to 89%
Minimum Consensus = 70% to 79%

**Soon = Before 2010
Late = 2010 or after

Online access to higher education learning resources will be implemented 24 hours/day, 7 days/week, 365 days/year [Item 5]. There is 100 percent consensus and a median panel, and subgroup ratings of 4.00 that 24/7/365 online access to learning resources will become available in North America before 2010. As to importance, 24/7/365 access achieves a "highly important" median rating (4.00) (Table 5.4). Although panel commentary is generally supportive, there are some reservations expressed, especially as to the negative affects on faculty's professional and personal lives.

> Already happening. No doubt it will benefit education in some ways, but it will be interesting to see whether there are negative effects on other aspects of our lives. [IT #9, Canada]
>
> . . . .Student may have access to learning resources on a 24x7 basis. The challenge is to determine the extent to which they will have the same degree of access to the technical support that may be required....Does [access] mean that the student should expect to be able to get immediate feedback from faculty on a 24x7 basis? If so, that is unreasonable. . . [Adm # 1, Canada]
>
> This trend will develop, but may plateau at a level of service which is not completely 24/7/365. . . we are starting to see a plateau of the ability and willingness of the institution and its staff to do this, and the expectations of students are reaching a limit too. Some basic human factors are coming into play: the need for a weekend etc. Expectations with regard to faculty availability need to be constrained. Faculty are not expected to be in their campus offices seven days a week, 24 hours a day. Nor should they be expected to be available in the online world in this way.
> [Adm #6, Canada]
>
> 24x7x365 is indeed possible, and quite likely . . . I think, if accompanied by changed employment practices on the part of online universities. Some of this is happening already, and more will. Students' queries can be routed to any tutor in any time zone. With databases holding student progress status information, having just one tutor throughout a class isn't essential. [Acad #14, Other]
>
> Some may be but most public institutions have agreements that limit the hours of instruction/instructor. . .it is probable but that tutors (or some other pseudonym for part-time non-permanent, contract staff) will replace instructors. [Acad # 3, Canada]

This panelists believes that access is an opportunity.

> As MIT gradually puts its massive set of course resources up on line, that will mean what you say in your statement . . . Whether or not folk actually use those resources is entirely another matter. I feel great when I know info is available to me when I want it, but I'm now resisting the flood of info; it's not good for my mental or physical health. So, 'access opportunity' rather than actual use is the bigger factor here. [Acad #8, Other]

<u>The costs of broadband telecommunication connections will NOT be passed on</u> to students, in order to eliminate the digital divide between the "haves" and the "have nots"[Item 42]. There is no consensus, a 67/33 division, and yet a median panel rating of 2.00 (improbable) on the allegation as to whether or not the cost of broadband ICT will be passed on to students and so reduce the digital divide between the "haves" and the "have-nots.". The majority (67 percent) rates this "improbable." All subgroup medians are "improbable" (2.00), with IT professionals' median (1.50) the lowest on probability. However, panelists accept that cost will be passed on in one form or another according to some commentary. Panel commentary reflects concern about these costs, but also offers possible solutions.

> There will be a premium to be paid for access but it is conceivable that support systems will be created to off set access issues for those in need. [Adm #5, Canada]

> ...students will probably end up paying for this service in one-way or another (depending on the region in which they live and the extent to which fees are determined by the institution or controlled by government). [Adm #1, Canada]

> . . . .the cost of Internet access is a cost of living not of education. [IT #8, Canada]

> . . . Schools may even out the cost effects, but more and more student on-line access is based at home and there the digital divide will continue to exist". . . .I see this type of capability being as common as a telephone, which no one considers an extraordinary educational expense, do they? [IT #19, Canada]

Governments may have to get involved.

> There is some danger here, but hopefully, government policies will ensure that access is available to all (In Canada at least).
> [Adm #6, Canada]

According to one individual costs will become low.

> . . . This will vary from institution to institution unless government gets involved which doesn't seem to be on the horizon in the US. I think it is more likely that the cost of broadband will become so low that it will be like long distance telephone rates and no one will think twice about using it. [IT #13, US]

<u>Online higher education, offered globally, using advanced wireless technology</u> will help cut across the cultural divide between rich and poor nations [Item 78]. There is a minimum consensus (71 percent) and a median panel, and subgroup, ratings of 3.00 on the assertion that online higher education, offered globally, using advanced wireless technology, may help cut across the cultural divide between rich and poor nations. This achieves a strong consensus on importance (98 percent); however, there is no level of consensus on timing. Yet the medians 2.00 for panel and subgroups rate that, within a decade, online higher education, offered globally, using advanced wireless technology, may help cut across the cultural divide between rich and poor nations. Some commentary reflects this uncertainty about outcomes for developing nations:

> [C]ountries like Africa are seeking both basic and higher education. [Acad # 3, Canada]

> . . . This process will be slow because of the limited resources of poor countries, but as costs are reduced some progress in this direction will occur. The important point is that more learners in poor countries will have opportunities to improve their lives because of IT than would have been the case without it ! [Acad # 5, Canada]

> The division between the Rich and the Poor will deepen, if rapid measures are not taken right now! [Acad #4, Other]

> As . . . Bill Gates says, get them clean water before bothering with IT. [Acad #11, Other]

> ...but the cultural product of this process may be quite dubious, cfC Astells' The Rise of the Network Society. [Adm #6, Canada]

> [T]his won't happen as long as a month's subscription rate for online service equals a month's salary. The presence of the technology in a region is not necessarily a measure of its accessibility. [Adm #13, US]

> . . . I think this is possible, but unfortunately not probable. Even with wireless technology, it is hard for me to imagine how countries that cannot feed large portions of their populations will be able to take significant advantage of wireless technology to improve their education. Until we solve the basic problems that threaten existence, we cannot think of technology and education. [IT # 13, US]

<u>The availability of widespread wireless communication</u> will give students in developing countries an increased access to higher education [Item 82]. There is a consensus (87 percent) and a median panel (and subgroup) ratings of 3.00 on the claim that widespread wireless communication will give students in developing countries an increase in access to higher education. The item also has a strong consensus (96 percent) on importance; however no level of consensus (58 percent) is achieved on the timing; but the median panel and subgroup ratings (2.00) concur the timing to occur before 2010. Panel commentary reflects serious doubt that it will happen soon and express concern about the barriers.

> This is true as to those institutions offering higher education which already have more money to build a network with the Western universities etc., but this is not true with those institutions (which unfortunately are a huge majority) which cannot do that. [Acad # 4, Other]

> Literacy is still the growth constraint, not technology. [Acad # 8, Other]

depends on other kinds of infrastructures and what learners need.
[Acad #11, Other]

- not in general, but socio-economic elite groups in dev[eloping] countries, yes [Adm # 1, Canada]

...the extent to which online teaching can attain this laudable goal will depend on the expense involved in accessing the technology. In those countries where online costs are nearly equal to a month's salary, it isn't going' to happen ....[Adm #6, Canada]

There will still be financial and social barriers. [Adm #13, US]

Is there any reason to believe this will happen with wireless when other technologies have not had this effect? [IT #8, Canada]

It's available now but it will be mitigated by how those countries will value such degrees and on how willing and disciplined students will be to take an entire undergraduate degree online" [IT # 13, US]

Eventually, maybe. [Adm # 9, Canada]

Convergence of data networks, portable phones, palmtop computers, e-texts, etc., will increase the accessibility of higher education [Item 83]. There is a strong consensus (94 percent) and all medians of 3.00 on the contention that the convergence of data networks, and hand held portable phones and other devices will increase the accessibility of higher education. Also this item is rated "important" with a consensus (96 percent) (Table 5.4); as well there is a consensus (87 percent) that this is likely to happen before 2010 (Table 5.18).

[I]f higher education course designs etc. are relevant. The real issue in this question is making IT easy-to-use and low-cost interfaces.
[Acad #8, Other]

. . . qualifier - once again - increase accessibility for whom (and who will be excluded). All the above cost money . . . money that many students . . . even in prosperous communities . . . do not have. Institutional programs that would assist students acquire access and/or ownership would be highly desirable. [Adm #1, Canada]

Means

Table 5.1 (m) shows all subgroups score "probable" (academics 3.05, administrators 3.10 and IT professionals 3.02). Administrators have the highest importance mean score (3.30). Academics score the earliest timing (1.89). This theme has agreements between subgroups on the student access/equity issues.

Table 5.1 (m)

Means - Student Access/equity

Subgroup	Ratings	Sums	N	Means
Academics	Probability	174	57	3.05
	Importance	181	56	3.23
	Timing	102	54	1.89
Administrators	Probability	360	116	3.10
	Importance	370	112	3.30
	Timing	213	105	2.03
IT Professionals	Probability	193	64	3.02
	Importance	212	65	3.26
	Timing	121	61	1.98
Entire Panel	Probability			3.07
	Importance			3.27
	Timing			1.98

Summation on Student Access/equity

All items in this theme are rated as being "important" and there is a strong consensus that in rich western countries 24/7/365 student access will become available soon, before 2005. There is only 71 percent consensus that ICT will help cut across the divide between rich and poor countries. Although ICT access is widely available in rich countries, 40 percent of panelists do not expect broadband access in poor countries until after 2010. Almost all panelists agreed that innovations in hand-held technology will increase access to higher education. However, poor countries will have other priorities, for example, food, shelter, and so on, and may not be able to afford Internet access for a decade or two. Although people in poor countries may be able to improve the quality of their lives because of IT, the divide between rich and poor nations is likely to widen because of ICT. There will be political, financial and social barriers that will limit the benefits of ICT in poor countries to just a few socio-economic groups. Illiteracy, and religious, economic and political influences, not a lack of ICT, have been the real constraints on personal growth in poor countries.

Educational Values

In this theme I focus the investigation on those educational values that may be changed through the influences of ICT. Six things stand out from Table 5.19: (1) Panelists do not agree on the probability of all but two items, even though all items are considered "important." (2) There is no consensus on whether or not ICT will alter good scholarship and good argumentation, but a majority (57 percent) thinks ICT will not alter what is considered good scholarship [Item 17]. (3) There is a strong consensus (98 percent) that ICT will not cause a loss of interest in the humanities, arts, and social sciences [Item 40]. (4) No level of consensus is reached on whether or not there will be a blurring of the distinctions between public and private education as online courses become rich and ubiquitous [Item 53]. (5) There is no consensus on whether or not online higher education will result in an assimilation of cultures, but the majority rate this "probable" (62 percent) [Item 79]. (4) There is a consensus (88 percent) that ICT will challenge the philosophy of colleges and universities [Item 84].

Table 5.19 - Level of Consensus – Educational Values

		Probability			Importance			Timing**		
			%	%		%	%		%	%
Item	Statement	N	Low	High	N	Low	High	N	Soon	Late
17	IT and the Internet will alter, at a deep rigorous level, what we consider good scholarship and good argumentation.	53	57 *	43	46	19	81	35	63 *	37
40	Because of online education there will be a loss of interest in the humanities, arts, and social sciences.	49	98	2	46	20	80	20	80	20
53	The distinctions between public and private higher education will blur when an IT environment (in terms of courses offered) becomes rich and ubiquitous.	42	36	64 *	38	24	76	33	64 *	36
79	Online higher education will result in an assimilation of cultures.	45	38	62 *	41	12	88	42	75	25
84	Online education will challenge the philosophy of colleges and universities as to whom and how they serve.	50	12	88	47	4	96	43	88	12

Notes.
* = Does not meet criterion for consensus
Strong Consensus = 90% to 100
Consensus = 80% to 89%
Minimum Consensus = 70% to 79%

**Soon = Before 2010
Late = 2010 or after

IT and the Internet will alter, at a deep rigorous level, what we consider good scholarship and good argumentation [Item 17]. There is no consensus, but the majority (57 percent) of the panel rate it a *low probability* and a median panel rating of 2.00 on the claim that ICT will alter what we consider good scholarship and good argumentation. Two subgroups' medians are "improbable" (2.00), but the IT professionals' median is "probable" (3.00) (Table 5.3). There are some differences among the subgroups, as 54 percent of administrators and 44 percent of IT professionals rate it "improbable." The academic subgroup reaches a consensus (77 percent) that this item is "improbable" (CD-ROM).

Some panelists comment that there may be more rigour because of the improved research possible through ICT and that this may change argumentation.

> There's some good demonstration examples that this can occur. The delay in this happening is the experience needed in designing powerful learning environments that encourage a quicker transfer from research to teaching and opportunities for argumentation. [Adm # 9, Canada]

> This is already starting to happen. Those who think the new techniques of presenting and organizing information are only neutral tools underestimate how much our current models of scholarship and argumentation are dependent on the form of the single, unidimensional manuscript. . . This change in its fuller and deeper manifestations won't come quickly, however. At lot of people brought up in the old culture will need to die off first. [IT # 19, Canada]

> I think that the criteria for good scholarship and argumentation should be almost unchanging. But academe is prey to trends, and possibly there could be a temporary fad in scholarship around the Internet.
> [Acad #5, Canada]

> I think it will in the long term, not immediately. [IT # 9, Canada]

Some panelists say scholarship and argumentation will not change.

> [T]he principles are the same regardless of format. [Acad # 8, Other]

> Not IT per se, but increasing access to current, ongoing research and to the work of a wide range of sources has already begun to raise the bar. I see more rigor applied to standards we already have. We need to solve the problems of peer review and the valuing of publishing on the Web in the eyes of promotions committees...before this will get very far. I'm going to say "improbable" because I don't see "deep rigorous level" change to different standards of excellence. [Acad # 14, Other]

> I believe IT changes the speed, mode, and quality of our communications and interactions. I do not believe it changes the values we hold of what constitutes good research or a good argument. [IT # 13, US]

Because of online education there will be a loss of interest in the humanities, arts, and social sciences [Item 40]. There is a consensus (98 percent) on a *low probability* and a median panel, and all subgroups ratings of 1.00 on the allegation that there will a loss of interest in the humanities, arts, and social sciences due to ICT. The importance medians are "important" (3.00) for the panel and subgroups (Table 5.4) that these fears not transpire. Commentary confirms these findings:

> Highly unlikely. The Internet is neutral or mildly positive with respect to these areas. Blaming the net is just scapegoating. [Acad # 5, Canada]
>
> On the contrary, we will see a new wave of interest in those fields. [Acad # 4, Other]
>
> The loss of enrolment in the humanities, arts, and social sciences is not due to online learning. [Acad # 14, Other]
>
> Nothing to do with online education. [Adm #1, Canada]
>
> ....it is highly important that this NOT be a consequence. [Adm # 6, Canada]
>
> The strongest enrollments for 1st and 2nd year courses ...at [this college] are in the arts...humanities and social sciences...There's little interest/student demand for online courses in these disciplines....perhaps this will increase over time...but students say they go to [this] College because of personal contact with instructors and small classes (provincial student follow up surveys). [Adm #14,Canada]
> Loss of interest is already happening (note enrollment declines in these areas). This is due to labor markets, not to IT. [Adm # 13, US]
>
> I already see evidence of interest in some humanities and other subjects increasing with on-line content. It all has to do with presentation. [IT # 19, Canada]
>
> The focus on "marketable skills" may impact the humanities, but online education works in both science and non-science disciplines. [IT # 8, Canada]
>
> ....Does television have any less content from the humanities, arts and social sciences than newspapers? Actually, there is probably more

available depending on how you define humanities, arts and social sciences. [IT # 13, Canada]

The distinctions between public and private higher education will blur when an IT environment (in terms of courses offered) becomes rich and ubiquitous [Item 53]. There is not a consensus, but the majority (64 percent) rates it as "probable" and a median panel rating of 3.00 over the position that the distinctions between public and private higher education will blur when an IT environment becomes rich and ubiquitous in terms of courses offered (Table 5.19). Academics' and administrators' medians are "probable" (3.00), but IT professionals' median is "improbable" (2.00) (Table 5.3). Consensus is achieved within two subgroups: 80 percent of the academics and 71 percent of the administrators rate this item "probable," but the IT professionals do not achieve a consensus, as 67 percent rate it "improbable" (CD-ROM). Commentary expresses the differences.

> There is already a rich private sector market in initial computer based courses. There will likely be the rise of a second privately funded Higher Education infrastructure. Perhaps they will ignore gov't control since they wont get gov't $$s. [Acad # 3, Canada]
>
> ....This is occurring now. It is a sign of maturity among consumers when they judge the product by its quality and relevance not such extraneous considerations as public and private. [Acad # 5, Canada]
>
> cost factors (to the student) will determine, to some extent, how much "blurring" will take place. [Adm #6, Canada]
>
> Isn't this the case right now in the US where private and public universities' courses are available. [Adm #1, Canada]
>
> Universities are about people, not IT. [IT # 8, Canada]
>
> Good private universities will continue to distinguish themselves by their personal attention and emphasis on teaching and mentoring students. They will simply use more technology in their delivery. . . .[on-campus]

> will continue to be the primary means of receiving a four-year-degree for those who can dedicate four years to full time study. . . .[IT # 13, Canada]

Online higher education will result in an assimilation of cultures [Item 79]. There is not a consensus that online higher education will result in an assimilation of cultures, but the majority thinks it "probable" (62 percent) (Table 5.19). Academics provide the only "improbable" median (2.00) on this item; other subgroups and panel medians (3.00) are "probable" (Table 5.3, in appendix). Median on "importance" is 3.00 for subgroups and panel. The panel commentary confirms that the views on this issue are passionately held:

> We are all being assaulted by the US bombardment so that our education system is becoming Americanized. I fear the assimilation is going one way only. . . . [Acad #3, Canada]
>
> It will contribute to some extent, but this is happening already. [Adm # 13, US]

These comments give reasons why there will not be an assimilation of cultures:

> The potential for this to occur will be restricted because of ill advised government policies of which the CRTC in Canada is the best example. . . online education will enable groups of like-minded people to segregate themselves. In other words in the online world people can avoid mixing with others who are different from themselves, thus preventing assimilation of cultures. [Acad #7, Canada]
>
> There's a lot more to 'culture'. [Acad #5, Canada]
>
> In some respects, yes (for instance, my mother tongue is [not English]. but here I am, answering to these questions in English. . .In some other respects, I believe that people's feeling of their ethnic and national identity is growing (see e.g. the growth of ethnicity-based conflicts in Europe . . . or citizen movements like the Attac). [Acad #4, Other]
>
> Or no particular 'CULTURE' at all, because durable norms and values may be contrary to the "creative destruction" following the flexibility of the network society. [Acad # 11, Other]

> English and Chinese languages will dominate the Web in my opinion. [Adm # 6, Canada]

> Yes, to an extent. Much like the reality of English being the language of the web today. [IT # 8, Canada]

> ....Will take a long time to tell. In many ways the Internet makes it easier for different cultures and interests to survive. You will probably be able to see both effects--assimilation and sustained, even intensified, differentiation. [IT # 19, Canada]

> ....I think this is too strong a statement. I do believe it will result in some assimilation, but not a total assimilation . . . as this question states. I would like to think that online higher education would more likely result in a better understanding and appreciation for different cultures, not their assimilation. [IT # 13, US]

<u>Online education will challenge the philosophy of colleges and universities</u> as to whom and how they serve [Item 84]. There is a consensus (88 percent) and a median panel and subgroup ratings of 3.00 on the assertion that online education will challenge the philosophy of colleges and universities as to whom and how they serve. Also there is a strong consensus (96 percent) on importance (Table 5.19). As well, panelists think that within a decade, the philosophy of colleges and universities as to whom and how they serve will be challenged (Table 5.5). Some panel commentary provides rationales behind the ratings.

> Because it raises questions of quality and legitimacy it will force institutions to critically examine their goals and assumptions about how to achieve them. [Acad # 5, Canada]

> The economics of higher education are exerting the most pressure in that direction. [Acad #14, Other]

> Yes, but slowly, as the current faculty are replaced. [Adm # 6, Canada]

> It will affect philosophies differentially. Some at the margins, some at the core. [Adm #13, US]

> Many universities still do not think in terms of the life long learner as a core constituent, but as a 'continuing studies student'. [IT #8, Canada]

> Old issues will be examined anew, and that is always a challenge. [IT #19, Canada]

Means

Three of the five items in this theme of Educational Values did not achieve a consensus; yet one of the five items is rated *high probability* and another one is rated *low probability.* Table 5.1(n) shows all subgroups score *low probability* (means, under 2.50), but all items score *high importance.* There is not much differentiation between subgroup scores. They score the items as happening later, if at all.

Table 5.1 (n)

Means – Educational Values

Subgroup	Ratings	Sums	N	Means
Academics	Probability	140	58	2.41
	Importance	151	48	3.15
	Timing	85	37	2.30
Administrators	Probability	282	115	2.45
	Importance	319	108	2.95
	Timing	181	82	2.21
IT professionals	Probability	159	66	2.41
	Importance	192	62	3.10
	Timing	109	48	2.27
Entire Panel	Probability			2.43
	Importance			3.04
	Timing			2.25

Summary Discussion on Educational Value Issues

All items within this theme have *high importance*, and the item achieving the highest percentage of importance is that online education will challenge the philosophy of colleges and universities as to whom and how they serve. Only two of the five items within this theme achieve a level of consensus on the probability. Strong disagreements remain on the probabilities that concern good scholarship, good argumentation, the distinctions between public and private higher education, and if there will be an assimilation of cultures. As to assimilation of cultures, nearly two-thirds of the panel believes there is a *high probability*. There is a fear that, as English is the language of the Internet, and because of US dominance on the web (and elsewhere) there will be an "Americanization" of the world's cultures. But countries other than the US are seen as becoming increasingly aware of their national ethnic and cultural identities.

Panelists review questions concerning scholarship, argumentation, challenges to the beliefs underlying university culture and influences, as well as the consequences of ICT use. There are considerable differences in view among panelists. Eighty-eight (88) percent of the panelists expect that ICT will challenge the mandates of universities and colleges, but they do not reach agreement on whether the technologies will alter scholarship and argumentation at a deep rigorous level. There may, however, be an added level of rigour introduced to existing methods of review because of the wide access to knowledge and information available through ICT. The notion that online education will lead to an assimilation of cultures achieves a mixed reaction and led to emotional commentary. Panelists recognize that online learning will challenge cultural values, but there is fear that an assimilation of cultures might be synonymous with "Americanization." However some panelists comment on an increased awareness of old roots, ethic origins and traditional cultural values; ironically, recent ethically motivated wars are cited as evidence of this awareness.

Though there is division within the panel, nearly two-thirds rate a *high probability* that the distinction between public and private education will blur as online courses become rich and ubiquitous. Panelists agree that universities and colleges will be well advised to stay grounded in their solidly based traditions of research, teaching, and service. But academicians and administrators will need to accept, with an open mind, that enrichment can come from incorporating the best of online learning into teaching.

Items Rated "Improbable"

There are nine out of sixty-four items that achieved consensus on which panelists reach agreement as to the *low probability* of occurrence (Table 5.20). The results may interest leaders in the academy, as they do tend to discount some fears about adverse influences of ICT use that are expressed in the literature. For instance, there is a consensus (88 percent) that job loss for faculty at public institutions will not occur because of ICT. As well, fears about the future of residential colleges and the quality of ICT learning are discounted. Almost all panelists agree on a *low probability* that any loss of interest in the humanities, arts, and social sciences would be due to online education. Panelists' commentary indicate that there are increases in enrolments and interest in these fields. Some panel commentary indicate that to blame the Internet is an excuse and any less interest in the humanities may be due to with marketable skills and the labor markets.

Table 5.22 (in appendix) ranks the probability means using the dichotomy scale of negative 1 to represent highly improbable and improbable while positive 1 represents highly probable and probable. The item least likely to occur, according to the panel, academics, and administrators is that "because of online education there will be a loss of interest in the humanities, arts, and social sciences" [Item 40]. But the IT professionals' results show the least likely to happen is that "Online higher education will become elitist, because of the costs to individuals of hardware, software, and access" [Item 38].

This panel doubts that online higher education will become elitist (in North America) because access to the Internet is compared to access to the television; hence such access is considered a cost of living, not a cost of education. History has shown that costs of technology decreases over time.

Table 5.20 - Level of Consensus – Not Probable

		Probability			Importance			Timing**		
			%	%		%	%		%	%
Item	Statement	N	Low	High	N	Low	High	N	Soon	Late
9	Higher education provided online by large global institutions, consortia, and/or corporations will threaten sound pedagogical values	46	80	20	42	20	80	43	88	12
15	Standardised course material will de-personalize education and lower standards.	49	86	14	45	29	71	27	89	11
27	Residential colleges and/or universities will no longer be an important component of the higher education landscape.	52	92	8	47	13	87	31	52 *	48
38	Online higher education will become elitist, because of the costs to individuals of hardware, software, and access.	47	94	6	43	14	86	28	96	4
39	Faculty at public institutions will experience job loss due to a shift to online education.	49	82	18	47	30	70	28	71	29
40	Because of online education there will be a loss of interest in the humanities, arts, and social sciences.	49	98	2	46	20	80	20	80	20
41	Public institutions will lose important staff members when the mean salaries of faculty employed by "no name" online schools, grow to exceed the salaries and perks of "first tier" institutions.	47	72	28	42	24	76	31	65 *	35
46	Online education will be dominated by the 'for-profit' sector of higher education at the expense of brick and mortar campuses.	48	73	27	47	11	89	36	78	22
73	Governments will 'get out of the way' in response to market pressures to deregulate higher education.	44	80	20	42	12	88	32	72	28

Items Identified for Further Research

Twenty-one of eighty-five items in this research did not attain the 70 percent minimum rating set for consensus (Table 5.21 in appendix). Two of these items were dropped from analysis because they are rated *low importance* [Items 3 and 6], and Item 63 was dropped due to ambiguousness. Because of differences in panel opinion, these items are identified as areas for further study. It is acknowledged that there may be differences about whether 70 percent is an appropriate level at which to set a minimum consensus, but these items stand out as having attracted wide differences of opinion. Some of these items may justify further research inquiring into the reason for differences between panelists or whether these findings are valid. For instance, Items 10 and 47 raise questions about the probability that large, well-financed global online consortia will form and challenge established institutions. This is identified as an important area for further research into the timing, formation, status opportunities and threats offered by such consortia.

Cross Referencing of Items to Themes

Table 5.32 (in appendix) lists all items in numerical order and identifies the theme under which each is considered and the table number in which the item's consensus level is given. Appendix V gives an index of all the statements in item number order.

Synopsis of Means Ratings

Means Rank on Probability and Importance

Probability Table 5.22 ranked the means for the panel and subgroups using the dichotomies negative 1 for *low probability* and positive 1 for *high probability.* The panel, academics and administrative subgroups all agree the *lowest probability* of occurrence (means – .96 to –1.00) is that the threat due to online education there will be a loss of interest in the humanities, arts, and social sciences [Item 40], highly unlikely. However the IT professionals' believe that online higher education will not become elitist, because of the costs to individuals of hardware, software, and access lowest rank (mean, -1.00) [Item 38].

Academics have eight ties for *highest probability* (means, 1.00), IT professionals have three ties for the *highest probability* (means, 1.00), and administrators have one item only for the *highest probability* (mean, 1.00), which is the only match between the subgroups, sharing the highest probability (mean, 1.00). Therefore academics and administrators agree on the likeliness of the event that large universities and corporate competitors with high brand recognition or demonstrated 'value-added' services and assessment models will dominate large sectors of the online educational market [Item 49]. IT professionals did not have a match with other subgroups for the highest probability.

Academics eight highest ranked probability means (1.00) occurs on item 12, 29, 44, 49, 52, 67, 77, and 83. Universities and colleges will be obliged to respond to industry's (commerce) demand for training at the workplace and "just-in-time" online employee training [Item 12]. Many colleges, universities and polytechnics will face serious competition in their home territories from 'outside' institutions offering online education [Item 77]. Acceptance by employers of private certification will force universities and colleges to compete online [Item 52]. IT and the Internet funding and training will be a priority within higher education institutions [Item 29]. Convergence of data networks, portable phones, palmtop computers, e-texts, etc., will increase the accessibility of higher education [Item 83]. As wireless and broadband networks merge, rich data banks will become an important extension of our brain [Item 44]. Quick, easy, seamless Enterprise Resource Planning (ERP) computing systems (an administrative portal) will facilitate a "virtual campus" experience, dovetailing with existing enrollment, records, financial and other systems [Item 67].

IT professionals' highest ranked means on probability (means, 1.00) three items are 4, 30, and 54. Online learners will demand pedagogically sound, technology-mediated courses compatible with their learning styles [Item 4]. The educational market will be global; educators will be more inclined to think of competing beyond provincial/state or regional markets [Item 54]. The use of IT and the Internet will result in major professional and cultural change for faculty (with respect to roles, teaching methods, work processes, avenues for recognition, and research opportunities) [Item 30].

Importance Table 5.23 (in appendix) ranks the panel means and subgroups means using the dichotomies negative 1 for *low importance* and positive 1 for *high importance.* The academics have twenty-five (25) items with *high importance* means (1.00). The IT professionals have seventeen (17) items with *high importance* means (1.00); and the administrators have fourteen (14) items with *high importance* means (1.00).

For the panel five items make *high importance* means (1.00); they are item numbers 4, 34, 45, 66, and 85. These include the process changes, events, opportunities and/or threats that are important to address. The future outcome that online higher education will challenge the mandate of colleges and universities about how far geographically their mission extends. The use of the web by colleges, universities and polytechnics will become essential to the educational experience. Market analysis of online higher education and training programs will be essential where public and for-profit organizations compete aggressively. Major textbook publishers and online learning software developers will build strong corporate partnerships for the marketing of virtual "textbooks" integrated with instructor-customized course material. Online learners will demand pedagogically sound, technology-mediated courses compatible with their learning styles.

High Probability and Importance issues of online learners will demand pedagogically sound, technology-mediated courses compatible with their learning styles achieves *highest importance* from all subgroups and among the *highest probability* from the IT professionals. Online teaching and online learning is the priority ICT issue according to this panel.

Probability means from the findings that use the data collection scale 1 to 4 from Round 3 is shown on Table 5.24 (in appendix) which ranks the top 10 means of probabilities. The top ranking *highest probability* for the panel, academic and IT professional subgroups is that IT and the Internet will be critical components of the post-secondary institution's strategies. The administrative subgroup's *highest probability* rank is the use of the web by colleges, universities, and polytechnics will become essential to the educational experience.

Importance Table 5.25 (in appendix) gives the panel's top ten ranked importance means from the findings that use the data collection scale 1 to 4 from Round 3. The panel, academic and administrative subgroups' *highest importance* rank is the use of the web by colleges, universities, and polytechnics will become essential to the educational experience. The IT professionals' *highest importance* rank is that IT and the Internet will be critical components of the post-secondary institution's strategies.

Table 5.26 (in appendix) is the Panel Probabilities Means Ranked & SD and uses the data collection scale 1 to 4 in Round 3. The *highest probability* ranked means for the panel is that IT and the Internet will be critical components of the post-secondary institution's strategies. The second *highest probability* ranked means for the panel is the use of the web by colleges, universities, and polytechnics will become essential to the educational experience. Table 5.27 (in appendix) shows the panel's *highest importance* rank as the use of the web by colleges, universities, and polytechnics will become essential to the educational experience. These tables give the ranked means and standard deviations for all the items.

Table 5.28 Academics' Ranked Importance Means gives the means and standard deviations for all items. The *highest probability* ranked means (3.83) is the use of the web by colleges, universities, and polytechnics will become essential to the educational experience. Table 5.29 Administrators' Ranked Importance Means also gives the means and standard deviations for all items. The administrators' *highest probability* ranked means (3.73) matches the placement of the academics; but the administrators' *second highest probability* ranked means (3.54 tie) concerns the financial burden of continuing innovations in hardware, software and networks will challenge higher education institutions' funding and that IT and the Internet will be critical components of the post-secondary institution's strategies. Table 5.30 IT Professionals' Ranked Importance Means (in appendix) shows the *highest probability* ranked mean (3.92) is IT and Internet access and use will become universal and ubiquitous in higher education institutions. IT professionals' *second highest probability* ranked mean (3.85) matches the placement of the administrator's ranking that IT and the Internet will be critical components of the post-secondary institution's strategies.

Timing ranked means for the panel (Table 5.31, in appendix). The item forecast to occur the soonest (mean, 1.27) is that course content will be web-based but students will expect individualized tutorial support, if needed. The next soonest to occur (mean, 1.28) is that many learners will expect courses and programs to be delivered on the web.

Summary of Data Analysis Methods

In sum, Chapters Four to Seven have covered ten different types of data, five quantitative and five qualitative. The five types of quantitative data are: (1) level of consensus (strength of consensus or non-consensus) for each item within the themes (Tables 5.6. to 5.19); (2) comparison of medians between panel and subgroups (Tables 5.3. to 5.5, in appendix) on each item; (3) identifying the differences among and between subgroups when consensus is not achieved (CD-ROM); (4) means of scores within the themes (Table 5.1); and (5) a ranked order of items reviewed based on means as to probability, importance and timing (Tables 5.22. to 5.31, in appendix).

Five types of qualitative data were reported: (1) statements provided in Round 1 were converted into an 81 item questionnaire for Round 2; (2) the individual panel commentary on each item in Round 2; (3) the individual panel commentary on each item in Round 3; (4) at the conclusion of Round 3, open-ended commentary by panelists on other major influences of ICT use on higher education institutions they saw as not covered by the questionnaire (Appendix R); and (5) Panelists' evaluation of the web-based Delphi process. In Chapter Eight, the summary of findings will be compared with the literature review.

Section 3: Implications, Consequences, Conclusions and Recommendations

Chapter Eight: Discussion of Results and Summary

Chapter Nine:

Part 1: Implications and Consequences of ICT Use

Part 2: Conclusions and Recommendations for Practice and Research

CHAPTER EIGHT

SUMMARY OF RESULTS AND DISCUSSION

Introduction

This chapter discusses the research findings and compares them with a literature review up to and including the year 2000. The research provides a broad look at academia, as it might be eighteen years hence. The panel envisions a much-changed North American academy; but one still offering a collegial experience, with scholars at its core, commitments to academic freedom, and excellence in research, teaching, and service. This perspective is gained from both the literature and the pooled intelligence in a panel of over fifty women and men, all of whom are thoroughly experienced in fields of higher education and/or ICT.

The North American academy has served well for generations with its commitments to scholarship, independent research, teaching and service. Traditional values will remain foundational in the academy of the future, but may be redefined in an era of ICT. The panel does recognise probable threats by online education to some traditional institutions of education. Solidly based universities and colleges of good reputation in research, teaching, and service are not expected to be undermined, but the panelists acknowledge that weaker institutions may fail financially. The jury is still out on whether or not online global consortia of universities, and/or corporations eventually will undermine the stability of higher education institutions of solid reputation. Although there is not a consensus on this issue 46 percent of the panel rate it "probable." One panelist suggests that "The threat may well be from other 'traditional' institutions (MIT, Stanford) which encourage online learning" [Adm # 16, Canada]. There is division within the panel as to whether or not the distinction between public and private education will blur as online courses become rich and ubiquitous. But there is unanimous consensus that in western countries ICT access will become universal.

According to Altbach (1991) universities are singular institutions deeply embedded in their societies. They provide social mobility to previously disenfranchised groups and are important creators of new knowledge through basic research; the professor, at the centre of the institution, has enshrined autonomy. Kearns (1998) comments that many in academia insist that educational institutions remain entirely independent of specific constituencies in order to preserve the university's cherished traditional role. He asserts that an academy should not commit itself in terms of accountability to something as large, diffuse, and fickle as the general public. However, educational administrators cannot afford to ignore the views of taxpayers and their representative politicians.

Dill, Massy, Williams and Cook (1996) assert that the public sees academic quality not so much in terms of the academic reputation of individual teachers, but rather in the light of the collective impact of academic programs on the skills and accomplishments of post-secondary graduates. There will be consequences if political will is defied. For instance, despite strong objections from faculty and administrators a process for external assessment was established in both England and the Netherlands (Dill, et al., 1996). Yet one cannot underestimate the forces of continuity, and the academy's leaders have a lifetime invested in existing institutions and educational practices. Experience from the 20^{th} century clearly demonstrated the academy's capacity to transform when called to serve mass education. This research indicates that a similar transformation will take place during the first quarter of the 21^{st} century as a consequence of increased access to online education and the global influences of ICT. The panel forecasts that both the missions and funding of institutions of higher education will be challenged by ICT during the period between 2005 and 2015.

Phil Agre (1998) asks if there will be a revolution in the university, but argues that revolutions are destructive. He asserts that students inherit a conception of education from high school that is closer to vocational training. Technological skills rapidly become outdated, but other skills — reading, writing, talking to people and navigating on a social network — do not go out of date. The panel predicts that major professional and cultural change will happen within less than a decade.

American higher education faces formidable challenges caused by innovations in technology, changing student demographics, severe financial constraints, and lingering institutional rigidities (Baer, 1998). There are also anxieties and serious differences of opinion in higher education over the use of ICT (Postman, 1992; Noble, 1997 & 1998; Negroponte, 1995). A university plays a crucial role in technology transfer at two levels: (1) it provides the capability to develop the management skills required to utilize and organise a new technology; and (2) it is a site that can combine the basic research needed for the advancement of science-based industries with the training of management for these industries (Carnoy, 1996).

Brief Review of the Delphi Method

Forecasting the future is rooted in mythology, but systematic forecasting had its origin in the development of the Delphi method by RAND Corporation during the 1960s. The term 'futurology' indicates a search for a logic of the future in the same way history is a search for the logic of the past (Flechtheim, 1942). A futurist must be able to imagine solutions and inventions that no one else has yet forecast (Snow, 1993). But, speculation is best founded on thoughtful and reflective judgment and on insights from the best minds available; this is provided by a Delphi forecast. Alternative, or preferred futures are predicted in order to inform our creative thinking, shape our policies and inform our decision-making.

Any topic that can be discussed at a committee meeting can be investigated by gathering expert opinion through a Delphi inquiry. Gordon (1992) outlines how the Delphi approach removes conference-room impediments in accomplishing an unbiased expert debate. The influences that various rigorous Delphi methodologies have had cannot be exaggerated; Delphi is a fundamental tool for those working in technological forecasting (Linstone & Turoff, 1975). In sum, the Delphi method offers "a system of quantified estimates of change and alternatives, that is, a prediction of the timing, character, and degree of change...the design, evolution, or process of something according to a specified system of reasoning" (Hencley & Yates, 1974:10-11). According to Gordon and many others, experts are more likely than non-experts to be correct about future developments in their field; therefore, a consensus among experts can be important. One strength of the Delphi method is that the quality of forecasting improves as the procedure draws on the knowledge and experience of people with differing backgrounds; a range of expertise lends credibility to an outcome and can be valuable in gaining acceptance for a forecast (Twiss, 1992; Gordon, 1992). The Delphi process encouraged the study's panel members to step outside an immediate context, beyond the ferment over issues, and to consider how higher education will be changed in a decade or two.

Web-based Research Design

In North America there seems to be a determination to go online and a desire for the instantaneous response that is now possible through ICT, so I decided it was necessary to move the relatively cumbersome paper-based classical Delphi method onto the web. As well, the panelists requested asynchronous feedback and other interactive features possible through ICT.

The Delphi Research Design model used in this research is described in detail in Chapters Three and Four and illustrated in Figures 1 to 4. Three web-based Delphi questionnaires were created, designed, and developed by me, with the assistance of webmasters who provided the script code and administration. The convergence of communication networks with computer technologies has allowed the digital record keeping power of the computer to be applied to non-written, multimedia forms of communication. The development and execution of these Delphi online instruments proved complex and time consuming. However, the panel members found it easy to operate within the web-based system. This Delphi Method collects qualitative data from the conjectures of experts, which data are later expressed in quantitative terms.

This panel has subgroups—academics, administrators, and IT Professionals. When a consensus is obtained from a panel with several subgroups, it gives added reliability. While in some cases a consensus may be obvious, views that differ from a consensus often provide the most interesting of responses. According to Gordon, the value of a Delphi study rests in the ideas that it generates, both those that evoke consensus and those that do not. This research brings into focus divergent conjectures, priorities and ideas expressed by panel subgroups of influential people.

This web-based Delphi accomplished: (a) structured information flow; (b) feedback to the participants of statistical analysis and an edited version of commentary from other panelists; and (c) assured anonymity of response for the participants. This web-based application is a natural progression for the Delphi method because it combines the rigour of collection and analysis of multivariate data offered by the classical Delphi with the instantaneous collection and feedback of a Real-Time Delphi. Data are collected into databanks, managed by web instrumentation, quantified and transferred directly to statistical programs for computer analysis, thereby reducing clerical error. The instruments developed can be used as a model and adapted for testing in other multi-variate studies. The CD-ROM provides web-based documentation. Appendix D gives panel member evaluations of their experience in using these web-based instruments.

Qualitative Data

Qualitative data in this modified Delphi study arises from five distinct aspects of the methodology: First, from panel statements made in response to an open-ended question in Round 1, second from panel commentary in Rounds 2 and 3. They elaborate on responses on individual items, and provide rationales. As well panelists suggest modifications to improve the Round 3 questionnaire. Third, they give further comments, in Round 3, on rationales, particularly if where they are outliers. Fourth, at the conclusion of Round 3 panelists give open-ended commentary on issues not covered in the questionnaires. Fifth, panelists give an evaluation of the entire web-based Delphi process.

As to the first aspect of qualitative data in this research, a large quantity of data was collected in response to Round 1. Some of these data included complex paragraphs explaining multi-faceted issues. All of these data were critically examined, in some cases deconstructed, to provide an initial set of over 800 issues and statements. I accept that the procedure may encourage an "information overload." Subsequently, statements that covered similar ideas were clustered, where clusters of ideas were mentioned more than once, these were constructed into an 81-item questionnaire for Round 2 and subjected to pilot testing before implementation. Even this number of items may have been overly time consuming for panelists, they were to rate 243 variables (81 x 3).

A weakness is acknowledged as an item, mentioned only once in Round 1 and therefore not included in Rounds 2 and 3, might be insightful and potentially have an important influence on the academy. However, my critical analysis of the raw data inevitably was subjective; as well, the inclusion any more items for review might have resulted in a high dropout rate and low panel participation.

All panel commentary was critically reviewed, and edited for clarity and brevity. I did not provide a separate analysis of panel commentary. However, a rich resource of qualitative data is provided on the CD-Rom included with this research; these data are available for further analysis. Such an investigation could be relevant. However, I did review, all panel commentary in reaching an understanding of the quantitative analysis used in making the findings in this report. Although this report is based on analysis of quantitative ratings, the panel commentary was useful to me in reaching an understanding of the quantitative analysis used in making the findings. Also the edited commentary was used to inform panelists encouraging them to take a reflective approach to responses. Panelists commented that the procedures made them "think" and it was a factor in insuring their intellectual engagement.

Third another area of this Delphi where subjectivity occurred was in modifying the Round 3 questionnaire based on experience and commentary. My interpretation of their commentary resulted in changes in wording on some items and the addition of four items, increasing the number of variables to 255 (85 x 3). Panelists were candid in identifying weaknesses and in suggesting improvements to remove ambiguities and double-barreled statements. Although a subjective process was used in making modifications, the panel responded well to the revised Round 3 questionnaire. Fourth, the open-ended commentary at the end of Round 3 did not provide any significant new issues for analysis, but did reinforce some findings in the study. This commentary emphasizes the difficulties obstructing the use of ICT in developing countries. Fifth, the evaluation of the web-based Delphi process was positive and the methodology did accomplish the objective of a controlled interaction among the panel members. Ideas were shared, and perhaps insights were gained by panelists who have the power to influence change in higher education institutions.

My conclusion is that the web-based Delphi is a useful analytic communication tool and method. It insures anonymity, provides statistical controlled feedback and allows a relatively free flow of ideas within a stated context. A lower number of items would have been preferred by panelists and might have improved participation rates. Despite the length of this Delphi survey, forty-nine (49) panelists completed all three rounds. How effective is the web-based Delphi procedures as a tool? Other researchers, investigators, and decision-makers will have the opportunity to assess it.

Summary of Findings and Discussion

Residency

The panel achieves a strong consensus that residential colleges will not become redundant due to ICT. Participants agree that full-time on-campus degree programs will thrive in competition with online education and certificate granting systems. The on-campus collegial experience is recognised as a transition for learners, providing a social life and a move towards a growing independence. The intellectual/social experience of residency is an important part of young students' transition to independence. Online education cannot fulfill this need. On-campus students will be exposed to views they otherwise might not experience and may become more socially aware through contact with a diverse university population. Nevertheless, residency may become too expensive for most students and in consequence it may be necessary for residency to be reduced to one or two years, perhaps over several sessions.

The panel supports a collegial experience for young students, but it forecasts that education will be conducted increasingly online. As well, education will be ever more learner-centred (Twigg & Oblinger, 1996). The panel predicts that during the period 2005 to 2015 online learning will be at the core of on-campus education, a dual mode of online and face-to-face higher education is predicted to become dominant in North America within a decade.

Online Competition

There are considerable differences of opinion in the literature as to how online education may play out; some educators are not supportive and have a sense of historic mission and a belief that the academy and its educational and intellectual values should remain unaltered (Zemsky & Massy, 1995; Postman, 1992). However, according to this panel, change is likely, and online education and ICT will challenge both the missions and funding of universities and colleges during the 2005 – 2015 period. There is a strong consensus that many colleges, universities, and polytechnics probably will face serious competition in their home territories from "outside" institutions offering online education. As well, there is a strong consensus that when faced with competition for their core business, enterprising higher education institutions will organise to market their specialty programs online globally. Panelists recognise that online education has the potential to pose threats to some tradition-based institutions and acknowledge that weaker ones may fail financially. Solidly based institutions of good reputation are not expected to be undermined by online education. However, there is a strong consensus that large universities, corporate competitors, and consortia will dominate large sectors of the online higher education market, eventually these may pose a threat.

Funding and Efficiency

There is almost unanimous agreement in the panel on probability and importance that ICT funding and training will gain priority during the period 2005 to 2015. But

Frances and Pumerantz (1999) warn that the burden of ICT costs could affect sensitive areas such as faculty salaries and hiring. There is a strong consensus in the panel that there is a need for more business-like behaviour in the academy. But, unlike businesses, most public universities and colleges do not operate for-profit. As well, business, with its failures and occasional corrupt practices, cannot be held up as a model. Nor are business executives more skilled and capable than university administrators. On the other hand, most successful US corporations do have an annual cycle through which a corporate plan is built up from the "grass roots," starting with operating departments. These plans take time and experience, and are stressful to prepare, but do serve to keep corporations in touch with the changing economic and social environment in which they operate. Some, but not all, higher education institutions already use a similar model. Perhaps it is this kind of approach to planning that the panelists envision when they achieve consensus on the thorny issue of being businesslike.

The panel is divided on the probability of a two-tiered higher education system with a high-cost tier offering a collegial experience, and a low-cost tier online . A report by Lundin (1998) on the University of Queensland, Australia describes the use of ICT to serve a non-elite mass market in that country.

Higher Education and the Marketplace

ICT have affected most economic sectors, but how, when and to what degree ICT will be adopted by universities is hotly disputed. A transformation of higher education by ICT appears likely according to the panel. But not everyone agrees with this proposition, nor do all scholars agree that change is desirable. In his essays Noble (1997 & 1998) describes a commodification of education that treats teachers as "labour" drawn into the commercial process to assist in the design and efficient creation of educational products. He claims that the asynchronous learning systems of ICT will draw teachers into long and unpaid hours of work. There is one hundred percent agreement in this panel that market analysis for online higher education is both "probable" and "important," and will become essential when public and for-profit organisations compete aggressively. Brand names, cultural diversity, market influences, technical sophistication, advertising and the quality control of educational content may all become part of the lexicon of higher education during the 21st century. This prediction appears to confirm the worst fear of Noble: the "commodification" of education through ICT. But the panel and subgroups reach a consensus that on-campus, full-time undergraduate degree programs will thrive despite the availability of online options. The fears expressed so strongly by Noble (1997, 1998), Herman (1998) and Denning (1998) have fueled anxieties among faculty that the higher education system, learner outcomes and the personal careers of professors might be blighted because of these technologies. The panel does predict that the academy will be transformed, not damaged, during the period 2005 to 2015, not only because of ICT, but also due to a worldwide need for higher education. The panel disagrees with Noble's assertion that job security of professors is threatened by ICT.

The academy will have a global market orientation; however the panel agrees with Denning (1998) that this market orientation is not, as implied by Noble, due to any conspiracy or animus among administrators. In the panel's reasoned view changes in higher education are a consequence of a world that is changing fast and becoming intricately connected because of ICT. As well, the panel does not agree with Noble that the academy will be somehow reduced by ICT; on the contrary, they see most higher education institutions as reinforced and expanded in influence.

The panel predicts that universities will adopt web-based learning into both on- and off-campus education, as well, it forecasts that online courses will rival traditional on-campus teaching in quality during 2005 to 2015. In some instances there will be an improved presentation of course material and asynchronous online access which will help learners in reflection and revision; this reflection will offer reinforcement to learning in much the same way that an outstanding lecture will resonate through life.

Employment Training

There is a strong panel consensus on both probability and importance that universities and colleges will be obliged to respond to industry's demand for training for the workplace. However, in commentary, considerable anxiety is expressed about the vocational aspects of employment training. Clearly a university's obligation will not extend to training; but education for employment probably will become a responsibility. Employment qualifications are moving inexorably towards the kind of scientific, intellectual and technical skills provided by universities and colleges. Education for employment may become a duty of the academy in a knowledge-based economy (Twigg & Oblinger, 1996).

For-Profit Higher Education

Online for-profit universities are expected to grow but Baer (1998) discounts virtual universities as being too ambitious, not pervasive, and too dependent on online delivery. There is a minimum consensus that online education probably will not be dominated by the 'for-profit' sector of higher education at the expense of brick and mortar campuses. But there is no consensus on whether or not public and private institutions will retain a competitive advantage over for-profit providers in offering high quality, pedagogically sound online programming. Only 62 percent of the panel considers this "probable."

Geographic Reach of Higher Education Institutions

There is unanimous consensus on importance and a consensus on probability that before 2010 universities and colleges will be challenged about the geographical reach of their missions; as well, online education will challenge the philosophy of colleges and universities as to whom and how they serve. However, the panel predicts that the focus of most higher education institutions will remain within traditional settings and regions of influence. There is a consensus that educators will be inclined to think of competing beyond provincial/state or regional markets once a global online market in higher education is evident. But, some panelists report that Provincial/State higher education institutions are already competing beyond their traditional regions (some globally). Others contend that any 'dream' of extra dollars from a global market will be short-lived. There is a consensus that some institutions probably will overreach in seeking to serve large international markets, and then will not have the resources to service students.

Geographic reach alone will not define market competition during the period 2005 to 2015; universities and colleges will to face online competition on-campus as to the price, quality, and teaching support of course offerings in a global arena interconnected by the web. The road to change in education is likely to be bumpy as there are deep differences within academia, about a change from familiar practices. Katz (1999b) believes universities and colleges now have a competitive advantage, initially, but this may be challenged soon.

Picciano (2001) argues that the US does not have a history of central control in education and, unlike other countries, does not have many large universities that operate beyond its boundaries. But panelists expect that there will be serious challenging competition from national and global consortia and that both corporations and institutions will be involved in these consortia before 2010. There is a strong consensus that global online education will challenge universities and colleges to decide how far their missions will extend geographically and how and whom they will serve. Some (not all) universities and colleges will expand their offerings to provide employment skill education for the workforce. However, universities will have to be vigilant if they are to defend the freedom to pursue long-term, foundational inquiry in the face of government's increasing demand for a focus on economic goals.

Structural Change in the Academy

There is panel support for the premise that technology will play a leading role in changing the organisation of higher education institutions, but not to the extent of restructuring. The panel does offer a strong consensus that technology will affect the design of learning spaces, both on- and off-campus, and also that ERP portals will enable a virtual campus experience in teaching and new administrative systems. Change because of technology is not seen as any more threatening to institutions than other challenges they have met and survived. The panel does not have a consensus on the need to restructure universities and colleges in response to an increased use of ICT and online education; although almost two-thirds of the panel (65 percent) rate restructuring in the academy as probable. There is also no consensus by panel on whether institutions that do not restructure will decline in scope and reach.

Bates (1997) sees fundamental change as essential to meeting the needs of the public and students. He asserts that costs can be reduced through the use of ICT if the changes are introduced sensitively and carefully. According to Langlois (1998) the IAU task force also concluded that ICT will create dramatic change in higher education and that a computer literate student body will want a campus well equipped with new technology and technical support from faculty and staff. This panel predicts that the use of ICT will be firmly imbedded in higher education institutions by 2010. The panelists do not see ICT as replacing existing practices, but rather acting as a convenience in research and teaching. Baer (1998) supports this view, comparing alternative approaches, one radical and the other limited to upgrading administrative systems, with regards to the quality and speed of delivery of curricula. Baer concludes that ICT will be a supplement rather than a threat to tradition. On the other hand, Westera (1999) predicts fundamental change and asserts it is already underway in the US. The panel predicts that ICT will alter the way in which colleges, universities, and polytechnics operate and that the technologies will challenge such important matters as class scheduling and semesters.

Tjeldvoll's (1999) reports on Norwegian and international experiences arguing that there is widespread criticism within government and industry of the way in which western universities function and spend government funds. The author reasons that traditional research universities seem to be in a state of deep transition. This shift, he suggests, is to a considerable extent directed by forces external to the university. The change may cause research universities around the world to move away from a traditional knowledge-based culture towards that of a functionalist service university. He maintains that there is an internationally pervasive tendency for governments to exert more direct control over universities than ever before. Tjeldvoll proposed a model under which higher educational institutions will operate in two parallel modes: (a) the traditional role of a research university with its academic freedoms; (b) the functional role of a service university responding to economic goals. Tjeldvoll's proposal is likely to have stiff opposition in academia. Government assessment versus self-regulation by universities is at stake here, as is the issue of academic freedom to pursue research independently of the economic goals set by government (Wistera, 1999; Twigg & Oblinger,1996; Williams, 1998; Young, 1998; Dill, Massy, Williams & Cook, 1996).

Technological Change in Higher Education

According to McArthur and Lewis (1998), the greatest barrier to moving higher education onto the Internet and the Web is technical feasibility. But financial capability and ICT cost are inseparable and problematic issues which many administrators and academics perceive to be the most inhibiting factors in the smooth assimilation of ICT into academia. There is also division and concern in the literature on the implication of these costs. Green's (1998) study gives an optimistic view that the costs can be afforded if ICT is managed as a business. On the other hand, there is an upward spiral of both capital needs for technology and operating costs in education, and these daunting considerations are irrevocably intertwined with the capability of universities and colleges to expand the use of ICT (Forum Resources, 1999). Budget constraints are driving some institutions to accelerate plans for a partial or total systemic restructuring. Frances and Pumerantz (1999) comment that the burden of ICT costs could affect sensitive areas such as faculty salaries and hiring. The experience of UC Berkeley indicates that a central administration of ICT may be needed. However, achieving a balance between faculty autonomy and central control may require a new governance model. The shortcomings of centralisation resulted in decentralisation. For instance, a panelist's commenting in Round 1 gives his/her views on centralisation:

> .... Few universities to my knowledge have a program to move IT support staff around the institution for career development or changing priorities. Rather, the individual units closely guard existing resources, human and otherwise. Centralizing all these resources is not the answer. In fact, the shortcomings of centralized resources is what triggered the general decentralization of IT over the past 10-15 years. [IT #19, Canada]

The panel's strong consensus that the financial burden of continuing innovations in hardware, software, and networks will challenge higher education institutions' funding reconfirms the literature in this area. However, technological advances are improving in capability and affordability (Rubenson & Schuetze, 2000).

Increasing Student Populations

According to Twigg and Oblinger (1996) an increase of some two million traditional-age college students, in the US, is expected in the next 10 years. Add to that an increase in older and employed learners seeking skill enhancement and continuing education, and the numbers go much higher. Altbach (1991) asserts that demands for access by previously under-served groups will place additional pressure on higher education's bureaucratic, increasingly complex environment and on the efficient allocation of limited funds.

Global Competition and Economies of Scale

Canada and the US may respond in differing ways to the pressures of global competition, as the US seems to be more enterprising and aggressive in that arena. There is a panel consensus that higher education institutions could gain a lower marginal cost per student through attractive economies of scale, but a few (not most) panelists are concerned that large-scale might imply poorer quality. Some of the panelists are skeptical about the benefits that economies of scale from ICT will offer to a single university. Questions are raised as to whether the high standard of tutorial assistance that will be needed by ICT learners will be affordable. Frances and Pumerantz (1999) assert that computing costs have the potential to exceed the expense of books and supplies needed in the traditional classroom. However, it may be that setting fees for ICT courses at just above an institution's marginal cost per student will increase revenue for specialty courses and thus potentially reduce an institution's cost per student.

UK experience demonstrated that a lower marginal cost per student can occur when student enrollment increases sharply; yet, it appears, so can a drop in the quality of teaching (Williams, 1998). Whether these two results are irrevocably intertwined is still open to debate. There is a consensus that most higher education institutions will continue to operate primarily within their own regions but some will join large, well-financed, online consortia of universities/corporations operating globally. These consortia will enjoy the lower marginal cost made possible by a large market and will have the resources to develop and offer up-to-date high quality, well-presented, learning opportunities as well as good tutorial support. There is a consensus that global consortia will not threaten sound pedagogical values.

The panel predicts that consortia operating globally will form and grow to dominate large sections of the online higher education market within a decade. In order to achieve economies of scale universities may have to enter partnerships with other universities and corporations in consortia much more powerful than they are on their own. Universities will be faced with unprecedented challenging questions about how the global diffusion of ICT will affect their institutions' missions, structures, economics and operations. There are sharp differences about whether or not large online consortia will undermine the stability of many higher education institutions. A slim majority holds that to be unlikely, but the threat is not discounted.

The political, educational, and accreditation standings of corporate alliances and university consortia will bring into play attendant ethical and long-term survival issues and alliances that have yet to be fully tested. However, global online competition may force these issues to resolution. As well there may be problems with unions. For instance, the American Federation of Teachers Report (1996) demanded that courses taught by faculty be evaluated through traditional procedures; the union also argued that only a limited number of credits should be awarded for online distance education. The federation strongly opposed the notion of graduate degree programs taught at a distance.

Cultural Change for Faculty

There is a strong consensus that the use of ICT will result in major professional and cultural change for faculty before 2010, even though eighty-six (86) percent of participants predict that university faculty members will be unreceptive to fundamental, dramatic and rapid change. However, some panelists identify administrators as the main obstacle to the adoption of ICT.

Internet-savvy professors will teach via the World Wide Web, relying on other professionals to re-design "instructional" resources; however, there will be "lone rangers" and as technology improves more professors will want to control their own courseware. There is also a consensus that many IT and Internet-savvy virtual professors will divide their time and energy among a variety of universities, consortia, and corporations; panelists do not see this practice as unusual, but point out that it may not work for professors who want tenure. The question of whether Internet-savvy professors will dominate instruction in most large universities evokes a 50/50 division of opinion; panelists believe that most professors will be well informed (if not savvy) about ICT within a decade. As a rule, during the period 2005 to 2015, design professionals (or teams) will assist in the development of online course material. However, technological skill will not be the crucial requirement for teaching in higher education because instruction will continue to be dominated by people who have expertise in their subject area. Panelists acknowledge that some self-paced tutorial support may be built into sophisticated web-based programs but when students encounter difficulties they will want access to a teacher.

The web-based community of scholars is seen as likely to expand through ICT, because the Internet facilitates global discourse between professional peers. These scholars are at the intellectual core around which a university revolves but, for some, their interests may have little to do with teaching.

Faculty Rewards and Job Security

There will be a growing need for teaching in a competitive recruitment environment. The academy may find it necessary to improve the reward system to attract bright young professors to teaching, but there is only a minimum consensus that a shortage of teachers skilled in the use of ICT will make teachers valued and well-rewarded. Dill (1998) asserts that the academy's reward system favours research over teaching. Also, there is much skepticism among the panel that teachers (as opposed to researchers) will be well rewarded. Some panelists also doubt that e-learning skills will be well rewarded. Financial rewards are not seen as the primary motivating factor for teaching; panelists stress that they teach for the love and pride of teaching, not for big money.

The assertion that IT skills for the development of electronic-based learning will be highly valued within higher education institutions did achieve minimum consensus. There is a minimum consensus that improved rewards (financial, tenure, and other perks) probably will entice well-qualified academics to teach online. It is reasonable to assume, bearing in mind recruitment and market pressures that eventually the academy will be forced to offer higher rewards for teaching, but meanwhile higher education may be vulnerable to a loss of prospective ICT-savvy professionals to industry.

A Greying Professoriate and Changing Faculty Roles

Two factors, both unplanned, may work in the academy's favour when it faces retirement/recruitment issues: a greying professoriate and an increasingly internet-savvy student population. As to the first, US universities are now faced with the retirement of two-thirds of their existing faculty by 2009 (Chronister & Truesdall, 1991; Bowen & Schuster, 1986). As to the second, Hackman (1992) claims that a more diverse, well-educated, technologically savvy, doctoral level student body is emerging, and will be able to fill the need for replacement in faculty positions. As we entered a new century, professors hired in the growth years made up the majority of faculty in higher education. Recruitment of talented newcomers will be difficult for most universities until these retirement situations have run their course. Newly hired faculty will bring fresh, independent ideas and may be a crucial factor as these faculty members will constitute the leadership for academia in the early decades of the 21st century.

Slaughter (1998) says that the economics of higher education in the US have changed sharply since the US adopted a student-as-consumer, market model in the late 1970s; technology has caused a more entrepreneurial bent to emerge in university administrations to the disadvantages of the liberal arts. Yet there is almost a unanimous consensus among the panel that ICT will not contribute to a loss of interest in the humanities, arts, and social sciences.

ICT Training for Faculty

There is resistance among some panelists against extended ICT training for faculty because of a concern about being drawn into the minutiae of technology. As alternatives they predict, as does the literature, that there will be a new internet-savvy professoriate within a decade, improved ICT that progressively will be easier to operate, and a reliance on good ICT staff support. The panel forecasts that most universities and colleges will change their overall approach to pedagogy to support a "new generation" of Internet-savvy learners who will demand more than a "stand-and-preach" lecturing format within a decade.

Intellectual Property

Intellectual property (IP) ownership is a hotly disputed topic, but panelists expect an early solution. Whether or not new rules on professors' intellectual property will favour the institutions over intellectual property creators elicits no consensus, but the panel predicts that electronic publishing and business/payment models will make routine the delivery of content protected by copyright. There is a consensus that new electronic payment models, revised copyright rules and new legislation will encourage scholars to share intellectual property. Yet circumstances external to the academy make these predictions about IP debatable as the Internet has expanded and made more difficult a fair resolution of intellectual property issues. Once confined to disputes between the administration and faculty of universities, intellectual property is now vulnerable, worldwide, to threats of piracy and the infringement of an owner's legal rights; often in jurisdictions where redress is costly or impossible. Intellectual property (IP) is considered "highly important" and 100 percent of the panel expects a solution before 2010; having faith in the strength of tradition, many panelists believe that faculty will not be vulnerable to a loss of intellectual property because of ICT. But the cost and time taken in lawsuits may be beyond the resources of individual professors.

I take a less sanguine view than the panel and expect controversy over IP to be prolonged and bitter. I also do not expect this problem to be resolved in a way that is entirely fair to the creators of IP. New rules and legislation may appear to offer a fair solution. The reality may be that only large well-financed online consortia will be able to protect their IP. Negroponte (1995) may be correct in his claim that the existing IP system will have to break down under pressure from the Internet before it can be replaced.

Widespread Use of ICT in Education

The panel predicts that ICT use will spread deeply into most aspects of North American higher education during the period 2005 to 2015, and the use of these technologies is perceived as a convenient way to achieve learning. The panel does forecast a need for organisational change in response to a growing demand for teaching caused, in part, by online education. As well, the panel forecasts that pedagogical practices and faculty roles will alter in response to online education; however panelists caution that online learning will not replace face-to-face teaching. Within a decade, a mix of online and face-to-face higher education is predicted to emerge for on- and off-campus learners. There is no consensus on whether the distinction between public and private higher education will blur in North America.

There is one hundred percent consensus that 24/7/365 online access to learning resources will become available in North America before 2010. As well, English will remain the dominant online language for the Internet. There is also a unanimous consensus that in western countries ICT access will become universal and ubiquitous. ICT will be critical components of a post-secondary institution's strategies. There is a strong consensus that the convergence of data networks, hand held portable phones and other devices will increase the accessibility of higher education. The claim that in online learning students will have more control over the timing, location and format of their learning agendas than will exist on-campus, achieves a strong consensus. This agrees with Twigg and Oblinger (1996) and they contend a shift toward a consumer-centric learning model is rapidly accelerating and that the number of potential course providers is increasing. As well there is a strong consensus that online learners will demand pedagogically sound, technology-mediated courses compatible with their learning styles.

Not surprisingly, the panel forecasts a need for organisational change. As evidenced by the private sector, over decades any large institution accumulates unnecessary levels of management and reporting systems. ICT can enable management systems, which shed unnecessary work and accumulated bureaucracy. As well, pedagogical practices, the professional and cultural roles of faculty are predicted to alter in response to online education. Some panelists are concerned about the extra stress a high level of accessibility will put on faculty. They express fear about the erosion of a teacher's free time and the possibility of having to provide unpaid labour. Some panelists complain that this high level of accessibility will result in the use of part-time, poorly paid tutors. Clearly Noble (1997, 1998) resonates with the fears of these panelists.

Although ICT access will be widely available in rich countries, 40 percent of panelists do not expect broadband access in poor countries until after 2010. In any case, poor countries will have other priorities (food, shelter, and so on) and may not be able to afford Internet access for a decade or two. As well, there is no consensus as to the probability of online education helping to reduce the digital divide between rich and poor students, unless the cost of broadband access is financed by government. There has been an improvement in the US in access to education by previously underserved populations (Hackman, 1992; Frances & Pumerantz, 1999).

Constructivist/Collaborative Learning

Educators have long combined theory and experience in pedagogy. Hodges and Sasnett (1993) describe the development of a symbiotic relationship between IT learning methods and outcomes. They comment that central to the learning process are projects seeking to give students a creative, enactive role encouraging their interaction with ideas. There is a consensus that some online teaching and learning will be based on constructivist principles using collaborative, problem-based learning, and there will be innovative new models for learning and knowledge building. ICT offer the possibility of new approaches in learning (Hodges & Sasnett, 1993; Harasim, 1997). Innovative approaches to online learning using ICT will be discovered through research, by collaboration with other universities and with corporations around the world. A collaborative effort that can be conducted on the web. The panel does accept that constructivist principles will be used in the development of some (not all) online teaching and learning; however, there is much skepticism expressed about constructivism in panel commentary. There is a minimum consensus of the panel that most universities and colleges will change their overall approach to pedagogy to support a "new generation" of Internet-savvy learners.

The panel agree that there is a low probability that standardised ICT course material will de-personalize learning, and comment that text books did not have this affect; they reject the notion that online education will have lower standards. Panelists are doubtful that Virtual Reality (VR) textbooks will seriously challenge existing books (even electronic ones). However, one panelist comments that a VR learning experience can be deeper and leave a longer lasting impression. Fifty-eight (58) percent of the panel believes VR is "probable;" but academics are skeptical. There is a minimum consensus that the use of computer-embedded artificial intelligence (A.I.) chips will change the computing and online learning environment in significant ways. But a dozen respondents did not rate this item (an indication of uncertainty) and there is no consensus about how soon the use of A.I. chips might occur. Clearly panelists want to wait and see!

Inadequate bandwidth and limited modem speed currently constrain the transmission and reception of video and other formats where these involve an intense use of digital imagery (Hodges & Sasnett, 1993). Panelists predict that technical barriers will soon be overcome and that widespread use of ICT in higher education probably will occur before 2010. This prediction does not conform with the Getz, Siegfreid, and Anderson (1997) survey of technologies, which foreshadows a slow rate of adoption in universities and colleges. However, as Rubenson and Schuetze (2000) contend ICT use is developing at an unparalleled rate. There is almost unanimous agreement in the panel that trans-national agreements on software and telecommunication standards probably will emerge and will enable collaborative work between higher education institutions.

There is a consensus that learners will expect and get courses and programs delivered via the web. In sum, panelists expect ICT access in higher education to become a universal and critical component of post-secondary institutions' strategies before 2010 and there is a strong consensus that the use of the web will be an essential part of the higher education experience.

Educational Practices and Methods

There is a strong consensus in the panel on the probability that online learners will want more control over their learning agendas and will demand pedagogically sound, technologically-mediated courses. Students will be looking for independence and a lack of constraint through the use of online education, but reality and the obligations of group work online may dictate otherwise. Bates (1997) contends that there is little point in seeking to replicate the traditional classroom experience through online learning and there will be a combination of delivery formats. Claeys, et al. (1998) and many others assert that in an online situation the teacher will be more of a guide and mentor than an information giver. But one panelist commenting on sound pedagogical values, points out that in the classroom students are quite passive about the quality of educational offerings; but she/he acknowledges this may change as mature lifelong learners increasingly join in. There is skepticism about the practicality of an educational system in which the learner is given complete independence to judge the quality, content and structure of his/her learning. As well, McArthur and Lewis (1998) assert there is slim evidence of actual achievement in ICT use. There are also doubts about responding to a wide variety of learning styles; some panelists question whether students even recognise their own learning 'styles.'

Westera (1999) contends that change taking place in distance education, once a solitary endeavour for the student, is leading to a more interactive role between the teacher and learner. Harasim (1997) asserts that ICT is bringing about a special focus on new designs for learning. On the other hand, a panelist defends 'stand and preach' lectures, pointing out that "a rich lecture" experience can resonate throughout life. Panelists emphasize the importance of good teachers and of a face-to-face educational experience. They are skeptical about the work habits of students working alone, and have misgivings about whether the claimed independence of online students is genuine.

Certification for Employment

There is a minimum panel consensus that acceptance by employers of private certification will force universities and colleges to compete online. It is a surprise to me that the panel also concludes that certification and degree credentials will be established at national, trans-national or global levels despite objection from faculty unions and university administrations. However, favouring this outcome is a high level of expectation about enhanced interconnectivity between countries operating on the web, and national boundaries have become increasingly transparent. The panel also attains a consensus that the processes of assessment and accreditation will be carried out by a variety of international providers, but on this the IT professional subgroup disagrees.

Panelists acknowledge that certification in specific skills will be adequate in some job areas, but certification is not seen to carry the same weight as university degrees. Dede (1992) stresses the challenge of developing a workforce capable of operating in a diverse range of cultural settings and in a global marketplace. Universities may be reluctant to compete, but there is a vacuum that will have to be filled in education for employment. Credit banks and accreditation are recognised as important, though not seen as a major threat to degree granting universities, certification has begun to spread from colleges to universities. Panelists are divided and somewhat uncertain about the role of international providers and some of them did not respond on the issue of certification.

Differing National Approaches

Diversity in national approaches, in a world interconnected via ICT, brings into question whether, eventually, countries will be forced to change their education systems as national borders become increasingly transparent due to the Internet. In North America we will respond to these same pressures, but it can be expected that the US, with its ethos of freedom and enterprise, will respond quite differently than has Europe. Canada, with its public education system, may find itself locked into government control of its education institutions. How the roles of public and private providers will play out over the next two decades remains unclear. However, the tenor of commentary from Canadian and US participants confirms Skolnik and Jones's (1992) contention that the two nations have achieved quite different higher education systems, Canada's largely public and the US's a mix of publicly funded and private institutions. However, panelists agree that both governments may change funding arrangements to provide for public/private partnerships to undertake international missions. But in Canada, at least, it is unlikely that government will provide additional funding for separate international missions by a public university.

Traditional Values in Higher Education

Postman (1993) comments that two opposing world views, "the technical" and "the traditional," once co-existed in uneasy tension, but in the US a love of "things new" coupled with a weakening of traditional beliefs has led to the success of technology, and a devaluation of beliefs. Beliefs held when institutions were powerful in influence and held great sway over most changes that occurred in society such as the church and the university. Postman provides a persuasive and eloquent argument for the preservation of cherished values in the US. At the heart of his message is a concern for the academy and about religion; he warns that essential values of the US might be abandoned in a rush to technological progress. The degeneration of values against which Postman argues does exist in some, but certainly not all, US communities and unfortunately, outside these communities, within some groups of its children, youths and adults. These social problems require urgent attention. A portion of blame for the situation has been leveled, correctly, at various media, at a laxity in the education system and at failed parenting. Technology itself is not the cause of society's problems although it is has proved to be a handy vehicle for spreading any breakdown in values. Broad compassionate but strong leadership at a community and family level is needed, as well as loving attention to children everywhere.

In considering the message it gets from Postman (1993) the academy needs to look at its own valued set of beliefs in the context of ICT. The academy must decide which values are essential, non-negotiable and incapable of being transformed. For there is little doubt that values of the academy will be under pressure and some will be redefined in an era of ICT. On the other hand, institutional rigidities will be as much a threat to the academy as an undue willingness to accept change. Postman's quiet voice, amidst the clamour over ICT, alerts the academy to make well-balanced choices over paths to take in education and research. Although the author may prefer older simpler days, he does not call us to turn back the clock.

Anxieties expressed by Postman (1993) about a loss of traditional values are not shared by Dede (1992). Rather, Dede expresses concern that the education system of the USA has remained far too static. Dede and Tjeldvoll (1999) agree that higher education has not responded efficiently to a changing global socio/economic environment. Dede finds this disappointing, since excellence and quality will depend upon a pluralistic understanding of worldwide markets. He underscores this failure by lamenting that a future of little or no change in American education is probable, as similar opportunities for innovation have slipped away in the past.

Assimilation of Cultures

Profound disagreements were evoked on the assimilation of cultures. Some panelists fear that, because English is the language of the Internet and the US is dominant on the web (and elsewhere), there will be an "Americanization" of the world's cultures. It is possible that the global nature of online education and the growth of university/corporate consortia may pose a threat to underdeveloped countries and result in a form of "post colonial" economic assimilation of developing countries by the US. Nevertheless, panelists contend that countries, other than the US, are becoming increasingly aware of their national ethnic and cultural identities.

Scholarship and Argumentation

Eighty-eight percent of the panelists expect that ICT will challenge the mandates of universities and colleges, but they do not agree on whether the technologies will alter scholarship and argumentation at a deep rigorous level. The majority of the panel rates this as a low probability but no consensus was achieved; however the academic subgroup did achieve a consensus (80 percent) that change in scholarship and argumentation is "improbable." Some panelists suggest there will be an added level of rigour introduced to existing methods of review because of the wide access to knowledge and information available through ICT. The panel also accepts the probability that a classification system will be designed before 2010 to help verify knowledge gained on the web. But panelists consider this as too demanding a task to be undertaken by the academy.

Conclusion on Consensus Criteria

In sum, the majority of items in this Delphi are predicted to occur before 2010. Two items -- 3 and 6 -- were dropped from analysis due to no consensus on "importance;" as well Item 63 was also eliminated due to ambiguity. All other items in this research achieved a level of consensus that the issues are important. Seventy percent or greater as the criterion for a minimum consensus (Table 4.2) results in sixty-four of the eighty-five items in Round 3 achieving levels of consensus on probability; nine of which have a not probable consensus (Table 5.20). Twenty-one items, including the three discarded (Items 3, 6, and 63) did not achieve any level of consensus on probability (Table 5.21). By contrast, if a less stringent criterion for minimum consensus was used, (say sixty-percent) an additional thirteen items would then have achieved a level of consensus. Under that less stringent criterion seventy-seven of the eighty-five items investigated (90 percent) would have accomplished a level of consensus. However, the findings of this investigation are based on strict levels of consensus (70 to 100 percent); thus, these results have improved credibility.

CHAPTER NINE:

IMPLICATIONS, CONSEQUENCES OF ICT AND RECOMMENDATIONS FOR PRACTICE AND RESEARCH

Introduction

This chapter is comprised of two parts: Part 1 delineates the implications and consequences of ICT use, while Part 2 provides conclusions and makes recommendations for practice and research on key issues.

The research question guiding this Delphi study and posed to the panel was: "Growing use of ICT has caused radical and systemic shifts in the way business, communication and financial enterprises are structured. How will ICT use impact higher education institutions during the years 2005 – 2015?" Participants were asked to provide one or more major factors such as issues, events innovations, opportunities, threats, process changes and risks they believe will be influential in shaping higher education institutions during 2005 to 2015. The research investigated the impact ICT use might have on institutions of higher education during the study period. Some influences will be internal to universities, colleges, and polytechnics affecting aspects of teaching, research, administration and service. Other influences will be external, as interconnectivity through ICT causes profound change in the North American society in which the academy is set. Educational methods and practices will be subject to revision; notions about work and jobs will shift dramatically, throwing into question familiar methods of professional education and job training. The globalising influences of ICT and a knowledge-based economy will place new demands on universities and colleges as well as high expectations from government and public alike.

PART 1: IMPLICATIONS AND CONSEQUENCES OF ICT USE

All the research findings are useful but eleven influences of ICT stand out as likely to have key consequences and implications for the work of university administrators and faculty:

- Despite resistance, there will be major professional and cultural change for faculty.
- Within a decade there will be a younger, Internet-savvy professoriate and new leadership in the academy.
- Web-based learning will be of high quality; during 2005 to 2015 it will rival traditional offerings. Universities will incorporate the best of online courses into their teaching.
- The use of ICT will diffuse into most aspects of the academy's administration, research, and teaching, on-and off-campus, during the period 2005 to 2015.
- Over this decade, most universities and colleges will reorganise, and will change aspects of practice in response to ICT. There is a division of opinion on whether reorganisation will go so far as the restructuring of institutions. A majority of the panel rates this probable.

- Well-financed consortia of universities/corporations are predicted to form, operate globally, and grow to dominate large sections of the online education market.

- ICT will gain priority in government funding during the study period, but funding is unlikely to include provision for the separate international missions of a university or college. Government may, however, alter funding arrangements to support public/private institutional missions.

- Universities and colleges of solid reputation will be challenged, but not undermined, by competition from online consortia. Weaker institutions will be threatened financially and some will fail.

- Panelists consider an on-campus experience important to the growing independence of young students. Residential universities and colleges will remain key elements in higher education. Some panelists warn that the cost of long-term residency will become too high for most students.

- The demand for teaching will expand as the academy responds to the needs of previously under-served populations and to online education. As well, there will be a need for a constant updating of employment education data as, inexorably, the knowledge required of learners moves into areas that demand the engagement of universities and colleges.

- Market analysis and a more "businesslike" approach by the academy are predicted to become necessary in response to ICT. There is, however, little agreement on how to interpret the term "businesslike".

The early timing forecast by the panel came as a surprise; it rates change as likely to happen before 2010 on nearly all items, while the literature suggests a much more deliberate approach. For instance, Getz, Siegfreid and Anderson (1997) found that on average, about 26 years elapsed from the adoption of an innovation by the first institution to its adoption by the median institution. However, factors which will accelerate the rate of technological adoption include: (1) The nature of the Internet, its reducing costs, its improvement in speed, its ubiquity and its broad implications for higher education; (2) the emergence of a computer-literate student body and a young professoriate well trained in ICT use; and (3) competition from commercial educational products.

Prior to the Internet, early experiments in the use of computer technology in schools produced quite disappointing results (Williams & Brown, 1990). Partly because of these poor outcomes, some educators take a guarded position with respect to the extensive use of ICT. Twigg (1994) identifies incrementalism as the favoured course for academic change and claims this approach will no longer work in an ICT situation. Getz, Siegfreid and Anderson (1997) comment that on average, higher education seems to take three times longer than US industries to adopt technology. Strong leadership within competing institutions may be the determining factor in the rate at which various universities, colleges, and polytechnics will adopt ICT.

There are reasons to doubt whether, in practice, all this ICT change can happen as quickly as the panel predicts. For instance, the development and growth to dominance of online consortia may take several years, yet panelists accept that these entities will play a key role in the development of online education courseware. As well, the actual evidence of achievement in ICT use in education is as yet slim (McArthur & Lewis, 1998). On the other hand, ICT change is taking place at an unprecedented rate and costs are dropping (Rubenson & Schuetze, 2000). As well, developments in ICT that appeared quite speculative at the start of this research are now in place, and I do accept the probability that online learning will be thriving on- and off-campus during the period 2005 to 2015.

The panel forecasts widespread use of the web in higher education and predicts a change in the overall approach to pedagogy to support a new generation of internet-savvy learners. It will be difficult to get the learning methods and tools in place in time satisfy the increased demand for online education predicted in the literature. One consequence of time pressure will be that the need for research into and design of online courseware, developed to take advantage of the empowerment capacities of ICT, will take on an urgency requiring prompt attention from the academy. The use of ICT as part of the educational method involves a recognition of two underlying currents in the growth of multimedia using non-literate forms of documents and fundamental forms of expression that use simulation and visualization (Hodges & Sasnett, 1993). Writing on approaches to education, Twigg (1994) & Bates (1996) conclude that the problem with all of the uses of information technology in the last decade (computer-aided instruction, networked information, distance learning) is that they were bolted onto current instructional methods. Bates (1997) warns that it is futile to compare the learning effectiveness of a program based on technology if it seeks to simply replicate classroom-based teaching. He contends that, as of 1997, most research had done precisely that. There is a need for rethinking in education, with a special focus on new designs for learning (Harasim, 1997). Also a cohesive strategy is required, within the academy, for the research design and development of innovative learning methods; using the empowerment/interactive capacity now possible with ICT.

The design of new learning models will require strong support and financial help from government and a serious commitment by universities. Mounting distance education courses is expensive. The development of a high quality course that will emphasise the web's interactive multi-media capabilities can cost $1 million. Heavy capital investment will be needed at the outset. One solution is to have a corporation take all or part of the financial risk in return for a share of future revenues (Baer, 2000). Another approach is to join in a consortium with other universities and/or corporations in order to spread risk and share costs and revenues. As well, some universities have started their own for-profit entities. For instance, New York University's (NYU) Dean of the School of Continuing and Professional Studies comments on NYU's need to create a separate for-profit entity in order to gain options for additional capital support that a non-profit does not have (Baer, 2000).

Negroponte (1995) expects teachers to be freed from routine, repetitive work and empowered to discuss, lead, motivate and counsel learners towards a deeper understanding of knowledge. He comments that the digital era of ICT is like a force of nature that cannot be denied or stopped, with four powerful qualities — de-centralizing, globalizing, harmonizing, and empowering.

The (IAU) Task Force Report concludes that Information Technology offers unique possibilities to enrich traditional teaching, learning and research and that ICT will lead to a revolution in higher education. According to the task force, the Internet will act as a powerful supplement to existing teaching, and universities must face up to this challenge (Langlois, 1998). Despite all the ferment against change and the uncertainty expressed in the literature by Noble and others about the wisdom of adopting ICT, the panel predicts that the use of ICT will become firmly embedded in the administrative, research, and teaching activities of most universities and colleges within this decade.

But Noble (1997, 1998) warns that ICT robs the faculty of their knowledge and skills, their control over their working lives, the product of their labour. He asserts that the use of online education threatens the job security of non-unionised faculty members and that the real target for online courses will be the on-campus population. This panel clearly agrees with this later contention and predicts that web-based technologies will diffuse deeply into on-and off-campus higher education. One consequence will be that online learning, once a marginal activity, will indeed move to the core of on-campus education and become an essential part of the post-secondary educational experience during the years 2005 to 2015. However, unlike Noble, the panel forecasts that online learning will be of a quality that will rival traditional on-campus teaching. The panel discounts Noble's fear of faculty job loss. This panel prediction of job security for faculty is likely to be correct, bearing in mind the looming retirement of two-thirds of (US) faculty within less than a decade (Chronister & Truesdale, 1991; Bowen & Schuster, 1986).

Reorganisation of Higher Education Institutions

Nearly the entire panel forecasts that before 2010 universities and colleges will reorganise in response to ICT; the majority concludes that structural change in institutions will be a necessary part of this process, but over one-third of the panelists do not agree. Baer (2000) points out that higher education in the US is not a single mass market rather a series of large and small markets served by various institutions and that no single, one-size-fits-all model will fit the diverse set of academic institutions in the USA. On collaboration and partnerships between universities and with the private sector, he comments, "It is far too early to see, much less assess the results of current collaborative efforts." (p. 468).

Administration

Organisational change through ICT has not reached as deeply into the culture of universities as it has in the business community. As evidenced in the private sector, flexible management systems enabled by technologies can eliminate unnecessary bureaucracy or work, but an easy transition to ICT use for the whole academy is not certain and is seen by some in academia as undesirable. But Bates (1997) asserts that labour costs in universities can be reduced through the use of technology, provided change is introduced sensitively and carefully. Change in the private sector hit hard especially at middle management and white-collar workers. Companies merged suddenly and unexpectedly; they shed workers who previously had every reason to anticipate years of full employment. For academia to achieve reorganisation without disruptive layoffs and disputes will require planning and close cooperation between administrators and faculty members.

Several factors favour reorganisation for higher education institutions and changes in practice. Perhaps the most compelling of these is that we live in a society determined to go online. More particularly, the academy soon will have a younger, Internet-savvy professoriate and leadership, many from a generation that grew up in an era when interconnectivity through ICT became commonplace. The looming retirement of a majority of professors in the US makes stability of employment for faculty almost inevitable. At the same time a "changing of the guard" in faculty and administration may offer a unique opportunity to reorganise the academy from an existing establishment into one that may be markedly different and more receptive to change in a digital era of ICT.

Postman (1992) argues for a traditional approach to education. As well, a few senates may seek to perpetuate familiar patterns for their institutions; these senates may appoint like-minded successors to fill vacated faculty and administrative positions. But an academy faced with rapid change will need fresh thinking in leadership. Responsiveness to change in planning and policymaking have long been attributes of the North America universities; the new critical variable the academy now faces is the extraordinary rapidity at which change will occur.

Universities will need to re-evaluate their entire approach to ICT, as at UC Berkeley, vesting certain controls centrally under an experienced and knowledgeable staff. In response to ICT UC Berkeley found itself with a fragmented and inadequate IT infrastructure that was mired down in unclear policies and technology. As well, there was a failure in budgetary responsibility. The university's decentralised networked environment had blurred the traditional distinctions between academic and administrative computing. However, the development of new IT learning systems and applications will at best remain under the authority and responsibility of Deans, faculty and department heads. Not all North American universities are currently well organised to take advantage of ICT. Except in Continuing Studies and Extension Departments, many universities and colleges use websites primarily for marketing and for internal communication rather than for online/on-campus education (NEA Research Centre Update, Volume 7, 2001). Perhaps, there will be new ICT models responsive to ICT.

Postman (1992) poses, "to whom will the technology give greater power and freedom?" (p. 11). This is not an easy question. Jacobsen (2000), considering technology in the context of social and political action, notes that socio-organisational changes (institutional, managerial, legal, and educational) will be essential if technical innovations are to flourish in socially beneficial ways. Any examination of the assumptions guiding technological design should be inseparable from a scrutiny of the social forces that shape them. By contrast, if we accept Postman's parallel between ICT and the invention of writing, given time, the people of the world's civilisations will inevitably benefit both in freedom and in material well-being through the advent of ICT. Moreover, it is interesting to note that in the case of writing, power remained in the hands of the elite for centuries. In the case of ICT, the challenge to society is more urgent and fundamentally different. By their very nature, ICT are rapidly shattering traditional boundaries between the public and elites.

Virtual and For-Profit Universities

Theoretically, a virtual university can be established which is independent of campus and geography; its students can be drawn from other regions or countries, and faculty can teach from a variety of universities and colleges around the world. This possibility is somewhat discounted in Baer's (1998) reference to virtual (campus-independent) universities as being both ambitious and not pervasive; many are little more than online catalogues of courses and programs. While virtual universities have not yet been tested, in the long-term this possibility cannot be ignored. For-profit universities are growing rapidly; as well, web-based training is the fastest growing component of the US training sector (Baer, 2000). For example, the for-profit Phoenix University is now the sixth largest in the USA, with 125,000 students and over 5,000 staff. It offers three undergraduate and three graduate degree programs in business administration. Phoenix reported a 22 % rise in its 1999 worldwide enrollment (Phoenix University, 1999). But Marchese (1998) predicts that Phoenix won't be the one that sinks whole ships because bigger bergs are forming.

Regional and Global Interconnectivity

Ever-increasing interconnectivity through ICT systems, some yet to be invented, will cause universities to be intricately connected with the local and global communities in which they are set. Universities and colleges already reach out cooperatively to both private and public sectors. For instance, some have created downtown campuses ("town and gown"). But because of the ever-increasing interconnectivity caused by innovations in ICT it soon will be impossible for a university to operate as a separate self-contained community within its own campus. Its professors operate on the web, even its student body, increasingly, will be separated geographically. The myth of scholars in an ivory tower will be long forgotten as lifelong learning becomes entrenched in everyday life. Rubenson and Schuetze (2000) confirm that lifelong learning is a popular and important topic of policy papers not only in North America but also in Europe and among international organisations. Yet they contend a master concept and a cohesive strategy for its implementation are lacking and need to be addressed promptly by policy-makers.

The panel predicts that ICT will expand in reach as universities respond in varying ways to previously underserved student populations through online education. As inferred by Land (1994) the reputation of a university, in the period 2005 to 2015, may have more to do with its professors' activities on the web than with the buildings erected on its campus.

Innovations in ICT

The full consequence of web-based interconnectivity has yet to be experienced. There will be innovations, some of which may be as profound in influence as the Internet. The Internet2 project is expected to increase the speed of today's Internet by 100 to 1000 times. The program will keep the US at the cutting-edge of global information and communications technologies. Another innovative approach now under consideration is the Semantic Web. This is a development proposed by Timothy Berners-Lee who, in 1990, created the crucially important computer language (HTML) for applications on the World Wide Web. He gave that "brainchild" to the world free of royalty. The World Wide Web consortium (W3C), which Berners-Lee now heads, is a guardian of web technology standards and ideas, but relies heavily on commercial support for its budgets. Richard Hayes Roth, Hewlett-Packard Co.'s chief technology officer for software notes, "Web services would be handled by software modules that snap together like toy Lego blocks. We expect the Semantic Web to be as big a revolution as the original Web itself" (Internet Times, 2002). However, there is an ongoing dispute within W3C about whether, as Berners-Lee wants, the Semantic Web will be royalty-free. The draft specification aimed at the Semantic Web was published in January 2001 but has not moved since.

The creative idea behind the Semantic Web is that the technology will have software which not only measures words and concepts, but also interprets the logical relationships among them. Not only will computers on the Semantic Web crunch numbers, they will be adroit at dealing with language and reason. Berners-Lee predicts that the Semantic Web "will help more people become more intuitive as well as more analytical. It will foster global collaboration among people with diverse cultural perspectives, so we have a better chance of finding the right solutions to the really big issues"(Internet Times, 2002). Admittedly, this innovation of W3C is not yet a reality, but the imaginative concept behind the Semantic Web does illustrate the probability that the next decade or two will produce ICT systems that may be as powerful in influence as has been the Internet.

A Global Approach and Economies of Scale

A global approach to online education, which may be inevitable, will necessitate a review of our North American methods and practices by faculty and administrators. As well there will be a need for government and institutions to reconsider national missions and priorities. Long-term strategic thinking about the influences of ICT and the possibility of competition from the private sector will be necessary when setting revised directions for higher education. Multimedia corporations have immense financial resources as well as production skills, and already cater to large global markets. This marketing advantage makes it possible for private companies to produce sophisticated multimedia products and other educational courseware at affordable prices; educational institutions cannot as yet, match these economies of scale.

Globally Operating Consortia

The panel predicts that a few large, well-financed, and powerful consortia of universities/corporations are likely to form and grow to dominate large sections of the online higher education market. It forecasts that the offerings of these consortia are likely to be of high quality, up-to-date, intellectually sound, and well supported by tutors. In consequence, administrators of large prestigious universities will be well-advised to decide quite soon whether or not to join in the formation of consortia.

Rewards for Teachers

The panel predicts that during the period 2005 to 2015 global competition will not be seen solely in terms of an institution's geographic reach, and universities and colleges will be challenged on their own turf over the quality of course content, teaching support, fees, and so on. As demand grows, there may be more emphasis on teaching in the academy. An imbalance in rewards for teaching, as compared with research, may have to be addressed by university leaders in order to attract talented young professors to teach in the academy.

Organisation Change

There is general agreement within the panel that market analysis and a more "business-like" approach is needed because of ICT, but scholars have differences of opinion about the directions the academy might take. Noble (1998) sees a market-orientation as a wholly undesirable outcome. Tjeldvoll (1999) contends there is pervasive dissatisfaction in government and industry over the performance of universities and suggests this may lead to a completely new "service" university, catering to economic imperatives. Baer (1998) asserts that most students will want some face-to-face instruction and good social interactions; therefore these students will opt for a mix of on-campus and online courses. Other scholars contend that colleges and universities will continue to react against change, in the belief that at its core the academy is largely immutable' (Zemsky & Massy, 1995). Altbach (1991) asserts, "There is little chance that the basic structures of academic institutions will significantly change, although some of the traditional academic ideologies and practices are threatened" (p. 316). According to the panel most universities will continue to serve traditional regional catchment areas, but eventually may have to respond to competitive online pressure by offering the best of their specialty programs globally. The panel predicts an outcome similar to Baer (1998) that a mix of online off-campus and on-campus education probably will emerge as the dominant model in North America.

Residency

The cost of long-term residency and a commitment to full-time attendance may become too costly for most students, but how the scarce resource of residency will be allocated has yet to be decided. It is recommended for consideration by university leaders and faculty that within a decade residency may be limited to short periods, say a year or two, possibly in several sessions. Failing such a reconsideration residency may once again become the prerogative of an intellectual elite or of the wealthy.

Education for Employment

Ninety percent of panel members rate it probable (and important) that universities will respond to industry's demand for workplace training. Obviously, training will not become the responsibility of a university, but education for employment opportunities probably will. Many new students will be mature and professionally well experienced; some will not need, nor want, additional degrees or even certification. They will want sound, high quality, contemporary learning opportunities tailored to specific learning objectives related to their professions or work, courses of a quality that universities can provide. Dede (1992) stresses the challenge of developing a work force capable of operating in a diverse range of cultural settings and in a global market place. While ICT are eliminating many traditional jobs in business, they are also creating new ones. A reduction in management costs using ICT will be a useful step for the academy, but will not address a more sensitive issue: the relationship between graduating with a degree and employment (Dede, 1992).

Except in business, professional, and continuing studies programs, many universities tend to distance themselves from the vocational aspects of education. Universities see these as more appropriately a responsibility of colleges and polytechnics. In contrast, most students, parents and governments view the time and money invested in attendance at university as directly relevant to a student getting a good job; degrees and may not always match the changing nature of employment opportunities in a knowledge-based market. The focus of knowledge now required for employment is increasingly specialised and shifting towards the kind of intellectual, scientific, professional, and technical skills which only universities can provide. It is probable that universities will be drawn inexorably into the employment-education aspects of lifelong learning. As well, online education may be the preferred method of delivery for some of these learners. The university's role in education for employment will have to be examined afresh by its leaders.

Universities and colleges will not be able to rely solely on traditional offerings in serving mature students. The issues involved in matching education and employment are too intricate to be resolved by a series of top-level meetings between leaders from academia and industry. For example, researchers will have to develop and constantly update knowledge bases to match courses offered and employment needs. Cooperation between universities in data collection may be necessary. Delphi research conducted in cooperation with other universities and the private sector may provide a practical, worthwhile method for constantly informing the academy's policymakers on the coordination of career development/course planning with the reality of employment opportunities. Web-based Delphi instruments similar to those used in this research may be useful.

Intellectual Property

Whether an equitable solution will be found for the owners of intellectual property is open to serious doubt. An ICT transmission can be originated from anywhere in the world and copyright infringement lawsuits will be difficult and costly to pursue.

PART 2: CONCLUSIONS, RECOMMENDATIONS FOR PRACTICE AND RESEARCH

Introduction

The value of a Delphi depends on the informed opinion and the quality of expertise and experience in the panel involved. An impressive and credible panel was assembled (Appendix K) with subgroups -- academics, administrators, and IT professionals. Because all panelists were required to have a familiarity with ICT; and in many cases their university, association or company is a member of EDUCAUSE which supports ICT, a possibility of bias in favour of technology is acknowledged. But this is a panel of educational leaders with broad experience, in a range of disciplines, many of whom have a capacity to influence change. As well where consensus is obtained in a panel with several subgroups there is an added reliability.

A characteristic of the literature is that it represents the views of individual authors and does not seek consensus. By contrast, a Delphi study is a more efficient inquiry as it goes beyond the literature by asking an open-ended question, from which panelists' opinions and areas of consensus can be drawn. It provides a 'snapshot' of a period in the future based on the perceptions of a panel of experts at the time of participation. These perceptions change as the future unfolds; for example, some items identified as likely to happen at the start of this research have since become realities.

The strength of consensus varies from 70 percent to 100 percent in the findings in this study. This demonstrates a high level of agreement within the panel and therefore contributes to the trustworthiness of the results. Results below 70 percent were treated as having no consensus. Admittedly in all speculation about the future there is subjectivity and it can be full of surprises. However, panelists base their opinions on their professional knowledge, experience, and an understanding of what is occurring in their fields. This adds an element of objectivity to their conjectures and reinforces the trustworthiness of their perceptions. Observer bias is muted in a Delphi, particularly where members of the panel originate items under review. However, the possibility of bias remains where qualitative data is edited for inclusion on a questionnaire or when reviewing panel commentary. I am aware of these pitfalls and reviewed the work to minimize this possibility. In addition, all questionnaires were pilot tested. As well, panel members suggested modifications to improve Round 3 after they experienced Round 2. Ultimately, Applied Research and Evaluation Services (ARES), Faculty of Education at the University of British Columbia reviewed Round 3 before it was implemented. The data collection process and analysis in this web-based Delphi was thoroughly tested in an objective and trustworthy way. There may be blind spots in the perceptions of a panel member in giving opinions about the future. However, a large panel, such as this, mutes this possibility when a consensus is achieved.

There can be no evidence on what the future will contain; yet important information we need is that of the future. A tension exists between our need to forecast the future of society to take action that will shape events and the impossibility, in the strictest sense, of obtaining such knowledge. We require a method which provides a plausible understanding of what the future may hold and there are several from which to choose. For instance, a trend analysis is useful where the past provides a reliable indicator of the immediate future. But, in a situation where abrupt shifts may occur or when an accelerating rate of change is expected, a Delphi methodology offers a superior means of examining probabilities.

The Delphi method is unique in its capacity to handle complex questions about the future and where there is insufficient hard data. This study solicits a consensus of opinion from experts on what they believe the future will hold because of likely influences of ICT. Qualitative data is collected in a format which allows subsequent quantitative analysis. The method achieves an understanding of any solidarity in judgment and belief among the panel. A consensus of opinion from a group of experts has the advantage that any risk of error is lessened; but admittedly, the separate opinion of a single expert may turn out to be correct. A consensus of opinion allows the probability of change to be viewed somewhat objectively or at least distanced from ferment among scholars.

The conclusions and recommendations result from insights gained in a systematic web-based Delphi procedure and the views of experienced stakeholders involved in shaping higher education institutions. These experts use their experience, training, and intuitive judgment to identify probable future outcomes, events or conditions; as well they rate the probability, importance, and when these items will occur. The views of all stakeholders are important but some do not meet the criteria for expert and were not solicited in this research; for instance the views of students, parents, teachers with less than 5 years experience, elected government officials, relevant online communities, and military leaders are all beyond the scope of this dissertation.

Conclusions

The recent (2000 – 2002) turmoil over technology companies was considered by me in reaching my conclusions on the Delphi findings. At first the stocks of ICT companies were unrealistically 'hyped' by company officials, stock promoters and market analysts only to crash later in panic selling. An aggressive media fueled both rise and fall. Many investors were badly hurt and companies large and small were damaged or destroyed. This turmoil has brought into question the long-term stability of the high technology industry. But does this imply that the value of ICT in higher education is just an illusion? I think not. Admittedly, there will be problem areas; for instance, the high capital cost of installing fibre optic cable has to be recovered by selling service to a multitude of users who will "light" the cable. The development of ICT user companies has suffered a serious setback; as well some creative ideas and applications have been lost. However, a set of existing high technology companies large and small will survive and others will soon emerge. The probable consequence will be a delay in timing. I conclude that the panel finding that most of the technology needed by the academy for the use of ICT, will be in place by 2010 now is optimistic but I do support their broader finding that ICT will be implemented as an essential component and critical to teaching and research during 2005 to 2015.

The research findings and the literature led me to conclude, that within a decade, most universities will reorganize in response to ICT. The technologies will be used in all aspects of research, teaching, and administration both on- and off-campus. Three issues have long been near the top of the academy's wish list: lifelong learning, increased access, and interconnectivity. Because of ICT, all three are now well within reach, but how they will be handled still presents a challenge. There is a pressing need to establish and implement a cohesive lifelong learning strategy that will enable the academy to move beyond generalities and to identify specific areas in which an adult population will want and get higher education in the years and decades after leaving school. As well, fresh thinking will be needed about education for employment partly due to increased access offered online to underserved populations, but also due to the technical and intellectual requirements of a knowledge-based economy. There will be a larger and more diverse student body studying through universities, colleges and polytechnics.

According to the panel, interconnectivity will be ubiquitous in North America, via the web, and universal in life of the academy; but unfortunately, not for a decade or two in underdeveloped and developing countries. On the other hand, global competition will become commonplace and impossible to ignore in educational practice during the period 2005 to 2015. I consider these findings convincing and conclude that any failure by Canadian and/or US universities and colleges to accept the challenges presented by ICT and online education will simply mean that an expanding demand for online learning will be filled by offshore providers or by corporations.

The panel reached consensus that higher education will reorganize in response to ICT; as well a majority (not a consensus) are of the opinion that universities, colleges, and other higher education institutions will need restructuring. Examples from the private sector indicate the differences between restructuring and reorganisation. The world's stock markets became interconnected electronic entities; large companies which were competitors merged; these two changes are clear examples of restructuring. ICT companies have stripped away several layers of management to become leaner and more profitable; these are examples of reorganisation.

In some cases change in higher education institutions, due to ICT, may demand restructuring, in others not. For instance, a finding of the panel, with which I concur, is that online education will move to the core of on-campus learning; this will be an example of reorganisation. By contrast a change in the mandate of a university which enables it to serve a global population online, probably will involve restructuring. Disparate choices will be made by various institutions on changes in mode of operation, as well there will be differences between Canada's approach, mainly public, and that of the US where the higher education system has a free enterprise ethos and is both public and private.

A common problem for universities, colleges, and polytechnics is that over several decades large organisations tend to accumulate bureaucracy. As well they gather multiple levels of management and of reporting systems, some of which may become redundant because of ICT. It is beyond the scope of this dissertation to analyse the reforms and the differing approaches that higher education institutions will undertake in an era of ICT. I do support the panel finding that reorganisation in response to ICT will require a fresh look at institutional management and conclude that the looming retirement of a majority of faculty offers a unique opportunity to re-examine the size and structure of administrative establishments.

In an era of increased interconnectivity universities, colleges, and other institutions of higher education will have to decide which of the academy's values and missions are essential, non-negotiable, and incapable of being transformed. As well, they will have to decide how other values will be redefined or reshaped in the context of global online education. For instance, a commitment to excellence in teaching and research is an essential value and not negotiable, but the way in which excellence is achieved may be transformed.

At the core of any university, of solid reputation, distinguished scholars will continue to pursue independent research, as an end in itself, making contributions to knowledge; this is essential value and is non-negotiable. Arguably, on the other hand, research activity which is peripheral to this essential core, will be negotiable, even in a research university. Universities and colleges can expect increased pressure from government, other stakeholders and some donors to harness an increasingly larger share of the university's research activity to the needs of an expanding knowledge-based economy. As well a professor's freedom to choose and pursue particular research interests may be redefined or even curtailed as the demand for teaching underserved populations increases. This panel found that the professional, cultural, teaching roles of faculty will change with ICT. Also higher education institutions will reorganize to meet the needs of Internet savvy students. In all this I concur. Change may transform an institutions approach to teaching as online education is incorporated into on-campus learning.

The panel predicts a mix of online and face-to-face learning on-campus. I accept this finding as likely to occur. Although a mix of face-to-face learning on-campus and drawing a distinction between scholarly research pursued as an end in itself and other research does have commonalities with the dual mode research/service university proposed by Tjedvoll (1999), there are important differences. Under the dual mode approach, stakeholders other than the university itself would increasingly subject the service university to control. By contrast, the mix described here is an evolution of existing practices in response to a changing communication environment. But the universities will have to be both responsive to changing societal needs and vigilant in defending essential values. The external pressures described by Tjedvoll are real indeed, and institutional rigidity would be a certain path to a loss of academic freedom.

Freedom of access to higher education and the maintenance of higher academic standards may conflict and the universal right of access to higher education will extend throughout North America and ultimately globally. Maintaining standards of excellence and unrestricted access are disparate aims and both may not be achievable. Online education may contribute to relieving this tension but is not proposed as a panacea. However, in 2005 to 2015 the reputation of a university in research and teaching may have as much to do with its web presence as its activities on-campus.

Besides providing the panel's perception of the future of higher education institutions the web-based process serves to inform leaders who will help shape educational policy. Participation in this process may have acted as an intervention altering panelists' views and thinking affecting outcomes. Several of the panelists comment that the process used here caused them to think. Others either wanted to use screen shots in a book they were about to publish or to describe the Delphi process in seminars.

Recommendations For Research and Practice

The web-based Delphi developed in this research will have a wide range of applications at national; State/Provincial, School Boards and within individual institutions. These recommendations are made for research and policy consideration over change due to ICT in first quarter of the 21st century.

Recommendations for Practice

To governments and university leaders:

- Within 5 years agree on, develop and implement a cohesive policy for lifelong learning within 5 years. Enrollment growth has been due, primarily to increased participation by adults.

- Consider afresh a university's responsibility in matching employment education and with degree granting. Web-based Delphi research similar to that used in this investigation could be implemented. In a knowledge-based economy, coordination of research between universities and the private sector will be required.

- Consider the country's, province's, state's response to online higher education for underserved populations, nationally and globally.

- Within five years, implement a well funded comprehensive policy for the research, design and development of ICT empowered learning systems.

- Consider what part will be played by the private sector in the development of learning systems in higher education. Where desirable, involve private sector in partnership, in consortia or independently from universities and colleges.

To administrators in National, State and Provincial Education Departments and in Universities:

- Explore and develop a cohesive policy on the changing demand for access to higher education by underserved populations, education for employment and improved public access to lifelong learning.

To University Administrators Working in Cooperation with Faculty:

- Decide what, if any, responsibility the university is prepared to take in providing contemporary learning opportunities for people in the work force, and in updating employment skills data banks in a changing global knowledge economy.

- Examine and research the consequences of the university joining a large, well-financed online consortium (or several consortia) with other universities and/or corporations.

- Re-examine the university's management in the context of systems enabled by ICT, the aim will be to reduce bureaucracy and save unnecessary work.

Recommendations for Research

For Researchers Interested in Further Investigation into the Items or Issues Investigated in this Research:

- Verify the results of this research with other well-qualified sets of panelists.
- Analyse the qualitative data from panel commentary.
- Examine further those items on which no consensus is achieved (Table 5.21).
- Examine the differing responses between various demographic groups in these data, for example, US versus Canada, academics versus administrators, administrators versus IT professionals, academics versus IT professionals, and between genders.

Interaction via computer-mediated communication with panelists provided me with an extra motive to succeed and a determination not to let down panelists whose help evidenced a generous yet critical spirit. Philips' (1990) postulates what is crucial to the objectivity of any inquiry, whether qualitative or quantitative, is the critical spirit in which it has been carried out. As well, I feel honoured by the panelists' courtesy and the time they dedicated to this investigation. To all members, I offer my deep appreciation.

I do not believe the future is predetermined by fate or divine intervention, but is constantly being shaped and reshaped by human actions based on our choices. The future of higher education institutions is not, necessarily, inevitable in anticipating consequences of ICT use. We may alter its future. I hope this research provides a framework for interpreting some of the issues discussed and the web-based Delphi provides a model. This Delphi process does have the power and flexibility to have many uses and applications, including, for determining preferred outcomes.

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Chapter 1

Opening quote from Wendell Bell, 1997b:104

[1] Information and Communications Technologies (ICT) and Information Technology (IT) are used interchangeably. They are the improved telecommunication systems and networks and equipment that result from the convergence of telephone, microwave, cable, broadband-fibre optic, wireless and satellite communication systems with computer technologies and to digital systems designed to receive, disseminate generate, store, process and display in a variety of formats.

[2] Online: Definition - you have either an "access provider" or a "service provider", or both. InterNiche (2002) 7th para.

[3] James Dator, Professor and head of the Alternative Futures Option in the Department of Political Science, and director of the Hawaii Research Centre for Futures Studies and the first secretary-general and then president of the World Futures Federation from 1983 to 1993.

[4] Andy Hines was manager for consumer and research trends, Kellogg Corporation now Ideation leader for Dow Chemical. Retrieved September 19, 2002 from http://www.cl.uh.edu/futureweb/alumni/hines.html.

[5] NEC, 2002. Higher education enrollments in the USA grew from 8.9 million in 1970 to 14.4 million in 1991 leveling off to 15 million in 1999. However most explosive increases have been in adult education with enrollments increasing from 58 million in 1991, to 76 million in 1995, to 90 million in 1999. Retrieved June, 27, 2002 from http://nces.ed.gov/quicktables/.

Chapter 2: Part 1 – State of the Art

[1] Baer, Walter. Senior Analysis at RAND Graduate School.

[2] Ehrmann (1999) Director of Flashlight, American Association of Higher Education (AAHE).

[3] World Wide Web (WWW) Definition: connects huge, global information databases accessed via the Internet. The Internet"; "the World Wide Web"; "Cyberspace"; "Information SuperHighway": Many people use these terms interchangeably, there are subtle differences among them. The Internet is the general term given to the whole phenomenon of computer-aided communication over telephone lines. It's literally an "inter"connected "net"work of systems. The World Wide Web is an application, that is, a

means by which you can view and use the Internet in an exciting and user-friendly way.Cyberspace is another term used to describe the whole Internet phenomenon. It's a casual, non-technical term. Retrieved February 13, 2002 5th para. fom InterNiche, 2002.

[4] Slaughter, Shiela. (1998). President for the Association for the Study of Higher Education and Professor at the Center for the Study of Higher Education at the University of Arizona.

[5] Ted Marchese, President for the Association for the Study of Higher Education and Professor at the Center for the Study of Higher Education at the University of Arizona, 1998.

[6] Kevin P. Kearns is an associate professor of public and nonprofit management in the Graduate School of Public and International Affairs, University of Pittsburgh.

[7] David D. Dill, is a Professor of Public Policy Analysis and Education at the University of North Carolina at Chapel Hill; William F. Massy is Professor of Education and Founder of the Stanford Institute for Higher Education Research; Peter R. Williams is Director of the Quality Assurance Group at Higher Education Quality Council in the United Kingdom; and Charles M. Cook is Director of the Commission on Institutions of Higher Education at the New England Association of Schools & Colleges, Inc.

Chapter 2: Part 2

[1] Technocracy. Postman's term for the connection between science and the improvement of the human condition.

[2] Technopoly. Postman's term for a nation devoted to the use of technology, "the surrender of culture to technology," a totalitarian technocracy.

[3] Christopher Dede, Ph.D, at the time of this publication, was a professor at George Mason University with program responsibilities in education, information technology, and public policy has research interest in artificial intelligence, education and strategic planning. He is currently Professor in Learning Technologies, Chair, Learning and Teaching at Harvard Graduate School of Education. Retrieved December 14, 2002 from http://www.gse.harvard.edu/%7Ededech/.

Chapter 3

[1]Bell's (1997a:98-99) definition of the interpretation of prediction as single or multiple, conditional or unconditional, contingent or not, likely or unlikely, absolute or probabilistic, short- or long-range, small- or large-scale, trivial or momentous, based on scientific evidence or not, desirable or undesirable, and so on. Whatever their source or whatever they are labeled (e.g. 'projection,' 'forecast,' etc.), if a statement concerns some future outcome, event, or condition, I include it in the definition of 'prediction'.

Chapter 4

Kennedy, Kathryn (2000 – 2002) [Online].

[1] Round 1 website http://www.interchange.ubc.ca/kathrynk/DELPHI.HTM

[2] Round 2 website http://www.ubcdelphi.net/ubced.cfm

[3]Round 3 website http://www.ubcdelphi.net/ubcedr3.cfm

[4] Results for Round 2 and Round 3 http://www.ubcdelphi.net

[5] email address: kathrynk@interchange.ubc.ca, website http://www.interchange.ubc.ca/kathrynk/DELPHI.HTM

Chapter 5

[1] CNI – Coalition for Networked Information and NLII – National Learning Infrastructure Initiative.

[2] The Internet Society (ISOC). [Online]. http://www.isoc.org/internet/standards/.

[3] International Organization for Standardization (ISO). [Online]. http://www.scc.ca/whoweare/about_scc_e.html

[4]The Internet Engineering Task Force. [Online]. http://www.ietf.org/.

Appendix A

Chronology of Future Studies:

Some Key philosophical/ideological authors on Education

Date	Person, publication, event, organization
427-347 B.C.	Plato: "Republic" founder of *Western Idealism*
384-322 B.C.	Aristotle: founder of Western *Realism*
1269-1272	Thomas Aquinas: "Summa Theologiae" *Theistic Realism*
1516	Thomas More: "Utopia"- coined the word 'Utopia' *Utopianism*
1757	Jean-Jacques Rousseau: "Émile" *Naturalism*
1798	Thomas Robert Malthus: "First Essay on Population"
1813	Robert Owen: "A New View of Society" *Utopianism*
1848	Marx, Karl and Engles, Friedrich: "Manifesto of the Communist Party" *Utopianism*
1887	Edward Bellamy: "Looking Backward, 2000-1887" *Utopianism* – turns out with most accurate predictions about women
1895	H.G. Wells: "The Time Machine"
1899	H.G. Wells: "When the Sleeper Wakes"
	John Dewey: "The School and Society" *Pragmatism, Experimentalism, Instrumentalism*
1900	H.G. Wells: "Anticipations"
	Charles Sewall: "The Future of Long Distance Communication" Harper's Weekly, 44:II

1901 H.G. Wells: "Anticipations of the Reaction of Mechanical and Scientific Progress upon Human Life and Thought"

H.G. Wells: "Discovery of the Future", Smithsonian Annual Report, (1902:375-392) and Nature, Vol. 65.

George Sutherland: "20th Century Inventions"

1905 H.G. Wells: "A Modern Utopia"

1910 John Dewey: "How We Think" (problem solving) *Pragmatism, Experimentalism, Instrumentalism*

1913 H.G. Wells: "The World Set Free"

1914 Bertrand Russell: "The Future of Science"

1916 John Dewey: "Democracy and Education" *Pragmatism, Experimentalism, Instrumentalism*

1919 J.M. Keynes: "The Economic Consequences of the Peace"

1920 S.C. Gilfillan: "Successful Social Prophecy in the Past" (unpublished Master's thesis in Sociology, Columbia University).

1921 William H. Kilpatrick: "The Project Method" (Collaborative learning) *Progressivism*

1929 U.S. Stock Market Crash

U.S. President Herbert Hoover appointed President's Committee on Social Trends

Alfred North Whitehead: "Aims of Education"

1930 J.M. Keynes: "A Treatise on Money"

1931 John Dewey: "Philosophy and Civilization" *Pragmatisim*

1932 Aldous Huxley: "Brave New World"

George S. Counts: "Dare the School Build a New Social Order*?" Social Reconstructionism*

1933 President Hoover's Research Committee on Social Trends: "Recent Social Trends in the United States."(Vols 1-2)

1934 George S. Counts: "The Social Foundations of Education"
Social Reconstructionism

1935 Charles F. Kettering –"My interest is in the future because I shall spend the rest of my life there"

C.C. Furnas: "The Next Hundred Years: The Unfinished Business of

Science in 1935.

1942 Ossip Flechtheim, German sociologist coined the term 'futurology'

1946 W.F. Ogburn (assisted by J.L. Adams and S.C. Gilfillan): "Social effects of Aviation"(Boston: Houghton Mifflin Company.

1948 RAND founded as private think tank funded primarily by the US Air Force and hired Herman Kahn, as senior physicist to work on game theory, systems analysis and other techniques applied to military strategy

1949 George Orwell: "1984"

Kaplan, Skogstad and Girshick: "The Prediction of Social and Technological Events." P-93. RAND. A report on a pilot study of the prediction of social and technological events.

1950s *RAND's dominance in developing mathematical models, military games, for forecasting though much was proprietary. Nation building activities*

1951 F.L. Polak: "The Image of the Future"

Marshall McLuhan: "The Mechanical Bride: Folklore of Industrial Man"

1952 Kurt Vonnegut: "Player Piano"

1953 Dalkey, Helmer and Thompson: "Report on a Preliminary Systems Analysis for Strategic Targets. RM-1011/PR. RAND

1957 Karl R. Popper: "The Poverty of Historicism"

1958 Helmer and Rescher: "On the Epistemology of the Inexact Sciences. P-1513. RAND"

1959	C.P. Snow: "The Two Cultures and the Scientific Revolution"
1950s-1960s	*Forecasting methods based on mathematical-statistical techniques, positivist and/or behavioural traditions with emphasis on quantitative methods.*
1960s	*Future studies was a relatively small disciplinary enclave, but methodologies were continuing to be developed, nation building activities*
1960	Bertrand de Jouvenel founded Futuribles (with Ford Foundation money)
	U.S. President Eisenhower: Commission on National Objectives
	Herman Kahn: "On Thermonuclear War"
	Herman Kahn: "The Structure of Scientific Revolutions"(revolt against Positivism, new post-positivism theory of knowledge
1961	J.W. Forrester: "Industrial Dynamics"
	Kahn left RAND (after having termed "megadeaths") and founded the Hudson Institute, a leading futures research center
	Kahn was the great promoter of the concept of paradigm shifts and concept of 'alternative futures'; that the future is not a single inevitable state, but can evolve.
1962	Anthony Burgess: "A Clockwork Orange"
	Dalkey and Helmer: "An Experimental Application of the Delphi Method to the Use of Experts. Prepared for the United States Air Force Project Rand" – RAND. RM-727-PR.
	Kuhn: "The Structure of Scientific Revolution"
	Herman Kahn: "Thinking the Unthinkable" became the 1st popular contemporary futurist
1964	Max Ways: "The Era of Radical Change" – 4 categories of social change
	Dennis Gabor: "Inventing the Future"
	Gordon, Theodore J. and Helmer, Olaf: "Report on a Long Range Forecasting Study", RAND P-2982. First published large-scale Delphi. (Gordon, 1992)

	Marshall McLuhan: "Understanding Media"
Mid 60s	*The term 'futurist' began appearing in U.S. magazines. Time, devoted a major essay in 1965 to describe futurists. Technological forecasting still considered an art, not yet a science.*
1966	Daniel Bell: Commission of the Year 2000
	Edward Cornish: Founded the World Futures Society
1967	Bertrand de Jouvenel: "The Art of Conjecture" (first pub. In 1964 in Monaco)
	Herman Kahn and Anthony J. Wiener: "The Year 2000: A framework for Speculation on the Next Thirty Years." (made scenarios familiar to the world)
	Burnham Beckwith: "The Next 500 Years: Scientific Predictions of Major Social Trends.
	Helmer and Gordon developed Cross-Impact Analysis, but first experiment was done by Gordon and Hayward in 1968.
	Club of Rome founded by Aurelio Peccei
	Neiswender: "The Exploration of the Future, [Realities]" RAND P-3540.
	Helmer: "Analysis of the Future: The Delphi Method" RAND P-3558.
	Helmer: "New Developments in Early Forecasting of Public Problems: A New Intellectual Climate." P-3576. RAND
	Haydon: "The Year 2000". P-3571. RAND
	Helmer: "The Future of Science". P-3607. RAND
	Helmer: "Methodology of Societal Studies." P-3611. RAND
	Ware: "The Computer in Your Future." P-3626. RAND Retraining and reeducation will be the way of life for everyone except those retiring before 1972.
	Helmer: "Prospects of Technological Progress." P-3643. RAND.

Dalkey: "Delphi". P-3704. RAND. A procedure was established to overcome the disadvantages common to committees and small group meetings. The Delphi technique was modified by separately eliciting and refining the opinions of a group of experts without contact among them, and calculating a statistical 'group response.'

Helmer: "Systematic Use of Expert Opinions." P-3721. RAND

Marshall McLuhan: "The Medium is the Message"

Erich Jantsch: "Technological Forecasting in Perspective: A Framework for Technological Forecasting, its Techniques and Organization. (Paris, OECD) – forecasting an art, not yet a science. Techniques into 4 broad areas: intuitive thinking, exploratory, normative and feedback techniques.

1968 James R. Bright (ed.): "Technological Forecasting for Industry and Government: Methods and Applications

Baran: "Some Changes in Information Technology Affecting Marketing in the Year 2000." P-3717. RAND. Predicted changes in communications media and their effects on marketing.

Brown, B.B. and Brown, B.: "Delphi Process: A Methodology Used for the Elicitation of Opinions of Experts." P-3925. RAND. They describe an intricate problem in the selection of experts.

Dalkey: "Predicting the Future." P-3948. RAND. Modification to Delphi procedures to include anonymity, iteration with controlled response, and statistical group response.

Gordon, T.J. and Hayward, H.: "Initial Experiments with the Cross Impact Method of Forecasting, Futures, 1, 2. Dec. Cross-Impact analysis created by Gordon and Helmer in 1966.

Daniel Bell initiated Hawaii 2000

1969 Rescher: "Delphi and Values." P-4182. RAND

Dalkey: "The Delphi Method: An Experimental Study of Group Opinion." RM-5888-PR. RAND. The results of the experimentation increased construct validity of Delphi procedures, which incorporated: anonymous response, iteration and controlled feedback, and statistical group response to elicit and refine group judgment when exact knowledge is unavailable.

Brown, B.B., Cochran and Dalkey: "The Method Method II: Structure of Experiments." RM-5957-PR. RAND. Evaluated how groups use incomplete information to arrive at factual conclusion by comparing two different methods: The Delphi technique vs. the structured face-to-face discussion.

Dalkey, Brown, B.B. and Cochran: "The Delphi Method, III: Use of Self-Ratings to Improve Group Estimates. RM-6115-PR. RAND. Validity increased using self-rating as a technique for improving the selection of more accurate subgroups in applications of Delphi method for group judgment.

John McHale: "The Future of the Future"

1970s *New field of Futures studies expanded internationally, technological assessments and global models being developed, faith in government planning and its ability to solve problems with greater influences by media to public.*

1970 U.S. President Nixon: up set research group on national objectives who published "Toward Balanced Growth"

Dalkey, Brown, B.B. and Cochran: "The Delphi Method, IV: Effect of Percentile Feedback and Feed-In of Relevant Facts. RM-6118-PR. RAND. Tested two variations. (1) reiteration of individual percentiles resulted in no improvement over reiteration of median and quartiles of group response. (2) By adding a relevant fact to the median and quartiles reiteration, strengthens motivation for revision in expert judgment.

Dror: "A Policy Sciences View of Future Studies: Alternative Futures and Present Action." P-4305. RAND. A discussion on the necessary change of requirements for policy-oriented future studies—saliency, credibility, transformability into policymaking inputs and desirability by the policymaking system.

Quade: "On the Limitations of Quantitative Analysis." P4530. RAND. Suggests that Delphi method (questioning, anonymity, iteration, controlled feedback and statistical response) is more useful for investigating problems rather than solving them.

1970 Alvin Toffler: "Future Shock"

1971 Dalkey, N.C. and Rourke, D.L.: "Experimental Assessment of Delphi Procedures with Group Value Judgments. R-0612-ARPA. RAND. The experiment supported the conclusion that Delphi procedures are appropriate for processing value judgments as well as factual judgments.

Dalkey, N.C. and Brown, B.B.: "Comparison of Group Judgment Techniques with Short-Range Predictions and Almanac Questions." R-0678-ARPA. RAND. Correlations between standard deviation and accuracy, and between group self-rating and accuracy were significantly higher for prediction.

Hawaii Research Center for Futures Research (HRCFS) was created.

Futures Group founded by Theodore Jay Gordon

J.W. Forrester: World Dynamics

1972 October, U.S. President Nixon, signed into law U.S. Congressional Office of Technology Assessment (OTA) founded

Jib Fowles (ed.) "Handbook for Futures Research"

Joseph P. Martino: "Technological Forecasting for Decisionmaking"

H.W. Langford: "Technological Forecasting Methodologies

Donella H. Meadows, Dennis L. Meadows, Jørgen Randers and William W. Behrens III. "The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind"

Hawaii Research Center for Future Studies created at University of Hawaii

1973 Oil Crisis

Daniel Bell: "The Coming of Post-Industrial Society: A Venture in Social Forecasting"

H.S. Cole et al. (eds.): "Models of Doom: A Critique of Limits to Growth"

1974 Sackman, H.: "Delphi Assessment: Expert Opinion,
The major critic of the Delphi technique applied positivists' assumptions on the rigour of Delphi. Conclusion that Delphi is an unreliable and invalid scientific technique in principle and probably in practice; except for possible value as an informal exercise for heuristic purposes. A more detailed interpretation in this paper is under the section on weaknesses of the Delphi

methodology. [Loye, 1978 notes that Sackman's critique is a warped and savagely biased]

Robert L. Heilbroner: "An Inquiry into the Human Prospect"

mid 1970s *an increasing interest in Futures Studies worldwide expanded into a generalized social movement on concerns such as population, ecology, consumerism and human rights. Futures studies academic programs began to flourish. Hungarian futures research searching for new methods to understand alternative views.*

1975 University of Houston-Clear Lake established graduate program in Studies of the Future

1976 Club of Rome: Reshaping the International Order (Tinnergen, J.)

February: Canadian Association of Futures Studies founding meeting

Institute for Alternative Futures in Alexandria, VA founded by Clem Bezold

Sackman, H.: "Toward More Effective Use of Expert Opinion: Preliminary Investigation of Participatory Polling for Long-Range Planning." P-5570. RAND. The Delphi techniques that had been developed in response to the need for long-range R & D planning was applied at RAND. Results from a sampling of expert opinions on long-range R & D planning were generally credible and internally consistent. The formal experimental procedures were explicit, replicable, and amenable to quantitative analyses and the associated measures were statistically reliable.

Morrison, P.A.: "The Demographic Context of Educational Policy Planning." P-5592. RAND. By using demographic analysis with continuously updating trends in population growth and distribution, this will assist in planning for future educational problems and needs by devising a mechanisms to make for better choices.

1977 David Loye: The Knowable Future: a psychology of forecasting and prophecy

World Future Society: "The Study of the Future" (Edward Cornish)

1978 Harry Jones & Brian Twiss: "Forecasting Technology for Planning Decisions"

Ascher, W. "An Appraisal for Policy Makers and Planners"

Gammill, R.C.: "Personal Computers for Science in the 1980s." P-5954. RAND. Projected use of personal computers for scientific research could lead to significantly increased capabilities for many research scientists, and reduce their dependence on organizational affiliations, geographic location and funding agencies. The important problem for the 80s was projected to be secondary memory; however, the critical long-term problem would be economical inter-computer communications.

Baer, W. S.: "Telecommunications Technology in the 1980s." P-6275. RAND. Delphi method used to anticipate the advances in telecommunications technology that might be used in commercial systems during the 1980s.

1979 Futurist Magazine: "The Long-Term Multifold Trend of Western Culture"

Robert M. Fitch & Cordell M. Svengalis: "Futures Unlimited"

1980s *Shrinking size of U.S. federal government and resources to public. Scepticism toward planning projects and social engineering. Interdisciplinary Futures studies experiencing backlash against apocalyptic forecasts and failure to anticipate oil shocks of the 70s. A decline interest in future studies, a critical self-examination; however, increased popular literature about the future. Hungarians examine interrelationship of economic and environmental subsystems.*

1980 Alvin Toffler: "The Third Wave"

Global 2000 report for U.S. President Carter, later part of his term was the first attempt by U.S. government to generate interagency futures thinking on global issues such as economics, demographics, resources, environmental, and the future of the world. The report was considered pessimistic and when President Reagan took office, the report was ignored. However, one result of the report was the establishment of the Millennium Institute.

First Global Conference on the Future – jointly sponsored by the World Future Society and Canadian Association of Future Studies, July 20, Toronto, Canada – conference motto – "Think Globally, Acting Locally"

Robert E. Textor: "A handbook on ethnographic futures research (3rd ed., Version A). Stanford, CA: School of Education and Department of Anthropology, Stanford University.

1981	Murray, J.E.: "An Approach to Long-Range Forecasting." N-1609-DIA. RAND. The Delphi method was introduced for making long-range (10-20 years) forecasts using heuristic reasoning. Four central inquiries were supported by military intelligences' information.
	Roy Amara, Institute for the Future: "Toward the Year 2000, National Priorities
1982	John Naisbitt: "Megatrends"
	Alvin Toffer: "Previews and Premises"
	Olaf Helmer: "Looking Forward: A guide to futures research"
	Joesph P. Martino: "Technological Forecasting for Decision Making"
	Brita Schwarz, Uno Svedin, Björn Wittrock: "Methods in Futures Studies"
1983	Eleonora Masini: "Visions of Desirable Societies" [UBC library error shows date as 1978]
1982-1986	Royal Dutch/Shell Oil led scenario-building for constructing alternative futures
1984	Aurelio Peccei died, founder of Club of Rome
	Deleon, P.: "Future Studies and the Policy Sciences." P-7000. RAND. The Swedish Secretariat for Future Studies was in part evaluated by its legitimacy and determining the criteria. The tenets of the policy sciences and future studies share a problem-oriented contextuality, multidisciplinary approach, and a concern with human values. Both policy sciences and future studies have more in common with the methods of the social sciences than with the natural sciences.
1985	U.S. President Reagan invited a group of people described as 'futurists' for a luncheon at White House.
mid 80s	*Futurists agreed that government and institutions are out of date. Institutional structures are bureaucratic and sluggish (Coates & Jarratt, 1989)*
1987	Canadian Association of Future Studies closes

	Krishan Kumar: "Utopia and Anti-Utopia in Modern Times"
1989	Joe Coates and Jennifer Jarratt: "What Futurists Believe" – technology is the primary driver of change
1990	U.S. "Clean Air Act" – resulted from OTA report. However, there are five European equivalents of OTA.
	Thomas L. Saaty & Larry W. Boone: "Embracing the Future"
1991	Allan Tough: "Intellectual Leaders in Futures Studies—A Study"
1992	Brian C. Twiss: "Forecasting for Technologists and Engineers"
1993	Lucie Deschênes: "Futures Research, Long-Range Planning and Technology Monitoring"
	Barbieri Masini: "Why Futures Studies?"
1994	September 29, OTA closed – had staff of 200 and completed 750 full reports
	Freire, P.: "Pedagogy of Hope" (Revisionary Postmodernism)
1996	Richard A. Slaughter: "New Thinking for a New Millennium" Kuhn, T.S. "The Structure of Scientific Revolutions, 3rd ed.
1997	Wendell Bell: "The Foundations of Futures Studies" – 2 vols.
	The Millennium Project: "State of the Future: Implications for Action Today
1998	David Hicks & Richard Slaughter (eds.): "Futures Education"
	William A. Sherden: "The Fortune Sellers: the big business of buying and selling predictions"
1998	J.C. Glenn and T.J. Gordon: "1999 State of the Future: Challenges we face at the Millennium
Later 1990s	*Internet and WWW online electronic communication (online communities) resulted in many-to-many interactions, independent of time and place with a high level of interactivity.*

Note: A valuable resource for some key philosophies and ideological authors on Education is Gutek, Gerald. L. (1997). Philosophical and Ideological perspectives on education. 2nd Ed. Needham Heights, MA: Allyn & Bacon.

APPENDIX B

CHRONOLOGY OF RAND DELPHI AUTHORS: (1949 – 1990)

Year	Number of Delphi Studies	RAND Author(s)
1949	1	Kaplan, Skogstad, Girshick
1953	1	Dalkey, Helmer, Thompson
1958	1	Helmer-Hirschberg, Rescher, Helmer, Rescher
1962	1	Dalkey, Helmer
1964	2	Gordon and Helmer, B. Brown and Helmer
1967	4	Neiswender; Haydon;Ware; Dalkey
	5	Helmer
1968	4	Baran; B.B. Brown and B. Brown; Dalkey; Brown
1969	2	Rescher; Dalkey
	2	Dalkey and B.B. Brown and Cochran
1970	3	Dalkey and B.B. Brown and Cochran; Dror; Quade
1971	2	Dalkey and Rourke; Dalkey and B.B. Brown
1974	1	Sackman
1976	2	Sackman, Morrison
1978	3	Gammill, Baer, Morrison
1981	1	Murray
1984	1	Deleon
1988	1	Chin
1990	1	Builder

Source: The RAND website URL: "http://www.rand.org/cgi-bin/Abstracts/getab.pl"

APPPENDIX C

EVALUATION OF ONLINE DELPHI PROCESS

- In general; very stimulating, very useful as ideas/inputs for my own seminars. Thanks a lot, and good luck with your further work. Will be waiting eagerly for the Report. (Acad)

- The modified questions were much easy to answer; also this time I didn't complete all the questions at once and took a break, which was much easier. I simply didn't have time to look at the comments and feedback and also decided that I did not want to be influenced by the feedback. (Adm)

- This round of questions was sharper than the last round, and thus more stimulating as I answered each question. Thanks for modifying it as you have. (Adm)

- I thought the experience was good. As in all questionnaires one would want to be able to provide greater explanations for one's answers but time frames that. Overall, a good experience. (Adm)

- This was the best use of Delphi that I have seen, but the number of questions were too many. Also it would have been useful to have had the comments appear by default, instead of taking another click beyond the statistical results. (Acad)

- Let me tell you that your study and questionnaires are very stimulating and challenging. I feel sure you'll make a valuable contribution to this field. (Acad)

- Yes, well-designed and easy to use...plus it worked! An awful lot of questions though. (Adm)

- The process was excellent. The data were presented in a way that assisted my reflection rather than distracting me. The questions were, with only the odd exception, clear, thoughtful, and provocative. They forced me to think more deeply and comprehensively about the subject than I had before. (Acad)

- I think this version of your questionnaire is outstanding. It is easy to navigate, gives immediate, tangible feedback, and made completing the survey quite easy. (Adm)

- In interpreting your results, beware of selection bias. I do not know how you selected respondents to the survey, but that process is critical in interpreting results. For instance, I would love to see the distribution of results of folks like me (in the business of "ed-tech") vs. university presidents! (Acad)

- Great questionnaire site, Kathryn! I would like to refer to this site in the future---I can see it is quite relevant to some of our current work. Keep up the good work! (IT)

- The process was very interesting and the questions provided much food for thought. The format of the questions, however, did not always lend itself easily to a time-bound answer -- in other words, it wasn't always possible to provide an assessment of the time period within which a given answer might occur. That having been said, the questionnaire and the site were very easy to navigate. I look forward to reading the final report. (Adm)

- The feedback provided in round three was very helpful and provided an opportunity to reflect on the views of the group as well as my own. Well done. (Adm)

- Good luck on the analysis. I look forward to reviewing the results. (IT)

- The time demanded by Phase 3 was too long for a single sitting. It would have been better to send out more frequent calls to participate in shorter sessions. (Adm)

- CONGRATS on a beautifully designed web interface!! It was the best I've ever experienced: elegant in the best sense.

  I enjoyed the process--you made me THINK!

  I DO look forward to the results; and Kathryn, please: a trim, taut and terrific article for refereeing into JDE as soon as possible (back issues are now online). Good wishes to K[athryn] and the web designer, and thanks for your patience and courtesy re my lateness. (Acad)

- I thought the website was extraordinarily well-developed and easy to use with key information right at my finger tips. It was very long. Yes, the feedback was helpful to me. (IT)

- I have problems with the basic assumption about being influenced by the opinions of others; also I found the questions sometimes multi-headed or too general for one to be able to provide a considered opinion. I had a constant confusion with the date--for us, some, most, all? [O]ften when I disagreed it didn't matter but no opinion didn't really capture that.

- I guess, my greatest frustration was completing a question and being rewarded with another one--I don't enjoy surveys so I watched the red completion line pile up as my motivation to continue. (Acad)

Note.

Comments received at end of Delphi Round 3

Appendix E 1

Criteria for Sections of Experts on the Website

Scholars and Professors will be selected from a sampling of universities and other higher education institutions from around the world, but with an emphasis on Canada and the USA. They will be selected because they have been published on issues around IT and the Internet, in reviewed books refereed journals or in online journals. Alternatively, they may have given keynote addresses or other presentations at academic conferences/hearings on higher education, IT and the Internet.

Professors will have been, or are now, engaged in teaching at universities and will have achieved the academic rank of professor or associate professor. They will be identified as having carried out research or contributed to publications in their field/discipline of expertise around IT and/or Internet use.

Alternatively **scholars** and **professors** will be selected because they have attained leadership or a distinguished academic reputation, in their relevant field, in their university or professional associations.

Higher Education Administrators will be individuals who have achieved senior positions or leadership roles in the administration of universities. They will be well-experienced presidents, past-presidents, vice-presidents, chancellors, vice-chancellors, provosts or deans. Alternatively, they will be officials in senior governmental administrative positions concerned with the organization and/or financing of higher educational institutions. Alternatively, they will be administrators who have attained leadership or a distinguished academic reputation in their university or professional associations. Alternatively, they will be involved in administrative leadership positions (project director or assistant director) in Internet2, CANARIE (Canadian Network for the Advancement of Research, Industry and Education), Next Generation Initiative, World Wide Web Consortium (W3C) or similar projects.

Key personnel of IT and Internet enterprises may be senior personnel from private/public sectors of companies/corporations/associations or other business organizations in the area of IT and the Internet who are engaged in the innovation, development or diffusion of technology related to IT and the Internet. This category may include advanced IT/Internet applications, content and network services. Selection will be limited to persons well experienced in technological development or applications and knowledgeable about the convergence of IT and the Internet; preferably (but not necessarily) they will be well informed on IT/Internet use in higher education.

The private/public sectors representatives will be selected from industry/business leaders, a President, Director, Vice-President, or Assistant

Appendix E 1

Criteria for Sections of Experts on the Website

Vice-President of a company operating in the area of development or diffusion of IT and/or the Internet. Alternatively, they will be a department head or senior staff member who is a leader in the Research and Development division of such a company. Alternatively, they will be a proprietor or a partner or a senior research associate in a consulting firm providing advice or service to corporations and/or educational institutions in the areas of IT. Alternatively, they will be a department head or senior staff member engaged in R & D in a private corporation or institution involved in the development of the CANARIE, Inc. (Canadian Network for the Advancement of Research, Industry and Education), Internet2, World Wide Web (WWW), Next Generation Initiative or telecommunications. Alternatively, they will be a senior staff from a member organization of the World Wide Web Consortium (W3C) which is working on the next generation of the Web's infrastructure.

Alternatively, experts will be people identified by senior corporate management as key persons operating at the forefront of their field/discipline and with a working knowledge of higher education. Alternatively, panelists will be sought from leading higher education associations, foundations, or institutions. Alternatively, public/private sector panelists may be selected because they are the authors of books, papers, and articles in refereed journals; online journals and are well informed and experienced in issues around the use of IT/Internet in higher education.

These persons may include CIO's, Directors, Vice Presidents of IT

The purpose of the IT and Internet technology participants is to provide an informed technological viewpoint to panelists within the Delphi process.

Appendix E 2

Criteria for selection of experts

Explicit criteria for the three subgroups

Scholars and Professors

They will be selected from universities regarded as leaders in ICT and other higher education institutions from around the world, but with an emphasis on Canada and the USA. Panelists may be selected because they have been published in reviewed books, refereed journals or in online journals on issues around IT and the Internet. They may also have had papers published online, or will have given keynote speeches and other presentations at academic conferences on higher education, IT and the Internet.

Professors will have been, or are now engaged in, teaching at universities and will have achieved the academic rank of professor or associate professor. They will be identified as having carried out research or contributed to publications in their field/discipline of expertise around IT and/or Internet use. Alternatively scholars and professors may be selected because they have attained leadership or a distinguished academic reputation, in their relevant field, in their university or professional associations. They will be accessible and willing to engage in written intellectual dialogue. They are willing to commit time to participate until the conclusion of the study; they have a willingness to participate thoroughly and comprehensively. They have at least 5 years experience in their professional areas.

Educational Administrators

These will be individuals who have achieved senior positions or leadership roles in the administration of universities. They may be well-experienced presidents, past-presidents, vice-presidents, vice-chancellors, provosts and deans. Alternatively, they may be officials in senior governmental administrative positions concerned with the organisation and/or financing of higher educational institutions. Alternatively, they may be administrators who have attained leadership or a distinguished academic reputation in their university or professional associations. Alternatively, they may be involved in administrative leadership positions (project director or assistant director) in Internet2, CANARIE, Next Generation Initiative, World Wide Web Consortium or similar projects. They will be accessible and willing to engage in written intellectual dialogue. They are willing to commit time to participate until the conclusion of the study; they have a willingness to participate thoroughly and comprehensively. They have at least 5 years experience in these their profession area.

IT and Internet professionals

These will be senior personnel from private sector corporations or other business organisations in the area of IT and the Internet who are engaged in the innovation, development or diffusion of technology related to IT and the Internet. This category may include advanced Internet applications, content and network services available for use in higher education. Selection will be limited to persons well experienced in around technological applications or development and knowledgeable about the convergence of IT and the Internet; preferably they will be well informed around IT use in higher education. Private sector representatives may be selected from industry leaders, or alternatively they may be people identified by senior corporate management as key persons operating at the forefront of their field/discipline and with a working knowledge of higher education. Alternatively, recommendations of panelists, using similar job descriptions, will be sought from EDUCAUSE a non-profit association of universities, colleges and private business organisations in the USA supportive of IT and the Internet use in higher education. Alternatively, private sector panelists may be selected because they are the authors of books, papers, and articles in referred journals; online journals and are well informed and experienced in issues around the use of IT in higher education. These persons may include CIO's, Directors, Vice Presidents of IT within higher education institutions.

Specific Criteria

Positions from which Corporate Experts Will be Drawn

A President, Vice-President, or Assistant Vice-President of a company operating in the area of development or diffusion of IT and/or the Internet. Alternatively, an individual who is department head or senior staff member, a leader in the Research and Development division of such a company. Alternatively, a proprietor or a partner or a senior research associate in a consulting firm providing advice or service to corporations and/or educational institutions in the areas of ICT. Alternatively, a department head or senior staff member engage in R & D in a private corporation or institution involved in the development of Internet2, CANARIE, WWW, Next Generation Initiative or telecommunications. Alternatively a senior staff member from a member organization of the World Wide Web Consortium (W3C)which is working on the next generation of the Web's infrastructure.

Desirable professional qualities

Panelists from any one of the three sectors may have a high profile on the Web, may have multifaceted skills in all areas; this is a desirable qualification, but is not considered as an essential requirement. From professional writing, a panel candidate may appear as an individual who has a vision beyond local and temporary concerns and a sense of objectivity or rationality, one who is able to think conceptually. A conceptual thinker may provide "outside-the-box" ideas or forecasting which can challenge current assumptions and encourage creative thinking, an individual who can think and work consensually and at the same time is unafraid to stand alone in dissent.

Explicit criteria for the three subgroups

Scholars and Professors

The panel will be selected from universities known to be leaders in ICT. Faculty members from such universities and higher education institutions worldwide, but with an emphasis on Canada and the USA. Panelists may be identified because they have been published in reviewed books, refereed journals, or in online journals, on issues concerning IT and the Internet. These scholars may have had papers published online, or have given keynote speeches at academic conferences about IT and the Internet and higher education.

These panel members will have been, or will be engaged in, teaching at universities and will have achieved the academic rank of professor or associate professor. They will be identified as having carried out research or contributed to publications in their field/discipline of expertise around IT and/or Internet use. Scholars and professors may be selected because they attained leadership or a distinguished academic reputation, in a relevant field, either in their university or in a professional association. They will be accessible and be willing to engage in this web-based intellectual exchange. All have agreed in writing to commit time and have a willingness to participate thoroughly and comprehensively. Selected panelists will have at least 5 years experience in their professional areas.

Educational Administrators

These include individuals who have achieved senior positions or leadership roles in the administration of colleges, polytechnics or universities. These institutions will have the reputation as leaders in ICT. They include well-experienced presidents, past-presidents, vice-presidents, vice-chancellors, provosts or deans. They maybe designated by such leaders as begin the person in their institution best able to respond to the research questions. Administrators are drawn from the RAND Corporation and other various institutions, corporations or associations of higher education in Canada and the USA. Alternatively, administrators may be officials in senior governmental positions concerned with the organisation and/or financing of higher educational institutions. Alternatively, administrators may have attained leadership or a distinguished academic reputation in their university or professional associations. They may be involved in administrative leadership positions (project director or assistant director) in Internet2, CANARIE, Next Generation Initiative, World Wide Web Consortium or similar projects. All would be accessible and willing to engage in an intellectual exchange via the web. They gave written consent to participate in the study; participated thoroughly and comprehensively. All have at least 5 years experience in their professional area.

IT/Internet professionals

These will be senior personnel from private sector corporations or higher education institutions working in the area of IT and the Internet who are engaged in the innovation, development, administration or diffusion of technology related to IT and the Internet. This category may include people working in advanced Internet applications, content and network services available for use in higher education. Selection will be limited to persons well experienced in around technological applications or development and knowledgeable about the convergence of IT and the Internet; they will be well informed around IT use in higher education. Private sector representatives may be selected from industry leaders, or alternatively they may be people identified by senior corporate management as key persons operating at the forefront of their field/discipline and with a working knowledge of higher education. Alternatively, panelists were listed as EDUCAUSE's prime contact. Some private sector panelists were selected because they are the authors of books, papers, and articles in referred journals; online journals and are well informed and experienced in issues around the use of IT in higher education.

Specific Criteria

Positions IT professional experts are drawn

A President, Vice-President, or Assistant Vice-President of a company operating in the area of development or diffusion of IT and/or the Internet where that company does work in the area of higher education. Alternatively, they may be a department head or senior staff member who is a leader in the Research and Development division of such a company. Alternatively, they may be a proprietor or a partner or a senior research associate in a consulting firm providing advice or service to corporations and/or higher educational institutions in the areas of IT. They may be the Vice President, CIO or head of Information technology division/branch/department in a higher education institution.

Alternatively, they may be a department head or senior staff member engage in R & D in a private corporation or institution involved in the development of Internet2, CANARIE, WWW, Next Generation Initiative or a senior staff member from a member organization of the World Wide Web Consortium (W3C) working on the next generation of the Web's infrastructure.

Desirable professional qualities

Panelists from any one of the three sectors may have a high profile on the Web, may have multifaceted skills in all areas; this is a desirable qualification, but is not considered as an essential requirement. From professional writing, a panel candidate may appear as an individual who has a vision beyond local concerns and a sense of objectivity or rationality, one who is able to think conceptually. A conceptual thinker may provide "outside-the-box" ideas in forecasting which can challenge current assumptions and encourage creative thinking, they may be individuals who can think and work consensually and at the same time be unafraid to stand alone in dissent.

Examination of Credentials

It will not be possible to obtain detailed personal and professional qualifications of all panelists prior to issuing an invitation. However, any public information readily available about reputation and qualification will be gathered and will be the basis on which selection is made. If in response to the open-ended questionnaire a panelist does not appear to meet minimum criteria, their responses will be excluded from the study.

Appendix G

Panel Demographics

Designates for Panel at Round 1

35 percent	Designates of President, CEO or Director (23)
65 percent	Invited panelists who responded directly (44)

Gender at Round 1

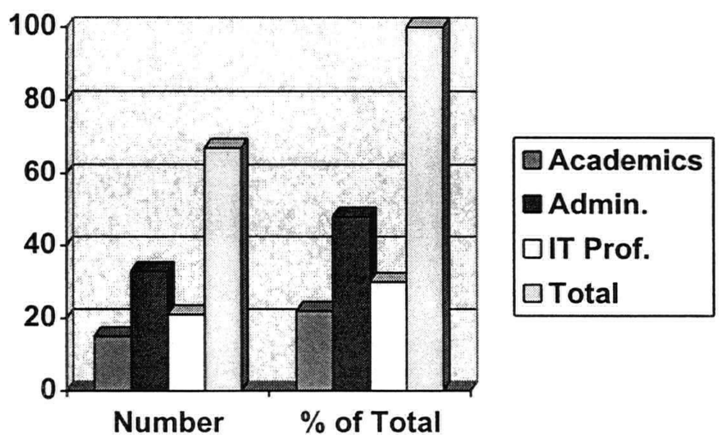
33 percent Female

67 percent Male

Panelists' countries of employment at Round 1

49 percent	Canada (34) - [26 percent - British Columbia (18)]
36 percent	U.S.A. (25)
15 percent	Other countries: United Kingdom, Australia, Colombia, Finland, the Netherlands, Norway, New Zealand, and Sweden

Subgroups at Round 1



Academics	(15)	22 percent
Administrators	(33)	48 percent
IT professionals	(21)	30 percent

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Panel Demographics

Institutions and IT organizations for Round 1 (see names below)

51 percent	Universities (35)
9 percent	British Columbia University Colleges (6)
4 percent	Polytechnics in British Columbia, Canada (3)
64 percent	Universities
12 percent	Government (Federal or Provincial/State) (8)
10 percent	National Higher Educational Associations (7)
6 percent	International higher education organizations/associations (4)
9 percent	IT organizations (6) [2] of these on Internet2 committee, and [1] from CANARIE (Canadian Network for the Advancement of Research, Industry and Education)

Titles of participants from Round 1

9 percent	5 Chancellors
4 percent	2 Chairman/Founders
11 percent	6 Presidents
18 percent	10 Vice President
5 percent	3 Associate Vice Presidents
7 percent	4 Executive Directors
25 percent	14 Directors
4 percent	2 Dean/Directors
5 percent	3 Managers
11 percent	6 Professors
2 percent	1 Chief Information Officer

56 total and remaining 13 are designates

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Panel Demographics

Governments:

Government of Canada
Provincial Government of British Columbia
Provincial Government of Manitoba
Provincial Government of Nova Scotia
Provincial Government of Saskatchewan

Universities and colleges:

Athabasca University
B.C.I.T.
Camosum College
Charles Sturt University, Australia
Columbia University, New York
Cornell University
Douglas College
Edith Cowan University, Australia
Kwantlen College
Langara College, B.C.
Malaspina University-College, Nanaimo, B.C.
Mid Sweden University
MIT
Mt. Saint Vincent University
Okanagan University/College
Ontario Institute for Studies in Education
Open UK
Pennsylvania State University
Royal Roads University
Simon Fraser University
Stanford University
Syracuse University, New York
TECHBC, B.C.
The University of British Columbia
Universidad del los Andes
University of Alberta
University of Cape Breton
University of Highlands, Scotland
University of Maryland
University System of Maryland (Maryland, USA) (USM)
University of New Brunswick
University of North British Columbia
University of North Carolina

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Panel Demographics

University of Northern Iowa
University of Oslo
University of Prince Edward Island
University of Twente, Netherlands
University of Wisconsin

Higher Education Associations/Non-Profit Organizations

American Association for Higher Education
American Association for the Advancement of Science (AAAS)
Association for American Universities
Association for Educational Communications and Technology Education in Canada
Association of Governing Boards of Universities and Colleges (AGB)
The Centre for Curriculum, Transfer and Technology, (B. C., Canada) (C2T2)
Canadian School Boards Association (CSBA)
Commonwealth of Learning (COL)
Corporation for Research and Educational Networking (CREN)
Council of Ministers of Education, Canada (CMEC)
EDUCAUSE
National Association of Independent Colleges and Universities
Office of Learning Technologies (OLT)
The TeleLearning Network of Centres of Excellence

Some highlights of the above associations

AGB is the only national organization [US] providing university and college presidents, board chairs and individual trustees of both public and private institutions with the resources they need to enhance their effectiveness among them identify issues that affect tomorrow's decision making.

(AAAS) American Association for the Advancement of Science worldwide membership stands at more than 138,000 scientists, engineers, science educators, policy makers and others dedicated to scientific and technological progress in service to society. The Association built pioneering programs for bringing underrepresented groups into science;

applying science to human rights; supporting the growth of science in the developing world; exploring issues of science, ethics, and law; tracking federal spending for R&D; and in bringing scientists and engineers to work in Congress and executive agencies of government.

AAC&U (US) The Association of American Colleges and Universities is the leading national association devoted to advancing and strengthening undergraduate liberal education and forges links among presidents, academic administrators, faculty members and national leaders committed to educational excellence.

(AAHE) American Association for Higher Education (US) envisions a higher education enterprise that helps all Americans achieve the deep, lifelong learning they need to grow as individuals, participate in the democratic process, and succeed in a global economy. Membership are 9,600+ faculty, administrators, and students from all sectors, disciplines, and positions, plus policymakers and leaders from foundations, government, accrediting agencies, the media, and business, addressing collectively the challenges higher education faces.

(CANARIE, Inc.) Canada's Advanced Internet Development Organization, non-profit corporation, directs the technical design of the optical network and has been catalyst in the development of next-generation communications research networks in Canada. Also intends to act as a catalyst and partner with governments, industry and the research community to increase overall IT awareness, ensure continuing promotion of Canadian technological excellence.

(CSBA) The Canadian School Boards Association (Canada) is composed of ten provincial school board associations representing almost 500 school boards serving three out of five (over three million) of Canada's elementary and secondary school students. Mandate includes promoting educational excellence, maintaining a national profile for school boards, providing leadership in issues with national implications, and fostering the maintenance of the principles of local autonomy in education. A Framework for Copyright Reform and the Consultation Paper on Digital Copyright Issues: This response represents the views of the Canada School Boards Association (CSBA) on A Framework for Copyright Reform and the Consultation Paper on Digital Copyright Issues, released by Industry Canada and Canadian Heritage in June 2001. CSBA is the national voice of school boards.

CMEC is the national voice for education in Canada. It is the mechanism through which ministers consult and act on matters of mutual interest, and the instrument through which they consult and cooperate with national education organizations and the federal government.

CREN is a non-profit, member organization of over 220 universities, colleges, and research organizations governed by a 12-member Board of Trustees with mission to support higher education and research organizations with strategic IT knowledge services and communication tools.

C2T2 is a non-profit, independent society that provides value-added products and services to British Columbia's public post-secondary system and other clients. C2T2 receives most of its funds from the Ministry of Advanced Education (AVED) but also receives funds from the federal government and other provincial ministries and agencies and promotes excellence in post-secondary education and training by supporting educators so learners will have access to high quality, relevant learning opportunities.

dot.edu (Wisconsin, US) dot.edu provides hosting services for online course development using an array of courseware products including, but not limited to, Prometheus and Blackboard. And provides a robust, up-to-date e-learning system infrastructure including technology, training, support, and instructional design services to effectively apply these resources to enhance education. dot.edu works with all University of Wisconsin System higher education institutions, public and private higher education institutions, and public and private schools, school districts, and educational agencies in Wisconsin and beyond.

EDUCAUSE (international) is a nonprofit association whose mission is to advance higher education by promoting the intelligent use of information technology and provides indispensable support and professional development opportunities for those involved with planning for, managing, and using information technologies in colleges and universities. Members of this professional community exchange ideas, share information, and learn from experts among their colleagues in this rapidly changing field. Advocating on higher education policy issues. Seek to influence policy makers and leaders in the corporate and government sectors who have a stake in the transformation of higher education through information technologies. The association provides leadership and a representative voice on key policy issues affecting member campuses, especially in the area of telecommunications and networking. Enables the transfer of leading-edge approaches to information technology management and use that are developed and shared through our policy and strategy initiatives.

COL (Commonwealth of Learning) is an intergovernmental organisation created by Commonwealth Heads of Government to encourage the development and sharing of open learning and distance education knowledge, resources and technologies and is committed to assisting Commonwealth member governments to take full advantage of open, distance and technology-mediated learning strategies to provide increased and equitable access to education and training for all their citizens.

Eduprise, a Collegis Eduprise company, is a leader in designing, developing, and deploying private-labeled, enterprise e-Learning solutions for education providers and provides the industry's broadest range of strategic planning, infrastructure support, instructional development, and Web integration services to colleges and universities.

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Panel Demographics

Finland Futures Research Centre is an organization for futures research, education and development, which has operations on local, national and international level. Extended networks of co-operation guarantee the Centre access to the latest ideas, visions and methods to deal with and evaluate perceptions of the future. The Centre is actively involved in larger EU projects and keeps up a creative role within institutions such as the World Futures Studies Federation, the Club of Rome and its Finnish association, the Finnish Society for Futures Studies, as well as several futures studies institutes in the Nordic countries.

"National associations are usually, but not exclusively, non-profit membership organizations that represent their constituents' interests before government; supply assistance and services to their members; and may set policy and regulate standards within their areas of interest and jurisdiction. While associations are non-governmental organizations (NGOs), they nevertheless exercise considerable influence in national policymaking, are regularly consulted by government in their areas of expertise and concern, and in some cases (as with accreditation) may exercise delegated power and authority" http://www.ed.gov/NLE/USNEI/us/natassoc.html.

Role of the U.S. Federal Government –

"Education is primarily a State and local responsibility in the United States. Education is primarily a State and local responsibility in the United States. The only direct control exercised by the federal government over educational providers is in the limited case of

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Panel Demographics

education and training services operated by federal agencies, such as the armed services academies, other government training institutions, and public schools operated at U.S. overseas facilities to provide primary and secondary education to the children of personnel stationed there (see http://www.ed.gov/NLE/USNEI/us/fedrole.html.

(NAICU) The National Association of Independent Colleges and Universities serves as the unified national voice [US] of independent higher education represents private colleges and universities on policy issues with the federal government, such as those affecting student aid, taxation, and government regulation.

(OLT) Human Resources Development Canada established Office of Learning Technologies to contribute to the development of a lifelong learning culture in Canada with the mission of working with partners to expand innovative learning opportunities through technologies. Their activities include to help develop policies and strategies to guide the evolution and application of learning technologies; support and monitor research and assessment; facilitate sharing of information on Canadian initiatives.

TeleLearning (Canada) The TeleLearning Network of Centres of Excellence (TeleLearningNCE) is actively fulfilling its mission to research, develop, and demonstrate effective knowledge building pedagogies, implemented through telelearning; to support the development of a knowledge economy and learning society in Canada; and to transfer the resulting knowledge into Canadian organizations, institutions of learning and Canadian companies for world-wide exploitation. Over 60 faculty from 28 Canadian universities are evaluating the effectiveness of new learning models, analyzing the cost-benefits and social impact of implementing telelearning, and creating new educational technologies.

USM - The University System of Maryland's 13 institutions fulfill this need by delivering the best in educational programs and services to Marylanders. The University of Maryland System will: achieve and sustain national eminence and become a model for American higher education and a source of pride for all Marylanders. In its 1999 session, the General Assembly of Maryland directed the Regents of the University System of Maryland (USM) to develop a new strategic plan for the University System, one that is consistent with the State plan for higher education and that incorporates the principles and priorities for higher education articulated in State law. What the University System of Maryland can and ought to be in the year 2010, identifies challenges the USM faces in realizing the plan, and articulates specific, measurable strategies USM institutions must undertake in order to succeed?

Corporations

Apple Computer
Blackboard
CANARIE
Cisco Systems Inc.
Euprise
Finland Futures Research Centre
IBM
Microsoft Research Ltd., UK
RAND Graduate School

Appendix H 8

Round 1 Completion Email Thank You

Thank you for your contributions to UBC Delphi Round One Questionnaire. This was the qualitative phase of the Delphi process. Panelists' responses have exceeded my expectations in both quality and perceptivity.

Panelists' factors will form the basis for Rounds 2 and 3 quantitative Questionnaires. You will be kept up-to-date with the progress of this Delphi research. Do not hesitate to ask if you may have any question.

Appendix I 4

Round 2 Email Follow up to Non-respondents (2)

[sent via email]

Dear [ ],

The deadline has been extended until midnight February 7th. The Comments have added a rich qualitative aspect. The participation rate has exceeded my expectations. If you disagree the your subgroup designation, please let me know. Hope this extra time allows your participation.

Best regards,

Kathryn

Appendix J 1

Excerpts from Emails - Reasons for Non- Participation

Some excerpts from invited respondents:

- I am really too overbooked to participate
- I would have liked to participate, but a variety of commitments makes it impossible. Sorry.
- My group has been working on several papers which has actually had me working day and night.
- This sounds like a great study, but I'm just too overwhelmed with work to participate
- I am very sorry but I simply cannot commit the time to participate.
- Unfortunately my schedule is such that I will not be able to participate.
- I just got back from a couple of weeks in Australia, and am starting up a company (in addition to my job at the university, so I will not have time to participate
- I am just too busy this term.
- Unfortunately I am too busy at the moment to be able to commit to take part.
- Due to an extremely busy schedule, I must decline your kind invitation.
- I don't think I'm going to have the time.
- I regret that I cannot participate....I am in the process of moving to another university and cannot add any new commitments at this time.
- I regret that I do not have sufficient time to participate.
- Due to numerous travel/keynote commitments unable to participate
- I would have liked to participate, but a variety of commitments makes it impossible.
- I'm just too overwhelmed with work to participate
- Due to an extremely busy schedule must decline your kind invitation
- I don't think I'm going to have the time.
- I get a significant number of such requests and I'm afraid my schedule does not allow me the time to participate.
- I have been out of town a good part of the summer....I will be going abroad...I regret that I will not be able to take part.
- I deeply regret this but my time is (a) at a premium and (b) what I get paid for....Sounds like your study will take a lot of time, certainly if I want to do it right. And my pride of workmanship will not allow me to do less, so regretfully, I will not be able to participate...
- I'm just too busy to participate...I'm going nuts trying to balance the demands of the Deanship, Chair and my research groups and simply have to say no to most other requests.
- I'm heavily over committed already, and I need to keep time clear to finish a book
- You have created a very high barrier (registration, disclaimer, profile, etc.) and offered me no value in return. My time is already fully booked and I can accept new projects only when they offer important value to me....I have already put many of my views into the public domain.
- Personal letters and emails see (Appendix J 2 to J 5) include letter from John Wetmore (IBM), Bill Joy (Sun Microsystems), Lou Gerstner (IBM), Nicholas Negroponte (MIT)

9 Faxes received - "Sorry, I cannot participate"

Appendix K

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Notes. Titles and addresses were as of August 2000.
Three participants wish not to be named: 1 - Designate of Director, 1 - University President, and 1- Manager of IT

Appendix L - Pilot Testers

Round 1 Pilot Testers

- Mary Selman, formerly ESL for adults specialist
- Gordon Selman, Professor Emeritus, University of British Columbia, Faculty of Education (Adult Education)
- Mark Bullen, Associate Director, Distance Education & Technology, Continuing Studies, University of British Columbia

Round 2 Pilot Testers

- Tom Sork, Professor, Educational Studies, University of British Columbia
- Mark Bullen, Associate Director, Distance Education & Technology, Continuing Studies, University of British Columbia
- Amanda Hunt, English Professor, Douglas College
- Graduate students at the University of British Columbia:
    - Cynthia Andruske
    - Janet Atkinson-Grosjean

Volunteer Panel members:

- Dean Sutphin, Dean, Associate Dean and Director of Academic Programs, Cornell University (Administrators' subgroup)
- Randy Bruce, Senior Advisor, Centre for Curriculum, Transfer & Technology (C2T2) (IT Professionals' subgroup).
- Dennis Macknak, Director, Regional Operations and University/College Relations, University of Northern British Columbia (Administrators' subgroup)

The Round 3 Pilot Testers

- Applied Research and Evaluation Services, Faculty of Education at the University of British Columbia.

Appendix N

Web-designer Agreement

My name is Alexei White, and I am responsible for the development of the software and database for Kathryn Kennedy's online project named "The Major Influences of Information Technology and the Internet on Higher Education Institutions in the years 2005 - 2015: An Exploratory Delphi Study."

One of the foundations of this study is the anonymity of participants and their responses. While developing this system, I am making certain (within reasonable bounds) that there is no way, either accidental or covertly, that someone, either participant or system administrator (including myself), could connect individual responses or accounts, to names, email addresses, or other personal information. No personal information is stored anywhere in the database, or anywhere within the context of the web site. Personal information is also not transmitted to anyone other than Kathryn Kennedy.

January 17, 2001

Alexei White

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Appendix Q 3

Round 2 Follow-up Email on Time Extension

[sent via email]

Dear [ ],

The deadline has been extended until midnight February 7th. The Comments have added a rich qualitative aspect. The participation rate has exceeded my expectations. If you disagree the your subgroup designation, please let me know. Hope this extra time allows your participation.

Best regards,

Kathryn

Appendix R

Respondents' Final Comments at end of Delphi Round 3

- In the capitalism of the network society the core aspect is the relation between learning, ICT and economy. The use of ICT making a clear impact on productivity, competition and profit both within the higher ed market and in the corporations will make the domination morphology, whatever conscious policies are created and attempted implemented. (Acad)

- The problem with answering lies within the fact that many claims are true (probable), if we think of the Western (OECD) world, but are untrue, or improbable, if we have a wider look and consider also the situation from the point of view of the developing countries. And those countries have the huge majority of people living on this globe. (Acad)

- The lack of hi-speed data communications will put Canada at a major disadvantage.

- Developing countries will install wireless but the major telecommunications providers in Canada have no incentive to introduce high-speed networks beyond wireless or fiber services. This role may then fall to government but the established carriers will resist. (IT)

- Internet education will, in my view, lead to education being delivered in very small packages aimed at meeting just in time mid-career learner needs with a mechanism for aggregating learning to qualify for a larger certification. The development of pedagogies and tools to facilitate this approach will be a key turning point in the use of Internet education. (Adm)

- Never underestimate the power of humanity to abuse and waste the potential of technology.

- One concern I have is that institutions think carefully about the importance of providing instructional design support for faculty who are wanting to go online. Many faculty have not had the benefit of discussing how to best teach in their disciplines. It is through conversations with distance education/online instructional designers that faculty self-identify this "missing link" in their professional preparation and experience. (Adm)

- When the notion of learnware becomes more ubiquitous and investors see a real opportunity, the world of education will be fundamentally transformed. The take up on on-line learning is still too modest. But, it will take off as the new more technologically literate kids hit the market and begin to require the services. (Adm)

Appendix S 2

Notice of Round 3 Questionnaire dated April 1, 2001

[sent via email]

Within a week or two, the third and final stage of data collection for our research into expert opinion about some major influences of IT and the Internet on higher education institutions in 2005 – 2015 will be ready. We do hope that you will continue to assist us in our investigation around expert viewpoints provided by Academics, Educational Administrators and IT/Internet professionals. The web-based Round 3 instrument will contain two windows; it will use a split-screen display (1) Round 3 Questionnaire and (2) Controlled feedback from the Round 2 Questionnaire.

Over 80% of the panelists who contributed to Round 1 also rated Round 2. As well, panelists contributed many useful and thoughtful comments. These will be used in two ways: (1) Where a panelist's commentary questions the structure, or terminology of a factor statement, the Round 3 Questionnaire will be modified to improve clarity. (2) All other relevant comments will be included as part of our controlled feedback.

You will be given the new URL for the online survey shortly. Your password will be the same as that used in Rounds 1 and 2. Please let me know if you need a reminder of your password.

Round 3 Questionnaire

The *top* of the split-screen will show the original or modified *Round 3* statements and you will be asked to rate these after considering the controlled feedback we provide. You may choose to refer to the feedback on all questions, or selectively. If, your responses (probability, importance and timing) lie outside the emerging consensus shown for Round 2, we will ask that you provide a rationale for your ratings in the 'Comment' box provided. The views of 'outliers' will be important in the discussion section of this research.

Controlled Feedback

The *bottom* half of the split-screen will have two sections: (1) a statistical analysis of the Round 2 Questionnaire and (2) commentary provided by panelists. You can scroll down to review this additional data for any question.

A 'click on' the *"Stats button'* will offer graphs, showing panel ratings, (displayed as percentages) within each subgroup. The horizontal histograms demonstrating these data will be colour-coded by subgroup: Academicians = green; Educational administrators = red; and IT Professionals = yellow. A 'n' Column will show the number of responses

Appendix T 1

Round 3 Announcement sent via email broadcast

Round 3 Questionnaire Notice

This is the third and final stage of data collection for our research into some major influences of IT and the Internet on higher education institutions in 2005 – 2015.

We hope that you will continue to assist us in investigating the areas of convergence or non-convergence among expert viewpoints of academics, educational administrators and IT/Internet professionals involved in higher education. We will look forward to sharing the results with you. The web-based Round 3 instrument contains two windows: a *split-screen* display with the Round 3 Questionnaire and the Controlled feedback from Round 2 Questionnaire. The online survey is at http://www.ubcdelphi.net/ubcedr3.cfm. Your password will be the same one used in Rounds 1 and 2. Please let me know if you need a reminder of your password.

Round 3 Questionnaire

The *top* of the split-screen shows the modified Round 3 factor statements that you are now being asked to rate. Please rate your responses after considering the controlled feedback we provide. Estimated time for completion is 90 minutes; however additional time will be a variable, whether you refer to the feedback either on all questions, or selectively. If, on reflection, your responses (probability, importance and timing) may lie outside the emerging consensus based on Round 2's factor statement, please provide a rationale for your ratings in the 'Comment' box provided. The views of outliers will be important in the discussion section of this research.

Over 80% of the panelists who contributed to Round 1 also rated the Round 2 factor statements. We received many useful and thoughtful comments that have been used in two ways: (1) Wherever panelists' commentary questioned the structure, or terminology of a factor statement, the Round 3 Questionnaire was modified to improve clarity. (2) All other relevant comments are included on the web-based instrument as part of the controlled feedback.

Controlled Feedback

The *bottom* half of the split-screen has two sections which include a statistical analysis of the Round 2 Questionnaire responses and commentary from some panelists. Scroll down to review the additional data for each question.

Click on "*Stats*" gives the graphs, showing panel ratings, displayed as percentages within each subgroup. Horizontal histograms are colour-coded by subgroup: Academicians = *green*; Educational administrators = *red*; and IT Professionals = *yellow*, respectively. The 'n' Column shows the number of responses, respectively, received for each item (probability, importance, timing). The Means are shown using colour-coded bars in the 'M' Column. The statistical analysis may, at first, appear somewhat complex, but after one or two questions, we believe you will find it familiar and interesting.

Click on *"Comments"* provides some relevant commentary from each subgroup on the factor statements. Some comments have been edited for syntax, abbreviations, et al., but will provide you with an insight into the rationale or qualifiers behind other panelists' ratings. Comments made, but not integrated into Round 3 will be included in the appendix of the dissertation.

Appendix U - Theme Categories

Institutional Issues

Government

55. Federal/Provincial/State governments will change funding arrangements to allow public/private partnerships to adopt and develop international missions.

71.* Governments' funding policies and strategies will favour internationalisation and globalisation; so politicians will allocate funds to those institutions with the best economic models.

73.** Governments will 'get out of the way' in response to market pressures to deregulate higher education.

Organization and infrastructure

18. Online education will challenge the maintenance of conventional class scheduling (semester, quarters, etc.).

27.** Residential colleges and/or universities will no longer be an important component of the higher education landscape.

59. Mobile and wireless technologies will affect the design and structure of learning spaces both on- and off-campuses.

62. Universities' faculty members will be unreceptive to fundamental, dramatic and rapid change; and so their administration will NOT be nimble in a fast-paced educational market. [modified]

63.* Most post-secondary institutions will restructure to take advantage of new technologies; the rest will decline in scope and reach.

67. Quick, easy, seamless Enterprise Resource Planning (ERP) computing systems (an administrative portal) will facilitate a "virtual campus" experience, dovetailing with existing enrollment, records, financial and other systems.

70. New methods of connectivity and access will alter the way in which polytechnics, colleges and universities are operated. [modified]

Appendix U - Theme Categories

Institutional Issues (cont.)

Funding and Efficiency

38.** Online higher education will become elitist, because of the costs to individuals of hardware, software, and access.

58. The financial burden of continuing innovations in hardware, software and networks will challenge higher education institutions' funding.

61.* A two-tiered education system will evolve, one elite, high cost, offering face-to-face instruction and a collegial experience, the other will be a lower cost system via the Internet.

64.* Some universities and colleges will flourish online; many post-secondary institutions will view the cost of IT and a de-emphasis of traditional values as too high. [modified]

68. Higher education institutions will have available data banks of student information to both decide on admissions and how to best serve students. [modified]

72. More business-like behaviour will be required of the academy in the administration and marketing of technology-based services.

81. Higher education institutes offering high quality online courses globally will achieve attractive economies of scale with lower marginal costs per learner. [modified]

Competitive Market conditions

9.** Higher education provided online by large global institutions, consortia, and/or corporations will threaten sound pedagogical values. [modified]

12. Universities and colleges will be obliged to respond to industry's (commerce) demand for training at the workplace and "just-in-time" online employee training.

19. On-campus, full-time undergraduate degree programs will thrive despite the availability of other options that will be principally online.

34. Major textbook publishers and online learning software developers will build strong corporate partnerships for the marketing of virtual "textbooks" integrated with instructor-customized course material.

Institutional Issues (cont.)

45. Market analysis of online higher education and training programs will be essential where public and for-profit organizations compete aggressively.

46.** Online education will be dominated by the 'for-profit' sector of higher education at the expense of brick and mortar campuses.

49. Large universities and corporate competitors with high brand recognition or demonstrated "value-added" services and assessment models will dominate large sectors of the online educational market.

50.* Public and private institutions will retain a competitive advantage over commercial (for-profit) providers in offering high quality, pedagogically sound online programming. [modified]

74. Corporate certification will compete favorably with university degrees in many job applications. [modified]

77. Many colleges, universities and polytechnics will face serious competition in their home territories from 'outside' institutions offering online education. [modified]

Globalisation/internationalism

10.* Higher education provided online by large global institutions, consortia, and/or corporations will undermine the stability of many traditional higher education institutions. [modified]

47.* Well-financed university consortia, operating globally, will seriously challenge individual institutions.

48.* Eventually those institutions that hold back from competing internationally in online education will be forced to respond, high overheads notwithstanding.

51. Facing competition for their core business, enterprising higher education institutions will organize and market their specialty programs worldwide via the Internet using linkages with other institutions and organizations.

54. The educational market will be global; educators will be more inclined to think of competing beyond provincial/state or regional markets. [modified]

60. Trans-national agreements on software and telecommunication standards will emerge.

65. Some institutions will overreach to serve large international markets, and then will not have the resources to service students well. [modified]

85. Online higher education will challenge the mandate of colleges and universities about how far geographically their mission extends. [modified]

Faculty and Staff Issues

Job Security and Rewards

23. IT skills needed to design and produce electronic-based learning (elearning) will be highly valued and well rewarded within higher education institutions.

24. A global shortage of qualified IT personnel will call for extended training in IT for both faculty and staff. [modified]

28. Improved rewards (financial, tenure, and other perks) will entice well-qualified academics to teach online. [modified]

37. Our vulnerability to control of IT and Internet technology by any group, will be mitigated by the Internet's ubiquity. [modified]

39.** Faculty at public institutions will experience job loss due to a shift to online education. [modified]

41.** Public institutions will lose important staff members when the mean salaries of faculty employed by "no name" online schools, grow to exceed the salaries and perks of "first tier" institutions. [modified]

69.* Universities and colleges in remote locations will retain high quality faculty because IT and the Internet will help professors overcome a sense of isolation.

Roles of faculty and staff

7. Internet-savvy professors will teach via the World Wide Web, but will rely on other professionals to re-design 'instructional' resources.

11. Course content will be web-based but students will expect individualized tutorial support, if needed.

Roles of faculty and staff (cont.)

20.* The changing clientele of higher education will break down the notion of a community of scholars who offer face-to-face education on-campus.

21. A 'virtual' community of scholars will thrive due to IT and the Internet where time and space barriers will be eliminated.

25. Many IT and Internet savvy virtual professors will divide their time and energy among a variety of universities, consortiums, corporations and companies. [modified]

26.* Internet-savvy professors will dominate instruction in most large universities.

29. IT and the Internet funding and training will be a priority within higher education institutions

30. The use of IT and the Internet will result in major professional and cultural change for faculty (with respect to roles, teaching methods, work processes, avenues for recognition, and research opportunities). [modified]

Intellectual Property

31.* New rules on professors' intellectual property will favor the institutions over intellectual property creators. [modified]

32. Electronic publishing, and business/payment models will make possible the routine delivery of content protected by copyright.

33. New intellectual property payment models, revised copyright rules and new legislation will encourage scholars to share intellectual property.

Appendix U - Theme Categories

Educational Issues

Wide spread use of the web

1. Many learners will expect courses and programs to be delivered on the web. [modified]

22. Learner participation in pioneering research and education programs will be facilitated through high-speed web connections.

35. The Canadian (and American) Associations of Research Libraries, Educause and others will design and develop Internet classification systems designed to verify the reliability of information found on the web. [modified]

44. As wireless and broadband networks merge, rich data banks will become an important extension of our brain.

56. IT and the Internet will be critical components of the post-secondary institution's strategies. [modified]

57. IT and Internet access and use will become universal and ubiquitous in higher education institutions.

66. The use of the web by colleges, universities and polytechnics will become essential to the educational experience. [modified]

80. In online higher education English will remain the dominant language. [modified]

Degrees-Certification-Accreditation

52. Acceptance by employers of private certification will force universities and colleges to compete online.

75. Certification and degree credentials will be established at national, trans-national or global levels despite resistance by faculty unions and university administrations.

76. Through IT the processes of assessment and accreditation will be carried out by a variety of international providers. [modified]

Appendix U - Theme Categories

Learner Focus

2. Online students (learning via the Internet) will have more choice and control over the timing, location and format of their learning agendas than will exist on-campus. [modified]

4. Online learners will demand pedagogically sound, technology-mediated courses compatible with their learning styles. [modified]

14. Most universities and colleges will change their overall approach to pedagogy to support a "new generation" of Internet-savvy learners who will demand more than a "stand-and-preach" lecturing format.

Online learning tools

8. Online teaching and learning will be based on constructivist principles using collaborative learning, problem-based learning, as well as innovative new models for learning and knowledge building.

13.* It will be easy to find good quality online courses on specialized topics that span national boundaries, like comparative law, rare languages, uncommon parts of history, and preservation of diverse cultures.

15.** Standardised course material will de-personalize education and lower standards.

16. Experiential virtual reality systems will compete with books (even electronic ones).

36.* A dependency on technology makes electronic learning (e-learning) susceptible to any person or group that gains control of the technology. [modified]

43. The use of computer-embedded artificial intelligence chips will change the computing and online learning environment significantly.

Student Access/equity

5. Online access to higher education learning resources will be implemented 24 hours/day, 7 days/week, 365 days/year.

42.* The costs of broadband telecommunication connections will NOT be passed on to students, in order to eliminate the digital divide between the "haves" and the "have nots."

Student Access/equity Issues (cont.)

78. Online higher education, offered globally, using advanced wireless technology will help cut across the cultural divide between rich and poor nations. [modified]

82. The availability of widespread wireless communication will give students in developing countries an increased access to higher education. [modified]

83. Convergence of data networks, portable phones, palmtop computers, e-texts, etc., will increase the accessibility of higher education. [modified]

Educational Values

17.* IT and the Internet will alter, at a deep rigorous level, what we consider good scholarship and good argumentation.

40.** Because of online education there will be a loss of interest in the humanities, arts, and social sciences.

53.* The distinctions between public and private higher education will blur when an IT environment in terms of courses offered becomes rich and ubiquitous. [modified]

79.* Online higher education will result in an assimilation of cultures. [modified]

84. Online education will challenge the philosophy of colleges and universities as to whom and how they serve. [modified]

Notes.

One Asterisk(*) = No Consensus achieved

Two Asterisks (**) = Consensus Not Probable

Appendix V - Index of Statements for Round 3
(in item number order)

1. Many learners will expect courses and programs to be delivered on the web. *

2. Online students (learning via the Internet) will have more choice and control over the timing, location and format of their learning agendas than will exist on-campus. *

3. The widespread availability of online learning will reduce the boundaries between undergraduate and graduate education.

4. Online learners will demand pedagogically sound, technology-mediated courses compatible with their learning styles. *

5. Online access to higher education learning resources will be implemented 24 hours/day, 7 days/week, 365 days/year.

6. Each field/discipline will establish its own specific standards for the appropriate use of IT and Internet resources. *

7. Internet-savvy professors will teach via the World Wide Web, but will rely on other professionals to re-design 'instructional' resources.

8. Online teaching and learning will be based on constructivist principles using collaborative learning, problem-based learning, as well as innovative new models for learning and knowledge building.

9. Higher education provided online by large global institutions, consortia, and/or corporations will threaten sound pedagogical values. *

10. Higher education provided online by large global institutions, consortia, and/or corporations will undermine the stability of many traditional higher education institutions. *

11. Course content will be web-based but students will expect individualized tutorial support, if needed.

12. Universities and colleges will be obliged to respond to industry's (commerce) demand for training at the workplace and "just-in-time" online employee training.

13. It will be easy to find good quality online courses on specialized topics that span national boundaries, like comparative law, rare languages, uncommon parts of history, and preservation of diverse cultures.

14. Most universities and colleges will change their overall approach to pedagogy to support a "new generation" of Internet-savvy learners who will demand more than a "stand-and-preach" lecturing format.

Appendix V - Index of Statements for Round 3
(in item number order)

15. Standardised course material will de-personalize education and lower standards.

16. Experiential virtual reality systems will compete with books (even electronic ones).

17. IT and the Internet will alter, at a deep rigorous level, what we consider good scholarship and good argumentation.

18. Online education will challenge the maintenance of conventional class scheduling (semester, quarters, etc.).

19. On-campus, full-time undergraduate degree programs will thrive despite the availability of other options that will be principally online.

20. The changing clientele of higher education will break down the notion of a community of scholars who offer face-to-face education on-campus.

21. A 'virtual' community of scholars will thrive due to IT and the Internet where time and space barriers will be eliminated.

22. Learner participation in pioneering research and education programs will be facilitated through high-speed web connections.

23. IT skills needed to design and produce electronic-based learning (elearning) will be highly valued and well rewarded within higher education institutions.

24. A global shortage of qualified IT personnel will call for extended training in IT for both faculty and staff. *

25. Many IT and Internet savvy virtual professors will divide their time and energy among a variety of universities, consortiums, corporations and companies. *

26. Internet-savvy professors will dominate instruction in most large universities.

27. Residential colleges and/or universities will no longer be an important component of the higher education landscape.

28. Improved rewards (financial, tenure, and other perks) will entice well-qualified academics to teach online. *

29. IT and the Internet funding and training will be a priority within higher education institutions. *

Appendix V - Index of Statements for Round 3
(in item number order)

30. The use of IT and the Internet will result in major professional and cultural change for faculty (with respect to roles, teaching methods, work processes, avenues for recognition, and research opportunities). *

31. New rules on professors' intellectual property will favor the institutions over intellectual property creators. *

32. Electronic publishing, and business/payment models will make possible the routine delivery of content protected by copyright.

33. New intellectual property payment models, revised copyright rules and new legislation will encourage scholars to share intellectual property.

34. Major textbook publishers and online learning software developers will build strong corporate partnerships for the marketing of virtual "textbooks" integrated with instructor-customized course material.

35. The Canadian (and American) Associations of Research Libraries, Educause and others will design and develop Internet classification systems designed to verify the reliability of information found on the web. *

36. A dependency on technology makes electronic learning (e-learning) susceptible to any person or group that gains control of the technology. *

37. Our vulnerability to control of IT and Internet technology by any group, will be mitigated by the Internet's ubiquity. *

38. Online higher education will become elitist, because of the costs to individuals of hardware, software, and access.

39. Faculty at public institutions will experience job loss due to a shift to online education. *

40. Because of online education there will be a loss of interest in the humanities, arts, and social sciences.

41. Public institutions will lose important staff members when the mean salaries of faculty employed by "no name" online schools, grow to exceed the salaries and perks of "first tier" institutions. *

42. The costs of broadband telecommunication connections will NOT be passed on to students, in order to eliminate the digital divide between the "haves" and the "have nots".

43. The use of computer-embedded artificial intelligence chips will change the computing and online learning environment significantly.

Appendix V - Index of Statements for Round 3
(in item number order)

44. As wireless and broadband networks merge, rich data banks will become an important extension of our brain.

45. Market analysis of online higher education and training programs will be essential where public and for-profit organizations compete aggressively.

46. Online education will be dominated by the 'for-profit' sector of higher education at the expense of brick and mortar campuses.

47. Well-financed university consortia, operating globally, will seriously challenge individual institutions.

48. Eventually those institutions that hold back from competing internationally in online education will be forced to respond, high overheads notwithstanding.

49. Large universities and corporate competitors with high brand recognition or demonstrated "value-added" services and assessment models will dominate large sectors of the online educational market.

50. Public and private institutions will retain a competitive advantage over commercial (for-profit) providers in offering high quality, pedagogically sound online programming. *

51. Facing competition for their core business, enterprising higher education institutions will organize and market their specialty programs worldwide via the Internet using linkages with other institutions and organizations.

52. Acceptance by employers of private certification will force universities and colleges to compete online.

53. The distinctions between public and private higher education will blur when an IT environment in terms of courses offered becomes rich and ubiquitous. *

54. The educational market will be global; educators will be more inclined to think of competing beyond provincial/state or regional markets. *

55. Federal/Provincial/State governments will change funding arrangements to allow public/private partnerships to adopt and develop international missions.

56. IT and the Internet will be critical components of the post-secondary institution's strategies. *

57. IT and Internet access and use will become universal and ubiquitous in higher education institutions.

Appendix V - Index of Statements for Round 3
(in item number order)

58. The financial burden of continuing innovations in hardware, software and networks will challenge higher education institutions' funding.

59. Mobile and wireless technologies will affect the design and structure of learning spaces both on- and off-campuses.

60. Trans-national agreements on software and telecommunication standards will emerge.

61. A two-tiered education system will evolve, one elite, high cost, offering face-to-face instruction and a collegial experience, the other will be a lower cost system via the Internet.

62. Universities' faculty members will be unreceptive to fundamental, dramatic and rapid change; and so their administration will NOT be nimble in a fast-paced educational market. *

63. Most post-secondary institutions will restructure to take advantage of new technologies; the rest will decline in scope and reach.

64. Some universities and colleges will flourish online; many post-secondary institutions will view the cost of IT and a de-emphasis of traditional values as too high. *

65. Some institutions will overreach to serve large international markets, and then will not have the resources to service students well. *

66. The use of the web by colleges, universities and polytechnics will become essential to the educational experience. *

67. Quick, easy, seamless Enterprise Resource Planning (ERP) computing systems (an administrative portal) will facilitate a "virtual campus" experience, dovetailing with existing enrollment, records, financial and other systems.

68. Higher education institutions will have available data banks of student information to both decide on admissions and how to best serve students. *

69. Universities and colleges in remote locations will retain high quality faculty because IT and the Internet will help professors overcome a sense of isolation.

70. New methods of connectivity and access will alter the way in which polytechnics, colleges and universities are operated. *

71. Governments' funding policies and strategies will favour internationalisation and globalisation; so politicians will allocate funds to those institutions with the best economic models.

Appendix V - Index of Statements for Round 3

(in item number order)

72. More business-like behaviour will be required of the academy in the administration and marketing of technology-based services.

73. Governments will 'get out of the way' in response to market pressures to deregulate higher education.

74. Corporate certification will compete favorably with university degrees in many job applications. *

75. Certification and degree credentials will be established at national, trans-national or global levels despite resistance by faculty unions and university administrations.

76. Through IT the processes of assessment and accreditation will be carried out by a variety of international providers. *

77. Many colleges, universities and polytechnics will face serious competition in their home territories from 'outside' institutions offering online education. *

78. Online higher education, offered globally, using advanced wireless technology will help cut across the cultural divide between rich and poor nations. *

79. Online higher education will result in an assimilation of cultures. *

80. In online higher education English will remain the dominant language. *

81. Higher education institutes offering high quality online courses globally will achieve attractive economies of scale with lower marginal costs per learner. *

82. The availability of widespread wireless communication will give students in developing countries an increased access to higher education. *

83. Convergence of data networks, portable phones, palmtop computers, e-texts, etc., will increase the accessibility of higher education. *

84. Online education will challenge the philosophy of colleges and universities as to whom and how they serve. *

85. Online higher education will challenge the mandate of colleges and universities about how far geographically their mission extends. *

Note.

* [modified] = Thirty-eight (38) statements were modified from Round 2.

Table 5.2 (a). Means of Themes Scores

INSTITUTIONAL ISSUES (TOTAL 35 ITEMS)

Table 5.1 (a) Government

(3 items) Q# 55, 71*, 73**

Subgroup	Ratings	Sum of Scores	N	Means
Academics	Probability	90	33	2.73
	Importance	91	29	3.14
	Timing	62	29	2.14
Administrators	Probability	152	64	2.38
	Importance	181	60	3.02
	Timing	93	47	1.98
IT Professionals	Probability	82	34	2.41
	Importance	96	33	2.91
	Timing	69	29	2.38
Entire Panel	Probability			2.47
	Importance			3.02
	Timing			2.13

Table 5.1 (b) Organization and infrastructure

(7 items) Q# 18, 27**, 59, 62, 63*, 67, 70

Subgroup	Ratings	Sum of Scores	N	Means
Academics	Probability	264	86	3.07
	Importance	237	73	3.25
	Timing	158	76	2.08
Administrators	Probability	481	162	2.97
	Importance	486	151	3.22
	Timing	259	140	1.85
IT Professionals	Probability	270	94	2.87
	Importance	295	93	3.17
	Timing	122	80	1.52
Entire Panel	Probability			2.97
	Importance			3.21
	Timing			1.82

(Table 5.1 continues)

Table 5.2 (a). Means of Themes Scores

Table 5.1 (c) Funding and Efficiency

(7 items) Q# 38**, 58, 61*, 64*, 68, 72, 81

Subgroup	Ratings	Sum of Scores	N	Means
Academics	Probability	242	83	2.92
	Importance	260	78	3.33
	Timing	139	72	1.93
Administrators	Probability	455	161	2.83
	Importance	475	151	3.15
	Timing	224	131	1.71
IT Professionals	Probability	241	88	2.74
	Importance	276	86	3.21
	Timing	121	71	1.70
Entire Panel	Probability			2.83
	Importance			3.21
	Timing			1.77

Table 5.1 (d) Competitive Market Conditions

(10 items) Q# 9**, 12, 19, 34, 45, 46**, 49, 50*, 74, 77

Subgroup	Ratings	Sum of Scores	N	Means
Academics	Probability	350	123	2.85
	Importance	333	114	2.92
	Timing	204	118	1.73
Administrators	Probability	640	232	2.76
	Importance	638	223	2.86
	Timing	344	202	1.70
IT Professionals	Probability	359	134	2.68
	Importance	369	131	2.82
	Timing	203	123	1.65
Entire Panel	Probability			2.76
	Importance			2.86
	Timing			1.70

(Table 5.1 continues)

Table 5.2 (a). Means of Themes Scores

Table 5.1(e) Globalisation/Internationalism

(8 items) Q#, 10*, 47*, 48*, 51, 54, 60, 65, 85

Subgroup	Ratings	Sums	N	Means
Academics	Probability	315	98	3.21
	Importance	286	89	3.21
	Timing	177	90	1.97
Administrators	Probability	545	180	3.03
	Importance	543	170	3.19
	Timing	316	159	1.99
IT professionals	Probability	230	103	3.04
	Importance	293	94	3.12
	Timing	183	90	2.03
Entire Panel	Probability			3.08
	Importance			3.18
	Timing			1.92

FACULTY AND STAFF ISSUES (TOTAL 18 ITEMS)

Table 5.1(f) Job security and rewards

(7 items) Q# 23, 24, 28, 37, 39**, 41**, 69*

Subgroup	Ratings	Sums	N	Means
Academics	Probability	224	79	2.84
	Importance	225	72	3.13
	Timing	111	63	1.76
Administrators	Probability	414	155	2.67
	Importance	420	140	3.00
	Timing	218	119	1.83
IT Professionals	Probability	227	94	2.41
	Importance	264	91	2.90
	Timing	135	70	1.93
Entire Panel	Probability			2.64
	Importance			3.00
	Timing			1.84

(Table 5.1 continues)

Table 5.2 (a). Means of Themes Scores

FACULTY AND STAFF ISSUES (CONT.)

Table 5.1 (g) Roles of faculty and staff

(8 items) Q# 7, 11, 20*, 21, 25, 26*, 29, 30

Subgroup	Ratings	Sums	N	Means
Academics	Probability	318	101	3.15
	Importance	299	93	3.22
	Timing	171	94	1.82
Administrators	Probability	572	185	3.09
	Importance	550	167	3.29
	Timing	218	166	1.31
IT Professionals	Probability	351	121	2.90
	Importance	343	115	2.98
	Timing	144	111	1.30
Entire Panel	Probability			3.05
	Importance			3.18
	Timing			1.44

Table 5.1 (h) Intellectual Property

(3 items) Q# 31*, 32, 33

Subgroup	Ratings	Sums	N	Means
Academics	Probability	99	33	3.00
	Importance	106	33	3.21
	Timing	54	31	1.74
Administrators	Probability	190	63	3.01
	Importance	190	58	3.28
	Timing	110	61	1.80
IT Professionals	Probability	113	37	3.05
	Importance	122	37	3.30
	Timing	60	36	1.67
Entire Panel	Probability			3.02
	Importance			3.27
	Timing			1.75

(Table 5. 1 continues)

Table 5.2 (a). Means of Themes Scores

EDUCATIONAL ISSUES

Table 5.1(i) Widespread Use of Web

(8 items) Q# 1, 22, 35, 44, 56, 57, 66, 80

Subgroup	Ratings	Sums	N	Means
Academics	Probability	350	99	3.54
	Importance	303	90	3.37
	Timing	287	92	3.12
Administrators	Probability	629	181	3.48
	Importance	598	174	3.44
	Timing	311	172	1.81
IT Professionals	Probability	365	107	3.41
	Importance	356	107	3.33
	Timing	171	101	1.69
Entire Panel	Probability			3.47
	Importance			3.39
	Timing			2.11

Table 5.1(j) Degrees-Certification-Accreditation

(3 items) Q# 52, 75, 76

Subgroup	Ratings	Sums	N	Means
Academics	Probability	111	34	3.26
	Importance	97	30	3.23
	Timing	62	30	2.07
Administrators	Probability	179	62	2.89
	Importance	178	60	2.97
	Timing	130	56	2.32
IT Professionals	Probability	96	36	2.67
	Importance	91	32	2.84
	Timing	72	31	2.32
Entire Panel	Probability			2.92
	Importance			3.00
	Timing			2.26

(Table 5.1 continues)

Table 5.2 (a). Means of Themes Scores

EDUCATIONAL ISSUES (CONT.)

Table 5.1(k) Learner focus

(3 items) Q# 2, 4, 14

Subgroup	Ratings	Sums	N	Means
Academics	Probability	134	39	3.44
	Importance	131	38	3.45
	Timing	65	38	1.71
Administrators	Probability	248	72	3.44
	Importance	246	69	3.56
	Timing	117	69	1.70
IT Professionals	Probability	142	47	3.02
	Importance	142	44	3.23
	Timing	69	43	1.60
Entire Panel	Probability			3.32
	Importance			3.44
	Timing			1.67

Table 5.1(l) Online learning tools

(6 items) Q# 8, 13*, 15**, 16*, 36*, 43

Subgroup	Ratings	Sums	N	Means
Academics	Probability	180	70	2.57
	Importance	182	60	3.03
	Timing	132	57	2.32
Administrators	Probability	322	123	2.62
	Importance	324	107	3.03
	Timing	178	86	2.07
IT Professionals	Probability	214	84	2.55
	Importance	231	82	2.82
	Timing	160	72	2.22
Entire Panel	Probability			2.58
	Importance			2.96
	Timing			2.20

(Table 5.1 continues)

Table 5.2 (a). Means of Themes Scores

EDUCATIONAL ISSUES (CONT.)

Table 5.1 (m) Student Access/equity

(5 items) Q# 5, 42*, 78, 82, 83

Subgroup	Ratings	Sums	N	Means
Academics	Probability	174	57	3.05
	Importance	181	56	3.23
	Timing	102	54	1.89
Administrators	Probability	360	116	3.10
	Importance	370	112	3.30
	Timing	213	105	2.03
IT Professionals	Probability	193	64	3.02
	Importance	212	65	3.26
	Timing	121	61	1.98
Entire Panel	Probability			3.07
	Importance			3.27
	Timing			1.98

Table 5.1 (n) Educational Values

(5 items) Q# 17*, 40**, 53*, 79*, 84

Subgroup	Ratings	Sums	N	Means
Academics	Probability	140	58	2.41
	Importance	151	48	3.15
	Timing	85	37	2.30
Administrators	Probability	282	115	2.45
	Importance	319	108	2.95
	Timing	181	82	2.21
IT Professionals	Probability	159	66	2.41
	Importance	192	62	3.10
	Timing	109	48	2.27
Entire Panel	Probability			2.43
	Importance			3.04
	Timing			2.25

(Table 5.1 continues)

Table 5.2 (a). Means of Themes Scores

Notes.

* Asterisk after item = No Consensus
** Asterisks after item = Consensus Not Probable

Table 5.1 (o) – Round 3 Scale for Rating Scores

	Highly Probable	Highly Probable	Timing
	4	4	4
	3	3	3
Balance Point 2.5			
	2	2	2
	1	1	1
	Highly Improbable	Not at all important	Timing

Table 5.3 Probability Medians and Means

SUBGROUP		Q1PROB	Q2PROB	Q3PROB	Q4PROB	Q5PROB	Q6PROB	Q7PROB	Q8PROB	Q9PROB	Q10PROB
1	Mean	3.85	3.62	2.89	3.38	3.92	2.85	3.23	2.85	2.18	2.83
	Median	4.00	4.00	3.00	3.00	4.00	3.00	3.00	3.00	2.00	3.00
	N	13	13	9	13	12	13	13	13	11	12
2	Mean	3.25	3.46	2.68	3.37	3.64	2.63	3.25	3.14	1.95	2.29
	Median	3.00	4.00	3.00	3.50	4.00	3.00	3.00	3.00	2.00	2.00
	N	24	24	22	24	25	24	24	21	21	21
3	Mean	3.50	3.38	2.67	3.33	3.81	2.50	3.19	3.13	2.00	2.67
	Median	4.00	3.00	3.00	3.00	4.00	2.50	3.00	3.00	2.00	3.00
	N	16	16	15	15	16	16	16	15	14	15
Total	Mean	3.47	3.47	2.72	3.37	3.75	2.64	3.23	3.06	2.02	2.54
	Median	4.00	4.00	3.00	3.00	4.00	3.00	3.00	3.00	2.00	2.00
	N	53	53	46	52	53	53	53	49	46	48

SUBGROUP		Q11PROB	Q12PROB	Q13PROB	Q14PROB	Q15PROB	Q16PROB	Q17PROB	Q18PROB	Q19PROB
1	Mean	3.31	3.38	2.46	3.31	2.00	2.58	2.31	3.62	3.17
	Median	3.00	3.00	2.00	3.00	2.00	2.00	2.00	4.00	3.00
	N	13	13	13	13	12	12	13	13	12
2	Mean	3.33	3.09	2.91	3.04	1.83	2.57	2.42	3.43	3.54
	Median	3.00	3.00	3.00	3.00	2.00	3.00	2.00	4.00	4.00
	N	24	22	23	24	23	21	24	23	24
3	Mean	3.69	3.20	2.67	3.06	2.14	2.87	2.69	3.13	3.50
	Median	4.00	3.00	3.00	3.00	2.00	3.00	3.00	3.50	3.50
	N	16	15	15	16	14	15	16	16	16
Total	Mean	3.43	3.20	2.73	3.11	1.96	2.67	2.47	3.38	3.44
	Median	3.00	3.00	3.00	3.00	2.00	3.00	2.00	4.00	3.00
	N	53	50	51	53	49	48	53	52	52

SUBGROUP		Q20PROB	Q21PROB	Q22PROB	Q23PROB	Q24PROB	Q25PROB	Q26PROB	Q27PROB	Q28PROB
1	Mean	2.31	3.62	3.31	3.17	3.08	3.08	3.00	1.92	2.92
	Median	2.00	4.00	3.00	3.00	3.00	3.00	3.00	2.00	3.00
	N	13	13	13	12	13	12	12	13	13
2	Mean	2.37	3.48	3.46	3.05	2.77	3.00	2.17	1.38	2.88
	Median	2.00	3.00	3.50	3.00	3.00	3.00	2.00	1.00	3.00
	N	24	23	24	22	22	21	23	24	24
3	Mean	2.50	3.44	3.44	2.36	2.60	2.80	2.80	1.60	2.80
	Median	2.00	3.00	3.00	2.00	3.00	3.00	3.00	2.00	3.00
	N	14	16	16	14	15	15	15	15	15
Total	Mean	2.39	3.50	3.42	2.87	2.80	2.96	2.56	1.58	2.87
	Median	2.00	3.50	3.00	3.00	3.00	3.00	2.50	1.50	3.00
	N	51	52	53	48	50	48	50	52	52

Notes.

Sub 1 = Academics Sub 2 = Administrators Sub 3 = IT professionals

(Table 5.3. continues)

Table 5.3. Probability Medians and Means

SUBGROUP		Q29PROB	Q30PROB	Q31PROB	Q32PROB	Q33PROB	Q34PROB	Q35PROB	Q36PROB	Q37PROB
1	Mean	3.42	3.23	2.78	3.64	2.62	3.42	2.33	2.80	3.25
	Median	3.00	3.00	3.00	4.00	3.00	3.00	2.00	3.00	3.00
	N	12	13	9	11	13	12	9	10	8
2	Mean	2.96	3.04	2.60	3.27	3.14	3.35	3.15	1.90	3.19
	Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.00	3.00
	N	23	23	20	22	21	23	20	20	21
3	Mean	3.00	3.40	2.82	3.43	2.83	3.62	3.00	2.08	3.08
	Median	3.00	3.00	3.00	3.00	3.00	4.00	3.00	2.00	3.00
	N	14	15	11	14	12	13	11	13	12
Total	Mean	3.08	3.20	2.70	3.40	2.91	3.44	2.93	2.16	3.17
	Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.00	3.00
	N	49	51	40	47	46	48	40	43	41

SUBGROUP		Q38PROB	Q39PROB	Q40PROB	Q41PROB	Q42PROB	Q43PROB	Q44PROB	Q45PROB	Q46PROB
1	Mean	1.77	2.46	1.33	2.18	2.00	2.80	3.25	3.69	2.42
	Median	2.00	2.00	1.00	2.00	2.00	3.00	3.00	4.00	2.00
	N	13	13	12	11	8	10	12	13	12
2	Mean	1.77	1.62	1.29	2.17	2.43	3.13	3.11	3.52	2.25
	Median	2.00	2.00	1.00	2.00	2.00	3.00	3.00	4.00	2.00
	N	22	24	24	23	21	15	19	23	24
3	Mean	1.42	1.83	1.38	2.23	1.80	2.92	3.08	3.62	2.17
	Median	1.00	2.00	1.00	2.00	1.50	3.00	3.00	4.00	2.00
	N	12	12	13	13	10	12	12	13	12
Total	Mean	1.68	1.90	1.33	2.19	2.18	2.97	3.14	3.59	2.27
	Median	2.00	2.00	1.00	2.00	2.00	3.00	3.00	4.00	2.00
	N	47	49	49	47	39	37	43	49	48

SUBGROUP		Q47PROB	Q48PROB	Q49PROB	Q50PROB	Q51PROB	Q52PROB	Q53PROB	Q54PROB	Q55PROB
1	Mean	3.08	2.64	3.38	2.42	3.54	3.33	3.10	3.23	3.18
	Median	3.00	3.00	3.00	2.50	4.00	3.00	3.00	3.00	3.00
	N	13	11	13	12	13	12	10	13	11
2	Mean	2.83	2.41	3.25	2.83	3.46	2.78	2.67	3.42	2.81
	Median	3.00	2.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	N	23	22	24	23	24	23	21	24	21
3	Mean	2.69	2.17	3.08	2.38	3.31	2.69	2.36	3.62	2.67
	Median	3.00	2.00	3.00	3.00	3.00	3.00	2.00	4.00	3.00
	N	13	12	13	13	13	13	11	13	12
Total	Mean	2.86	2.40	3.24	2.60	3.44	2.90	2.69	3.42	2.86
	Median	3.00	2.00	3.00	3.00	3.50	3.00	3.00	3.00	3.00
	N	49	45	50	48	50	48	42	50	44

Notes.

Sub 1 = Academics Sub 2 = Administrators Sub 3 = IT professionals

(Table 5.3. continues)

Scale. 1 = low 4 = high

Table 5.3. Probability Medians and Means

SUBGROUP		Q56PROB	Q57PROB	Q58PROB	Q59PROB	Q60PROB	Q61PROB	Q62PROB	Q63PROB	Q64PROB
1	Mean	3.92	3.85	3.25	3.42	3.58	2.90	3.08	2.85	2.69
	Median	4.00	4.00	3.00	3.00	4.00	3.00	3.00	3.00	3.00
	N	13	13	12	12	12	10	13	13	13
2	Mean	3.75	3.61	3.58	3.58	3.26	1.95	2.96	2.83	2.83
	Median	4.00	4.00	4.00	4.00	3.00	2.00	3.00	3.00	3.00
	N	24	23	24	24	23	22	23	24	23
3	Mean	4.00	4.00	3.31	3.69	3.50	2.17	3.23	2.42	2.46
	Median	4.00	4.00	3.00	4.00	3.50	2.00	3.00	2.00	2.00
	N	13	13	13	13	12	12	13	12	13
Total	Mean	3.86	3.78	3.43	3.57	3.40	2.23	3.06	2.73	2.69
	Median	4.00	4.00	4.00	4.00	3.00	2.00	3.00	3.00	3.00
	N	50	49	49	49	47	44	49	49	49

SUBGROUP		Q65PROB	Q66PROB	Q67PROB	Q68PROB	Q69PROB	Q70PROB	Q71PROB	Q72PROB	Q73PROB
1	Mean	3.08	3.85	3.60	3.18	2.89	3.17	2.82	3.54	2.18
	Median	3.00	4.00	4.00	3.00	3.00	3.00	3.00	4.00	2.00
	N	12	13	10	11	9	12	11	13	11
2	Mean	3.05	3.78	3.38	3.30	2.79	3.04	2.32	3.33	2.00
	Median	3.00	4.00	3.00	3.00	3.00	3.00	2.00	3.00	2.00
	N	21	23	21	23	19	23	22	24	21
3	Mean	2.85	3.85	3.46	3.31	2.54	3.17	2.50	3.69	2.17
	Median	3.00	4.00	4.00	3.00	2.00	3.00	2.50	4.00	2.00
	N	13	13	13	13	13	12	10	13	12
Total	Mean	3.00	3.82	3.45	3.28	2.73	3.11	2.49	3.48	2.09
	Median	3.00	4.00	4.00	3.00	3.00	3.00	2.00	4.00	2.00
	N	46	49	44	47	41	47	43	50	44

(Table 5.3. continues)

Notes.

Sub 1 = Academics Sub 2 = Administrators Sub 3 = IT professionals

Scale. 1 = low 4 = high

Table 5.3. Probability Medians and Means

SUBGROUP		Q74PROB	Q75PROB	Q76PROB	Q77PROB	Q78PROB	Q79PROB	Q80PROB	Q81PROB	Q82PROB
1	Mean	3.00	3.17	3.30	3.54	2.54	2.10	3.54	3.18	3.18
	Median	3.00	3.00	3.00	4.00	3.00	2.00	4.00	3.00	3.00
	N	12	12	10	13	13	10	13	11	11
2	Mean	2.96	3.00	2.89	3.17	2.83	2.73	3.29	2.87	3.04
	Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	N	24	21	18	24	24	22	24	23	23
3	Mean	2.92	2.69	2.60	3.15	2.83	2.46	3.08	2.67	3.08
	Median	3.00	3.00	2.50	3.00	3.00	3.00	3.00	3.00	3.00
	N	12	13	10	13	12	13	12	12	13
Total	Mean	2.96	2.96	2.92	3.26	2.76	2.51	3.31	2.89	3.09
	Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	N	48	46	38	50	49	45	49	46	47

SUBGROUP		Q83PROB	Q84PROB	Q85PROB
1	Mean	3.31	3.23	3.67
	Median	3.00	3.00	4.00
	N	13	13	12
2	Mean	3.30	3.08	3.41
	Median	3.00	3.00	3.00
	N	23	24	22
3	Mean	3.38	3.31	3.58
	Median	3.00	3.00	4.00
	N	13	13	12
Total	Mean	3.33	3.18	3.52
	Median	3.00	3.00	4.00
	N	49	50	46

Notes.

Sub 1 = Academics   Sub 2 = Administrators   Sub 3 = IT professionals

Scale.   1 = low   4 = high

Table 5.4 Importance Means and medians

SUBGROUP		Q1IMP	Q2IMP	Q3IMP	Q4IMP	Q5IMP	Q6IMP	Q7IMP	Q8IMP	Q9IMP	Q10IMP
1	Mean	3.23	3.23	2.75	3.46	3.58	2.55	3.31	3.25	2.70	3.25
	N	13	13	8	13	12	11	13	12	10	12
	Median	3.00	3.00	3.00	3.00	4.00	3.00	3.00	3.00	3.00	3.00
2	Mean	3.39	3.35	2.64	3.50	3.46	2.86	3.18	3.45	3.00	2.94
	N	23	23	22	22	24	21	22	20	18	17
	Median	3.00	3.00	3.00	3.50	3.50	3.00	3.00	3.50	3.00	3.00
3	Mean	3.19	3.29	2.64	3.40	3.56	2.63	3.15	3.27	3.07	3.07
	N	16	14	14	15	16	16	13	15	14	14
	Median	3.00	3.00	3.00	3.00	4.00	3.00	3.00	3.00	3.00	3.00
Total	Mean	3.29	3.30	2.66	3.46	3.52	2.71	3.21	3.34	2.95	3.07
	N	52	50	44	50	52	48	48	47	42	43
	Median	3.00	3.00	3.00	3.00	4.00	3.00	3.00	3.00	3.00	3.00

SUBGROUP		Q11IMP	Q12IMP	Q13IMP	Q14IMP	Q15IMP	Q16IMP	Q17IMP	Q18IMP	Q19IMP	Q20IMP
1	Mean	3.17	3.31	3.00	3.67	2.80	2.90	2.89	3.00	3.09	2.73
	N	12	13	12	12	10	10	9	12	11	11
	Median	3.00	3.00	3.00	4.00	3.00	3.00	3.00	3.00	3.00	3.00
2	Mean	3.30	3.14	3.05	3.42	2.40	2.61	2.86	3.05	3.33	2.89
	N	23	22	20	24	20	18	22	21	24	19
	Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
3	Mean	3.60	3.31	3.00	3.67	2.87	2.87	3.33	3.12	3.38	3.07
	N	15	13	15	15	15	15	15	16	16	15
	Median	4.00	3.00	3.00	4.00	3.00	3.00	3.00	3.00	3.00	3.00
Total	Mean	3.36	3.23	3.02	3.55	2.64	2.77	3.02	3.06	3.29	2.91
	N	50	48	47	51	45	43	46	49	51	45
	Median	3.00	3.00	3.00	4.00	3.00	3.00	3.00	3.00	3.00	3.00

SUBGROUP		Q21IMP	Q22IMP	Q23IMP	Q24IMP	Q25IMP	Q26IMP	Q27IMP	Q28IMP	Q29IMP	Q30IMP
1	Mean	3.54	3.33	3.42	2.92	3.10	3.00	3.09	3.08	3.42	3.33
	N	13	12	12	12	10	10	11	12	12	12
	Median	4.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
2	Mean	3.39	3.39	3.10	2.94	3.13	2.62	2.95	2.95	3.14	3.27
	N	23	23	20	17	16	21	21	21	21	22
	Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
3	Mean	3.38	3.25	3.29	2.93	3.00	3.00	3.47	3.00	3.21	3.33
	N	16	16	14	14	14	13	15	15	14	15
	Median	3.00	3.00	3.00	3.00	3.00	3.00	4.00	3.00	3.00	3.00
Total	Mean	3.42	3.33	3.24	2.93	3.08	2.82	3.15	3.00	3.23	3.31
	N	52	51	46	43	40	44	47	48	47	49
	Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

<u>Scale.</u> 1 = low 4 = high

(Table 5.4. continues)

Table 5.4. Importance Medians and Means

SUBGROUP		Q31IMP	Q32IMP	Q33IMP	Q34IMP	Q35IMP	Q36IMP	Q37IMP	Q38IMP	Q39IMP	Q40IMP
1	Mean	3.09	3.40	3.17	3.25	2.62	3.11	3.38	3.33	3.00	2.92
	N	11	10	12	12	8	9	8	12	11	12
	Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
2	Mean	3.22	3.30	3.30	3.18	3.35	2.88	3.20	2.90	2.52	2.74
	N	18	20	20	22	20	16	20	20	23	23
	Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
3	Mean	3.25	3.38	3.25	3.38	3.08	2.67	3.25	3.27	2.77	3.27
	N	12	13	12	13	12	12	12	11	13	11
	Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Total	Mean	3.20	3.35	3.25	3.26	3.12	2.86	3.25	3.12	2.70	2.91
	N	41	43	44	47	40	37	40	43	47	46
	Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

SUBGROUP		Q41IMP	Q42IMP	Q43IMP	Q44IMP	Q45IMP	Q46IMP	Q47IMP	Q48IMP	Q49IMP	Q50IMP
1	Mean	3.00	3.00	3.14	3.33	3.55	2.91	3.17	2.90	3.27	3.18
	N	10	8	7	12	11	11	12	10	11	11
	Median	3.00	3.00	3.00	3.00	4.00	3.00	3.00	3.00	3.00	3.00
2	Mean	2.76	3.10	3.23	3.17	3.45	2.96	3.00	2.90	3.09	3.14
	N	21	21	13	18	22	24	23	20	23	21
	Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
3	Mean	3.00	3.18	3.00	3.08	3.38	3.08	3.00	2.70	3.00	2.77
	N	11	11	10	12	13	12	12	10	12	13
	Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Total	Mean	2.88	3.10	3.13	3.19	3.46	2.98	3.04	2.85	3.11	3.04
	N	42	40	30	42	46	47	47	40	46	45
	Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

SUBGROUP		Q51IMP	Q52IMP	Q53IMP	Q54IMP	Q55IMP	Q56IMP	Q57IMP	Q58IMP	Q59IMP	Q60IMP
1	Mean	3.33	3.27	3.50	3.17	3.33	3.73	3.58	3.50	3.44	3.45
	N	12	11	8	12	9	11	12	10	9	11
	Median	3.00	3.00	3.50	3.00	3.00	4.00	4.00	3.50	3.00	3.00
2	Mean	3.30	2.81	2.74	3.23	3.05	3.54	3.52	3.54	3.39	3.48
	N	23	21	19	22	19	24	23	24	23	23
	Median	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.00	3.00
3	Mean	3.15	2.64	2.73	3.31	3.00	3.85	3.92	3.46	3.38	3.50
	N	13	11	11	13	11	13	13	13	13	10
	Median	3.00	3.00	3.00	3.00	3.00	4.00	4.00	3.00	4.00	3.50
Total	Mean	3.27	2.88	2.89	3.23	3.10	3.67	3.65	3.51	3.40	3.48
	N	48	43	38	47	39	48	48	47	45	44
	Median	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.00	3.00

Scale. 1 = low 4 = high

(Table 5.4 continues)

Notes.

Sub 1 = Academics Sub 2 = Administrators Sub 3 = IT professionals

Table 5.4. Importance Medians and Means

SUBGROUP		Q61IMP	Q62IMP	Q63IMP	Q64IMP	Q65IMP	Q66IMP	Q67IMP	Q68IMP	Q69IMP	Q70IMP
1	Mean	3.18	3.50	3.09	3.18	2.80	3.83	3.50	3.18	3.14	3.20
	N	11	12	11	11	10	12	8	11	7	10
	Median	3.00	3.50	3.00	3.00	3.00	4.00	4.00	3.00	3.00	3.00
2	Mean	2.85	3.04	3.00	2.90	3.10	3.73	3.45	3.27	3.17	3.30
	N	20	23	23	21	21	22	20	22	18	20
	Median	3.00	3.00	3.00	3.00	3.00	4.00	3.00	3.00	3.00	3.00
3	Mean	3.15	3.15	3.09	2.92	2.89	3.69	3.38	3.33	2.75	3.17
	N	13	13	11	12	9	13	13	12	12	12
	Median	3.00	3.00	3.00	3.00	3.00	4.00	4.00	3.00	3.00	3.00
Total	Mean	3.02	3.19	3.04	2.98	2.98	3.74	3.44	3.27	3.03	3.24
	N	44	48	45	44	40	47	41	45	37	42
	Median	3.00	3.00	3.00	3.00	3.00	4.00	4.00	3.00	3.00	3.00

SUBGROUP		Q71IMP	Q72IMP	Q73IMP	Q74IMP	Q75IMP	Q76IMP	Q77IMP	Q78IMP	Q79IMP	Q80IMP
1	Mean	3.00	3.58	3.10	3.27	3.10	3.33	3.62	3.25	3.00	3.00
	N	10	12	10	11	10	9	13	12	7	10
	Median	3.00	4.00	3.00	3.00	3.00	3.00	4.00	3.00	3.00	3.00
2	Mean	2.86	3.27	3.15	2.91	3.15	2.95	2.96	3.26	2.91	3.05
	N	21	22	20	23	20	19	24	23	22	21
	Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
3	Mean	2.80	3.31	2.92	3.25	3.09	2.80	2.92	3.25	3.00	3.00
	N	10	13	12	12	11	10	13	12	12	12
	Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Total	Mean	2.88	3.36	3.07	3.09	3.12	3.00	3.12	3.26	2.95	3.02
	N	41	47	42	46	41	38	50	47	41	43
	Median	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

SUBGROUP		Q81IMP	Q82IMP	Q83IMP	Q84IMP	Q85IMP
1	Mean	3.36	3.09	3.15	3.42	3.60
	N	11	11	13	12	10
	Median	3.00	3.00	3.00	3.00	4.00
2	Mean	3.18	3.32	3.23	3.36	3.52
	N	22	22	22	22	21
	Median	3.00	3.00	3.00	3.00	4.00
3	Mean	3.00	3.23	3.23	3.31	3.23
	N	12	13	13	13	13
	Median	3.00	3.00	3.00	3.00	3.00
Total	Mean	3.18	3.24	3.21	3.36	3.45
	N	45	46	48	47	44
	Median	3.00	3.00	3.00	3.00	3.00

Notes.

Sub 1 = Academics Sub 2 = Administrators Sub 3 = IT professionals

Scale. 1 = low 4 = high

Table 5.5 Timing Medians and Means

SUBGROUP		Q1TIME	Q2TIME	Q3TIME	Q4TIME	Q5TIME	Q6TIME	Q7TIME	Q8TIME	Q9TIME	Q10TIME
1	Mean	1.23	1.46	2.13	1.62	1.33	2.22	1.38	1.69	2.00	2.25
	N	13	13	8	13	12	9	13	13	12	12
	Median	1.00	1.00	2.00	2.00	1.00	2.00	1.00	2.00	2.00	2.00
2	Mean	1.29	1.38	2.00	1.57	1.56	2.00	1.35	1.74	1.60	2.13
	N	24	24	17	23	25	21	23	19	15	16
	Median	1.00	1.00	2.00	2.00	2.00	2.00	1.00	2.00	2.00	2.00
3	Mean	1.31	1.50	1.90	1.87	1.25	2.08	1.50	1.93	1.80	2.14
	N	16	14	10	15	16	13	16	15	15	14
	Median	1.00	1.50	2.00	2.00	1.00	2.00	1.00	2.00	2.00	2.00
Total	Mean	1.28	1.43	2.00	1.67	1.42	2.07	1.40	1.79	1.79	2.17
	N	53	51	35	51	53	43	52	47	42	42
	Median	1.00	1.00	2.00	2.00	1.00	2.00	1.00	2.00	2.00	2.00

SUBGROUP		Q11TIME	Q12TIME	Q13TIME	Q14TIME	Q15TIME	Q16TIME	Q17TIME	Q18TIME	Q19TIME	Q20TIME
1	Mean	1.25	1.77	2.58	2.08	2.29	2.82	2.38	1.85	2.18	2.73
	N	12	13	12	12	7	11	8	13	11	11
	Median	1.00	2.00	2.50	2.00	2.00	3.00	2.00	2.00	2.00	2.00
2	Mean	1.29	1.48	2.18	1.95	1.60	2.62	2.33	1.59	2.05	2.18
	N	24	21	22	22	10	13	15	22	19	17
	Median	1.00	1.00	2.00	2.00	2.00	3.00	2.00	2.00	2.00	2.00
3	Mean	1.25	1.53	2.47	1.79	1.90	2.57	2.42	1.60	2.15	2.33
	N	16	15	15	14	10	14	12	15	13	12
	Median	1.00	2.00	2.00	2.00	2.00	2.50	2.00	1.00	2.00	2.00
Total	Mean	1.27	1.57	2.37	1.94	1.89	2.66	2.37	1.66	2.12	2.38
	N	52	49	49	48	27	38	35	50	43	40
	Median	1.00	2.00	2.00	2.00	2.00	3.00	2.00	2.00	2.00	2.00

SUBGROUP		Q21TIME	Q22TIME	Q23TIME	Q24TIME	Q25TIME	Q26TIME	Q27TIME	Q28TIME	Q29TIME	Q30TIME
1	Mean	1.38	1.67	1.73	1.42	2.00	2.30	2.44	1.92	1.50	2.25
	N	13	12	11	12	11	10	9	12	12	12
	Median	1.00	1.50	2.00	1.00	2.00	2.00	2.00	2.00	1.50	2.00
2	Mean	1.64	1.59	1.71	1.67	2.05	2.29	2.75	1.80	1.55	1.91
	N	22	22	21	18	21	14	12	20	22	23
	Median	1.00	2.00	2.00	1.50	2.00	2.00	2.00	2.00	1.50	2.00
3	Mean	1.81	1.87	2.00	1.36	1.67	2.38	2.90	2.14	1.85	2.08
	N	16	15	12	11	12	13	10	14	13	13
	Median	2.00	2.00	2.00	1.00	2.00	2.00	3.00	2.00	2.00	2.00
Total	Mean	1.63	1.69	1.80	1.51	1.93	2.32	2.71	1.93	1.62	2.04
	N	51	49	44	41	44	37	31	46	47	48
	Median	1.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00

Scale. 1 = Before 2005 2 = 2005 – 2009 3= 2010 - 2015 (Table 5.5. continues)

Table 5.5. Timing Medians and Means

SUBGROUP		Q31TIME	Q32TIME	Q33TIME	Q34TIME	Q35TIME	Q36TIME	Q37TIME	Q38TIME	Q39TIME	Q40TIME
1	Mean	1.45	1.73	2.11	1.50	2.38	1.86	1.57	1.78	1.88	1.75
	N	11	11	9	12	8	7	7	9	8	4
	Median	1.00	2.00	2.00	1.50	2.00	2.00	2.00	2.00	2.00	2.00
2	Mean	1.67	1.64	2.10	1.87	1.95	1.67	1.53	1.50	2.08	1.60
	N	18	22	21	23	20	9	15	12	12	10
	Median	2.00	1.00	2.00	2.00	2.00	2.00	2.00	1.50	2.00	1.50
3	Mean	1.45	1.69	1.83	1.62	2.10	2.33	1.71	1.43	2.63	2.17
	N	11	13	12	13	10	6	7	7	8	6
	Median	1.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	3.00	2.50
Total	Mean	1.55	1.67	2.02	1.71	2.08	1.91	1.59	1.57	2.18	1.80
	N	40	46	42	48	38	22	29	28	28	20
	Median	2.00	1.50	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

SUBGROUP		Q41TIME	Q42TIME	Q43TIME	Q44TIME	Q45TIME	Q46TIME	Q47TIME	Q48TIME	Q49TIME	Q50TIME
1	Mean	1.71	1.50	2.71	2.50	1.67	2.20	2.25	2.33	2.54	2.18
	N	7	6	7	12	12	10	12	9	13	11
	Median	2.00	1.50	3.00	2.50	2.00	2.00	2.00	2.00	2.00	2.00
2	Mean	2.07	1.56	1.92	2.61	1.59	2.00	2.22	2.29	2.17	2.11
	N	15	16	13	18	22	16	18	14	23	18
	Median	2.00	2.00	2.00	2.50	1.50	2.00	2.00	2.00	2.00	2.00
3	Mean	2.44	1.64	2.67	2.36	1.33	2.40	2.50	2.44	2.00	2.09
	N	9	11	12	11	12	10	10	9	11	11
	Median	3.00	2.00	2.50	2.00	1.00	2.00	2.00	2.00	2.00	2.00
Total	Mean	2.10	1.58	2.37	2.51	1.54	2.17	2.30	2.34	2.23	2.13
	N	31	33	32	41	46	36	40	32	47	40
	Median	2.00	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00

SUBGROUP		Q51TIME	Q52TIME	Q53TIME	Q54TIME	Q55TIME	Q56TIME	Q57TIME	Q58TIME	Q59TIME	Q60TIME
1	Mean	1.77	2.00	2.50	2.09	2.20	1.64	1.92	1.80	2.23	1.92
	N	13	10	8	11	10	11	12	10	13	12
	Median	2.00	2.00	2.50	2.00	2.00	2.00	2.00	2.00	2.00	2.00
2	Mean	1.83	2.00	2.29	2.09	1.95	1.58	1.61	1.17	1.83	1.96
	N	24	21	17	23	19	24	23	23	23	23
	Median	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00	2.00
3	Mean	1.90	1.82	2.13	1.85	2.45	1.17	1.42	1.33	1.36	1.92
	N	10	11	8	13	11	12	12	12	11	12
	Median	2.00	2.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	2.00
Total	Mean	1.83	1.95	2.30	2.02	2.15	1.49	1.64	1.36	1.83	1.94
	N	47	42	33	47	40	47	47	45	47	47
	Median	2.00	2.00	2.00	2.00	2.00	1.00	2.00	1.00	2.00	2.00

(Table 5.5. continues)

Table 5.5. Timing Medians and Means

SUBGROUP		Q61TIME	Q62TIME	Q63TIME	Q64TIME	Q65TIME	Q66TIME	Q67TIME	Q68TIME	Q69TIME	Q70TIME
1	Mean	2.56	1.50	2.45	1.80	1.70	1.38	2.33	2.00	2.33	1.82
	N	9	10	11	10	10	13	9	10	6	11
	Median	2.00	1.50	2.00	2.00	2.00	1.00	2.00	2.00	2.50	2.00
2	Mean	2.25	1.40	2.05	1.78	1.84	1.50	1.81	1.65	1.72	1.80
	N	12	20	22	18	19	22	21	23	18	20
	Median	2.00	1.00	2.00	2.00	2.00	1.50	2.00	2.00	2.00	2.00
3	Mean	2.43	1.36	1.78	1.70	1.70	1.31	1.92	1.69	1.89	2.27
	N	7	11	9	10	10	13	13	13	9	11
	Median	2.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00
Total	Mean	2.39	1.41	2.10	1.76	1.77	1.42	1.95	1.74	1.88	1.93
	N	28	41	42	38	39	48	43	46	33	42
	Median	2.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00

SUBGROUP		Q71TIME	Q72TIME	Q73TIME	Q74TIME	Q75TIME	Q76TIME	Q77TIME	Q78TIME	Q79TIME	Q80TIME
1	Mean	2.10	1.46	2.11	1.73	2.27	1.89	1.62	2.31	2.83	1.70
	N	10	13	9	11	11	9	13	13	6	10
	Median	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.50	1.00
2	Mean	2.00	1.65	2.00	2.00	2.60	2.40	1.83	2.40	2.74	2.30
	N	15	23	13	22	20	15	23	20	19	20
	Median	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	3.00	2.00
3	Mean	2.38	1.42	2.30	2.18	2.73	2.44	1.83	2.67	2.91	2.67
	N	8	12	10	11	11	9	12	9	11	12
	Median	2.00	1.00	2.00	2.00	3.00	2.00	2.00	2.00	3.00	3.00
Total	Mean	2.12	1.54	2.13	1.98	2.55	2.27	1.77	2.43	2.81	2.26
	N	33	48	32	44	42	33	48	42	36	42
	Median	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	3.00	2.00

SUBGROUP		Q81TIME	Q82TIME	Q83TIME	Q84TIME	Q85TIME
1	Mean	2.27	2.45	1.67	2.00	1.45
	N	11	11	12	11	11
	Median	2.00	2.00	1.50	2.00	1.00
2	Mean	2.20	2.50	2.05	1.81	1.73
	N	20	22	22	21	22
	Median	2.00	2.00	2.00	2.00	2.00
3	Mean	2.20	2.58	2.23	1.73	1.92
	N	10	12	13	11	12
	Median	2.00	2.00	2.00	2.00	2.00
Total	Mean	2.22	2.51	2.00	1.84	1.71
	N	41	45	47	43	45
	Median	2.00	2.00	2.00	2.00	2.00

Scale. 1 = Before 2005 2 = 2005 – 2009 3= 2010 – 2015

Notes.

Sub 1 = Academics Sub 2 = Administrators Sub 3 = IT professionals

Table 5.21. Level of Non-Consensus (21 Items)

Table 5.21.		Probability			Importance			Timing**		
			%	%		%	%		%	%
Item	Statement	N	Low	High	N	Low	High	N	Soon	Late
3	The widespread availability of online learning will reduce the boundaries between undergraduate and graduate education.	46	37	63*	44	39	61*	35	85	15
6	Each field/discipline will establish its own specific standards for the appropriate use of IT and Internet resources.	53	41	59*	48	35	65*	43	81	19
10	Higher education provided online by large global institutions, consortia, and/or corporations will undermine the stability of many traditional higher education institutions.	48	54*	46	43	16	84	42	79	21
13	It will be easy to find good quality online courses on specialized topics that span national boundaries, like comparative law, rare languages, uncommon parts of history, and preservation of diverse cultures.	51	39	61*	47	11	89	49	53*	37
16	Experiential virtual reality systems will compete with books (even electronic ones).	48	42	58*	43	30	70	38	45	55*
17	IT and the Internet will alter, at a deep rigorous level, what we consider good scholarship and good argumentation.	53	57*	43	46	29	81	35	63*	37
20	The changing clientele of higher education will break down the notion of a community of scholars who offer face-to-face education on-campus.	51	59*	41	45	22	78	40	68*	32
26	Internet-savvy professors will dominate instruction in most large universities.	50	50*	50*	44	25	75	37	65*	35

Table 5.21. Level of Non-Consensus (21 Items)

Table 5.21.		Probability			Importance			Timing**		
			%	%		%	%		%	%
Item	Statement	N	Low	High	N	Low	High	N	Soon	Late
31	New rules on professors' intellectual property will favor the institutions over intellectual property creators.	40	63*	37	41	7	93	40	100	0
36	A dependency on technology makes electronic learning (e-learning) susceptible to any person or group that gains control of the technology.	43	68*	32	37	24	76	22	90	10
42	The costs of broadband telecommunication connections will NOT be passed on to students, in order to eliminate the digital divide between the "haves" and the "have nots".	39	67*	33	40	5	95	33	100	0
47	Well-financed university consortia, operating globally, will seriously challenge individual institutions.	49	35	65*	47	15	85	40	68*	32
48	Eventually those institutions that hold back from competing internationally in online education will be forced to respond, high overheads notwithstanding.	45	62*	38	40	22	78	32	69*	31
50	Public and private institutions will retain a competitive advantage over commercial (for-profit) providers in offering high quality, pedagogically sound online programming.	48	38	62*	45	12	88	40	80	20
53	The distinctions between public and private higher education will blur when an IT environment in terms of courses offered becomes rich and ubiquitous.	42	36	64*	38	24	76	33	64*	36
61	A two-tiered education system will evolve, one elite, high cost, offering face-to-face instruction and a collegial experience, the other will be a lower cost system via the Internet.	44	66*	34	44	20	80	28	64*	36

Table 5.21. Level of Non-Consensus (21 Items)

Table 5.21.		Probability			Importance			Timing**		
			%	%		%	%		%	%
Item	Statement	N	Low	High	N	Low	High	N	Soon	Late
63	Most post-secondary institutions will restructure to take advantage of new technologies; the rest will decline in scope and reach.	49	35	65*	45	13	87	42	76	24
64	Some universities and colleges will flourish online; many post-secondary institutions will view the cost of IT and a de-emphasis of traditional values as too high.	49	35	65*	44	11	89	38	92	8
69	Universities and colleges in remote locations will retain high quality faculty because IT and the Internet will help professors overcome a sense of isolation.	41	39	61*	37	13	87	33	85	15
71	Governments' funding policies and strategies will favour internationalisation and globalisation; so politicians will allocate funds to those institutions with the best economic models.	43	54*	46	41	22	78	33	76	24
79	Online higher education will result in an assimilation of cultures.	45	38	62*	41	12	88	36	75	25

* = Does not meet criterion for consensus

**Soon = Before 2010
Late = 2010 or after

Table 5.22. Ranked Means of Probability (negative 1 to positive 1)

Items	Entire Panel	Academics	Administrators	IT Pros.
40	-0.96	-1.00	-1.00	-0.85
38	-0.87	-0.69	-0.91	-1.00
27	-0.85	-0.69	-0.92	-0.87
15	-0.71	-0.67	-0.83	-0.57
39	-0.63	-0.08	-0.92	-0.67
9	-0.61	-0.45	-0.62	-0.71
73	-0.59	-0.27	-0.71	-0.67
46	-0.46	-0.17	-0.58	-0.50
41	-0.45	-0.27	-0.48	-0.54
36	-0.35	0.20	-0.60	-0.38
42	-0.33	-0.75	-0.05	-0.60
61	-0.32	0.20	-0.55	-0.33
48	-0.24	0.09	-0.27	-0.50
20	-0.18	-0.38	-0.08	-0.14
17	-0.13	-0.54	-0.08	0.12
10	-0.08	0.17	-0.43	0.20
71	-0.07	0.27	-0.27	0
26	0	0.67	-0.48	0.20
16	0.17	-0.17	0.14	0.47
6	0.17	0.23	0.25	0
13	0.22	-0.08	0.48	0.07
69	0.22	0.56	0.26	-0.08
79	0.24	-0.4	0.64	0.08
31	0.25	0.33	0.10	0.45

(Table 5.22. continues)

Table 5.22. Ranked Means of Probability (negative 1 to positive 1)

Items	Entire Panel	Academics	Administrators	IT Pros.
50	0.25	0	0.48	0.08
3	0.26	0.56	0.18	0.20
53	0.29	0.60	0.43	-0.27
64	0.31	0.23	0.57	-0.08
63	0.31	0.38	0.50	-0.17
47	0.31	0.38	0.39	0.08
81	0.39	0.64	0.39	0.17
24	0.40	0.69	0.36	0.20
78	0.43	0.23	0.50	0.50
23	0.46	0.83	0.73	-0.29
74	0.46	0.50	0.50	0.33
28	0.46	0.38	0.50	0.47
76	0.47	0.80	0.56	0
55	0.50	0.82	0.43	0.33
35	0.50	-0.33	0.7	0.82
43	0.51	0.40	0.60	0.50
75	0.52	0.67	0.71	0.08
52	0.54	1.00	0.39	0.38
25	0.58	0.50	0.71	0.47
14	0.58	0.69	0.67	0.38
33	0.61	0.23	0.81	0.67
65	0.65	0.50	0.81	0.54
18	0.65	0.85	0.74	0.38
8	0.67	0.54	0.71	0.73
70	0.70	0.83	0.74	0.50
62	0.71	0.69	0.65	0.85

(Table 5.22. continues)

Table 5.22. Ranked Means of Probability (negative 1 to positive 1)

Items	Entire Panel	Academics	Administrators	IT Pros.
82	0.74	0.82	0.74	0.69
29	0.76	1.00	0.65	0.71
84	0.76	0.85	0.67	0.85
77	0.80	1.00	0.67	0.85
12	0.80	1.00	0.73	0.73
7	0.81	0.85	0.83	0.75
44	0.81	1.00	0.79	0.67
67	0.82	1.00	0.81	0.69
58	0.84	0.83	0.92	0.69
4	0.85	0.85	0.75	1.00
83	0.88	1.00	0.83	0.85
54	0.88	0.69	0.92	1.00
49	0.88	1.00	1.00	0.54
30	0.88	0.85	0.83	1.00

Notes.

In ascending order for the Panel: Least Probable to Most Probable.

Scale: Highly improbable and improbable = negative (-) 1

Highly probable and probable = positive (+) 1

Table 5.23. Ranked Means of Importance (negative 1 to positive 1)

Item	Entire Panel*	Academics	Administrator	IT Pros.
3	0.23	0.25	0.27	0.14
6	0.29	0.09	0.52	0.12
39	0.40	0.64	0.30	0.38
16	0.40	0.40	0.11	0.73
15	0.42	0.60	0.10	0.73
26	0.50	0.80	0.24	0.69
36	0.51	0.78	0.50	0.33
41	0.52	0.40	0.52	0.64
24	0.53	0.50	0.65	0.43
48	0.55	0.60	0.60	0.40
20	0.56	0.45	0.47	0.73
40	0.61	0.67	0.39	1.00
17	0.61	0.56	0.36	1.00
9	0.62	0.40	0.67	0.71
10	0.67	0.67	0.53	0.86
47	0.70	0.67	0.83	0.50
28	0.71	0.83	0.62	0.73
38	0.72	1.00	0.60	0.64
43	0.73	0.71	0.85	0.60
50	0.73	0.82	0.9	0.38
63	0.73	0.64	0.74	0.82
27	0.74	0.82	0.62	0.87
65	0.75	0.60	0.90	0.56
18	0.76	0.83	0.71	0.75
64	0.77	1.00	0.71	0.67

(Table 5.23. continues)

Table 5.23. Ranked Means of Importance (negative 1 to positive 1)

Item	Entire Panel*	Academics	Administrator	IT Pros.
46	0.79	0.64	0.83	0.83
13	0.79	0.83	0.8	0.73
12	0.79	0.85	0.73	0.85
35	0.8	0.50	0.90	0.83
25	0.8	1.00	0.75	0.71
62	0.83	1.00	0.74	0.85
31	0.85	0.64	1.00	0.83
67	0.85	0.75	1.00	0.69
55	0.85	1.00	0.79	0.82
44	0.86	1.00	0.89	0.67
23	0.87	1.00	0.80	0.86
81	0.87	1.00	0.82	0.83
49	0.87	0.82	0.91	0.83
8	0.87	0.83	0.90	0.87
42	0.90	1.00	0.90	0.82
37	0.90	1.00	0.90	0.83
54	0.91	0.83	0.91	1.00
82	0.91	0.82	0.91	1.00
84	0.91	1.00	0.91	0.85
29	0.91	1.00	0.90	0.86
21	0.92	1.00	0.91	0.88
83	0.92	1.00	0.82	1.00
33	0.95	0.83	1.00	1.00
32	0.95	1.00	1.00	0.85
22	0.96	1.00	0.91	1.00
2	0.96	1.00	0.91	1.00

(Table 5.23. continues)

Table 5.23. Ranked Means of Importance (negative 1 to positive 1)

Item	Entire Panel*	Academics	Administrator	IT Pros.
5	0.96	1.00	0.92	1.00
19	0.96	1.00	1.00	0.88
30	0.96	0.83	1.00	1.00
7	0.96	1.00	0.91	1.00
14	0.96	1.00	0.92	1.00
1	0.96	1.00	1.00	0.88
11	0.96	0.83	1.00	1.00
68	0.96	0.82	1.00	1.00
34	1.00	1.00	1.00	1.00
66	1.00	1.00	1.00	1.00
45	1.00	1.00	1.00	1.00
4	1.00	1.00	1.00	1.00
85	1.00	1.00	1.00	1.00

Notes. *In ascending order by panel means

Scale: Not at all important and of little importance = negative (-) 1

Important and Highly important = positive (+) 1

Table 5.24. Panel's Top 10 Probability Means Ranked

Panel Rank	Item No. and Statement	Academic Rank	Administrators Rank	IT Profs Rank
1	[56] IT and the Internet will be critical components of the post-secondary institution's strategies.	1 tie	2	1 Tie
2	[66] The use of the web by colleges, universities and polytechnics will become essential to the educational experience.	2 tie	1	2
3	[57] IT and Internet access and use will become universal and ubiquitous in higher education institutions.	2 tie	4	1 tie
4	[5] Online access to higher education learning resources will be implemented 24 hours/day, 7 days/week, 365 days/year.	1 tie	3	3
5	[45] Market analysis of online higher education and training programs will be essential where public and for-profit organizations compete aggressively.	3	7	5 tie
6	[59] Mobile and wireless technologies will affect the design and structure of learning spaces both on- and off-campuses.	10	5 Tie	4 tie
7	[85] Online higher education will challenge the mandate of colleges and universities about how far geographically their mission extends.	4	12	6
8	[21] A 'virtual' community of scholars will thrive due to IT and the Internet where time and space barriers will be eliminated.	6	8	9 Tie
9	[72] More business-like behaviour will be required of the academy in the administration and marketing of technology-based services.	9	16 Tie	4 Tie
10 Tie	[1] Many learners will expect courses and programs to be delivered on the web.	2	21 Tie	7 Tie
10 Tie	[2] Online students (learning via the Internet) will have more choice and control over the timing, location and format of their learning agendas than will exist on-campus.	6	9 Tie	12 Tie

Table 5.25. Panel's Top 10 Importance Means Ranked

Panel Rank	Item No. and Statement	Acad. Rank	Adm. Rank	IT Rank
1	[66] The use of the web by colleges, universities and polytechnics will become essential to the educational experience.	1	1	3
2	[56] IT and the Internet will be critical components of the post-secondary institution's strategies.	2	2 Tie	2
3	[57] IT and Internet access and use will become universal and ubiquitous in higher education institutions.	6	3 Tie	1
4	[14] Most universities and colleges will change their overall approach to pedagogy to support a "new generation" of Internet-savvy learners who will demand more than a "stand-and-preach" lecturing format.	3	8	15
5	[5] Online access to higher education learning resources will be implemented 24 hours/day, 7 days/week, 365 days/year.	6 Tie	6	6
6	[58] The financial burden of continuing innovations in hardware, software and networks will challenge higher education institutions' funding.	9 Tie	2 Tie	9
7	[60] Trans-national agreements on software and telecommunication standards will emerge.	11	5	7
8 Tie	[45] Market analysis of online higher education and training programs will be essential where public and for-profit organizations compete aggressively.	7	7 Tie	11 Tie
8 Tie	[4] Online learners will demand pedagogically sound, technology-mediated courses compatible with their learning styles.	10	4	10
9	[85] Online higher education will challenge the mandate of colleges and universities about how far geographically their mission extends.	5	3 Tie	17 Tie
10	[67] Quick, easy, seamless Enterprise Resource Planning (ERP) computing systems (an administrative portal) will facilitate a "virtual campus" experience, dovetailing with existing enrollment, records, financial and other systems.	9 Tie	7 Tie	11 Tie

Table 5.26. Panel Ranked Means of Probability

Item No	N	Mean	Std. Deviation
56	50	3.86	.35
66	49	3.82	.49
57	49	3.78	.42
5	53	3.75	.43
45	49	3.59	.50
59	49	3.57	.54
85	46	3.52	.55
21	52	3.50	.50
72	50	3.48	.58
2	53	3.47	.64
1	53	3.47	.77
67	44	3.45	.66
19	52	3.44	.57
51	50	3.44	.64
34	48	3.44	.54
11	53	3.43	.60
58	49	3.43	.65
54	50	3.42	.61
22	53	3.42	.57
60	47	3.40	.58
32	47	3.40	.54
18	52	3.38	.82
4	52	3.37	.63
83	49	3.33	.59
80	49	3.31	.58
68	47	3.28	.54
77	50	3.26	.69
49	50	3.24	.56
7	53	3.23	.61
12	50	3.20	.61
30	51	3.20	.53
84	50	3.18	.63
37	41	3.17	.59
44	43	3.14	.64
14	53	3.11	.82
70	47	3.11	.76
82	47	3.09	.58
29	49	3.08	.57
62	49	3.06	.59
8	49	3.06	.75
65	46	3.00	.67
43	37	2.97	.83

(Table 5.26 cont.)

Table 5.26. Panel Ranked Means of Probability

Item No.	N	Mean	Std. Deviation
25	48	2.96	.74
74	48	2.96	.77
75	46	2.96	.79
35	40	2.93	.86
76	38	2.92	.75
33	46	2.91	.63
52	48	2.90	.66
81	46	2.89	.71
23	48	2.88	.70
28	52	2.87	.74
55	44	2.86	.67
47	49	2.86	.74
24	50	2.80	.67
78	49	2.76	.66
63	49	2.73	.67
69	41	2.73	.67
13	51	2.73	.72
3	46	2.72	.69
31	40	2.70	.61
64	49	2.69	.62
53	42	2.69	.72
16	48	2.67	.91
6	53	2.64	.71
50	48	2.60	.68
26	50	2.56	.73
10	48	2.54	.82
79	45	2.51	.69
71	43	2.49	.77
17	53	2.47	.89
48	45	2.40	.81
20	51	2.39	.83
46	48	2.27	.54
61	44	2.23	.89
41	47	2.19	.71
42	39	2.18	.76
36	43	2.16	.87
73	44	2.09	.64
9	46	2.02	.61
15	49	1.96	.64
39	49	1.90	.74
38	47	1.68	.66
27	52	1.58	.64
40	49	1.33	.52

Table 5.27. Panel Ranked Importance Means & SD

Item No.	N	Mean	Std. Deviation
66	47	3.74	.44
56	48	3.67	.48
57	48	3.65	.48
14	51	3.55	.54
5	52	3.52	.54
58	47	3.51	.55
60	44	3.48	.51
4	50	3.46	.50
45	46	3.46	.50
85	44	3.45	.50
67	41	3.44	.63
21	52	3.42	.57
59	45	3.40	.58
72	47	3.36	.61
84	47	3.36	.57
11	50	3.36	.53
32	43	3.35	.53
8	47	3.34	.67
22	51	3.33	.52
30	49	3.31	.51
2	50	3.30	.51
19	51	3.29	.50
1	52	3.29	.50
51	48	3.27	.61
68	45	3.27	.50
34	47	3.26	.44
78	47	3.26	.53
37	40	3.25	.63
33	44	3.25	.49
82	46	3.24	.52
23	46	3.24	.64
70	42	3.24	.69
29	47	3.23	.52
54	47	3.23	.52
12	48	3.23	.63
7	48	3.21	.46
83	48	3.21	.50
31	41	3.20	.56
44	42	3.19	.55
62	48	3.19	.57
81	45	3.18	.53
27	47	3.15	.75
43	30	3.13	.73
35	40	3.13	.72
75	41	3.12	.56

(Table 5.27 cont.)

Table 5.27. Panel Ranked Importance Means & SD

Item No.	N	Mean	Std. Deviation
77	50	3.12	.66
38	43	3.12	.70
49	46	3.11	.48
55	39	3.10	.60
42	40	3.10	.44
74	46	3.09	.63
25	40	3.08	.53
73	42	3.07	.56
10	43	3.07	.63
18	49	3.06	.56
50	45	3.04	.56
63	45	3.04	.56
47	47	3.04	.59
69	37	3.03	.55
80	43	3.02	.51
61	44	3.02	.66
17	46	3.02	.83
13	47	3.02	.49
28	48	3.00	.55
76	38	3.00	.62
46	47	2.98	.44
64	44	2.98	.46
65	40	2.98	.58
9	42	2.95	.66
79	41	2.95	.63
24	43	2.93	.63
40	46	2.91	.81
20	45	2.91	.60
53	38	2.89	.69
52	43	2.88	.66
41	42	2.88	.59
71	41	2.88	.56
36	37	2.86	.82
48	40	2.85	.62
26	44	2.82	.62
16	43	2.77	.72
6	48	2.71	.58
39	47	2.70	.75
3	44	2.66	.64
15	45	2.64	.80

Table 5.28. Academics Ranked Means of Importance

Item No.	N	Mean	Std. Deviation
66	12	3.83	.39
56	11	3.73	.47
14	12	3.67	.49
77	13	3.62	.51
85	10	3.60	.52
72	12	3.58	.51
57	12	3.58	.51
5	12	3.58	.51
45	11	3.55	.52
21	13	3.54	.52
67	8	3.50	.76
62	12	3.50	.52
58	10	3.50	.53
53	8	3.50	.53
4	13	3.46	.52
60	11	3.45	.52
59	9	3.44	.53
84	12	3.42	.51
29	12	3.42	.51
23	12	3.42	.51
32	10	3.40	.52
37	8	3.38	.52
81	11	3.36	.50
38	12	3.33	.49
30	12	3.33	.65
76	9	3.33	.71
55	9	3.33	.50
51	12	3.33	.65
44	12	3.33	.49
22	12	3.33	.49
7	13	3.31	.48
12	13	3.31	.63
74	11	3.27	.65
52	11	3.27	.47
49	11	3.27	.65
78	12	3.25	.62
34	12	3.25	.45
10	12	3.25	.75
8	12	3.25	.87
1	13	3.23	.44
2	13	3.23	.44

(Table 5.28 cont.)

Table 5.28. Academics Ranked Means of Importance

Item No.	N	Mean	Std. Deviation
70	10	3.20	.92
68	11	3.18	.60
64	11	3.18	.40
61	11	3.18	.87
50	11	3.18	.60
33	12	3.17	.58
54	12	3.17	.58
47	12	3.17	.72
11	12	3.17	.58
83	13	3.15	.38
69	7	3.14	.38
43	7	3.14	.69
36	9	3.11	.60
25	10	3.10	.32
75	10	3.10	.74
73	10	3.10	.57
82	11	3.09	.54
63	11	3.09	.70
31	11	3.09	.70
27	11	3.09	.54
19	11	3.09	.30
28	12	3.08	.51
80	10	3.00	.47
79	7	3.00	1.00
71	10	3.00	.67
42	8	3.00	.00
41	10	3.00	.82
39	11	3.00	.63
26	10	3.00	.47
18	12	3.00	.43
13	12	3.00	.43
40	12	2.92	.79
24	12	2.92	.67
46	11	2.91	.54
48	10	2.90	.57
16	10	2.90	.74
17	9	2.89	.93
65	10	2.80	.42
15	10	2.80	.79
3	8	2.75	.71
20	11	2.73	.47
9	10	2.70	.82
35	8	2.62	.74
6	11	2.55	.52

Table 5.29. Administrators Ranked Importance Means

Item No.	N	Mean	Std. Deviation
66	22	3.73	.46
58	24	3.54	.59
56	24	3.54	.51
85	21	3.52	.51
57	23	3.52	.51
4	22	3.50	.51
60	23	3.48	.51
5	24	3.46	.59
45	22	3.45	.51
8	20	3.45	.60
67	20	3.45	.51
14	24	3.42	.58
59	23	3.39	.50
22	23	3.39	.58
21	23	3.39	.58
1	23	3.39	.50
84	22	3.36	.58
35	20	3.35	.59
2	23	3.35	.57
19	24	3.33	.48
82	22	3.32	.57
51	23	3.30	.47
11	23	3.30	.47
70	20	3.30	.57
33	20	3.30	.47
32	20	3.30	.47
72	22	3.27	.55
30	22	3.27	.46
68	22	3.27	.46
78	23	3.26	.54
43	13	3.23	.60
54	22	3.23	.53
83	22	3.23	.61
31	18	3.22	.43
37	20	3.20	.70
34	22	3.18	.39
81	22	3.18	.59
7	22	3.18	.50
44	18	3.17	.51
69	18	3.17	.51

Table 5.29 (cont.)

Table 5.29. Administrators Ranked Importance Means

75	20	3.15	.59
73	20	3.15	.59
29	21	3.14	.48
50	21	3.14	.48
12	22	3.14	.64
25	16	3.13	.62
23	20	3.10	.55
65	21	3.10	.44
42	21	3.10	.44
49	23	3.09	.42
55	19	3.05	.52
13	20	3.05	.51
80	21	3.05	.50
18	21	3.05	.59
62	23	3.04	.56
9	18	3.00	.59
63	23	3.00	.52
47	23	3.00	.43
77	24	2.96	.55
46	24	2.96	.36
28	21	2.95	.59
27	21	2.95	.86
76	19	2.95	.52
24	17	2.94	.56
10	17	2.94	.66
74	23	2.91	.60
79	22	2.91	.61
64	21	2.90	.44
38	20	2.90	.72
48	20	2.90	.55
20	19	2.89	.66
36	16	2.88	.81
17	22	2.86	.94
6	21	2.86	.57
71	21	2.86	.48
61	20	2.85	.59
52	21	2.81	.60
41	21	2.76	.44
40	23	2.74	.92
53	19	2.74	.45
3	22	2.64	.66
26	21	2.62	.67
16	18	2.61	.92
39	23	2.52	.85
15	20	2.40	.88

Table 5.30. IT Professionals Ranked Importance Means

Item No.	N	Mean	Std. Deviation
57	13	3.92	.28
56	13	3.85	.38
66	13	3.69	.48
14	15	3.67	.49
11	15	3.60	.51
5	16	3.56	.51
60	10	3.50	.53
27	15	3.47	.64
58	13	3.46	.52
4	15	3.40	.51
59	13	3.38	.77
45	13	3.38	.51
34	13	3.38	.51
67	13	3.38	.77
32	13	3.38	.65
19	16	3.38	.62
21	16	3.38	.62
17	15	3.33	.49
68	12	3.33	.49
30	15	3.33	.49
72	13	3.31	.75
84	13	3.31	.63
54	13	3.31	.48
12	13	3.31	.63
2	14	3.29	.47
23	14	3.29	.83
40	11	3.27	.47
38	11	3.27	.79
8	15	3.27	.59
37	12	3.25	.62
31	12	3.25	.62
78	12	3.25	.45
74	12	3.25	.62
33	12	3.25	.45
22	16	3.25	.45
85	13	3.23	.44
83	13	3.23	.44
82	13	3.23	.44
29	14	3.21	.58
1	16	3.19	.54
42	11	3.18	.60
70	12	3.17	.72
61	13	3.15	.55
62	13	3.15	.55

Table 5.30 (cont.)

Table 5.30. IT Professionals Ranked Importance Means

Item No.	N	Mean	Std. Deviation
51	13	3.15	.80
7	13	3.15	.38
18	16	3.12	.62
75	11	3.09	.30
63	11	3.09	.54
46	12	3.08	.51
44	12	3.08	.67
35	12	3.08	.79
10	14	3.07	.47
9	14	3.07	.62
20	15	3.07	.59
80	12	3.00	.60
47	12	3.00	.74
13	15	3.00	.53
49	12	3.00	.43
43	10	3.00	.94
41	11	3.00	.63
28	15	3.00	.53
26	13	3.00	.58
25	14	3.00	.55
81	12	3.00	.43
79	12	3.00	.43
55	11	3.00	.77
24	14	2.93	.73
77	13	2.92	.76
73	12	2.92	.51
64	12	2.92	.51
65	9	2.89	.93
15	15	2.87	.64
16	15	2.87	.35
76	10	2.80	.63
71	10	2.80	.63
50	13	2.77	.60
39	13	2.77	.60
69	12	2.75	.62
53	11	2.73	.90
48	10	2.70	.82
36	12	2.67	.98
3	14	2.64	.63
52	11	2.64	.81
6	16	2.63	.62

Table 5.31. Panel Ranked Means and SD of Timing

Item No.	N	Mean	S.D.	Variance	Skewness
79	36	2.81	.82	.675	.384
27	31	2.71	.97	.946	.174
16	38	2.66	.75	.555	.249
75	42	2.55	.86	.742	.327
44	41	2.51	.84	.706	.093
82	45	2.51	.84	.710	.441
78	42	2.43	.70	.495	.487
61	28	2.39	.79	.618	.628
43	32	2.38	.79	.629	.440
20	40	2.37	.93	.856	.591
17	35	2.37	.84	.711	.431
13	49	2.37	.86	.737	.226
48	32	2.34	.65	.426	.997
26	37	2.32	.85	.725	.444
53	33	2.30	.92	.843	.368
47	40	2.30	.82	.677	.541
76	33	2.27	.80	.642	.616
80	42	2.26	1.01	1.027	.471
49	47	2.23	.63	.401	.847
81	41	2.22	.72	.526	.050
39	28	2.18	.72	.522	.347
46	36	2.17	.77	.600	.868
10	42	2.17	.73	.533	.915
55	40	2.15	.70	.490	.258
50	40	2.13	.82	.676	.924
73	32	2.12	.91	.823	.571
71	33	2.12	.78	.610	.618
19	43	2.12	1.07	1.153	.606
41	31	2.10	.87	.757	.129
63	42	2.10	.76	.576	.540
35	38	2.08	.67	.453	.469
6	43	2.07	.63	.400	.540
30	48	2.04	.71	.509	1.040
33	42	2.02	.64	.414	1.133
54	47	2.02	.77	.586	.570
83	47	2.00	.66	.435	.950
3	35	2.00	.54	.294	.000
74	44	1.98	.85	.720	.522
67	43	1.95	.65	.426	.583
52	42	1.95	.73	.534	.861
14	48	1.94	.76	.570	.414
60	47	1.94	.76	.583	.722

(Table 5.31 cont.)

Table 5.31. Panel Ranked Means and SD of Timing

Item No.	N	Mean	S.D.	Variance	Skewness
28	46	1.93	.71	.507	.868
25	44	1.93	.66	.437	1.084
70	42	1.93	.68	.458	.086
36	22	1.91	.68	.468	1.097
15	27	1.89	.80	.641	1.181
69	33	1.88	.74	.547	.692
84	43	1.84	.69	.473	.682
59	47	1.83	.76	.579	.610
51	47	1.83	.67	.449	.663
40	20	1.80	.77	.589	.372
23	44	1.80	.70	.492	.731
8	47	1.79	.66	.432	.251
9	42	1.79	.65	.416	.228
77	48	1.77	.66	.436	.745
65	39	1.77	.48	.235	-.571
64	38	1.76	.59	.348	.090
68	46	1.74	.61	.375	.204
85	45	1.71	.66	.437	.885
34	48	1.71	.62	.381	.271
22	49	1.69	.77	.592	.882
32	46	1.67	.79	.625	.946
4	51	1.67	.59	.347	.227
18	50	1.66	.59	.351	.258
57	47	1.64	.67	.453	1.030
21	51	1.63	.82	.678	1.026
29	47	1.62	.68	.459	1.088
37	29	1.59	.50	.251	-.369
42	33	1.58	.50	.252	-.321
12	49	1.57	.50	.250	-.298
38	28	1.57	.57	.328	.338
31	40	1.55	.50	.254	-.209
45	46	1.54	.66	.431	1.309
72	48	1.54	.62	.381	.685
24	41	1.51	.68	.456	1.490
56	47	1.49	.59	.342	.723
2	51	1.43	.54	.290	.683
66	48	1.42	.58	.333	1.032
5	53	1.42	.63	.401	1.747
62	41	1.41	.63	.399	1.903
7	52	1.40	.53	.285	.803
58	45	1.36	.53	.280	1.100
1	53	1.28	.50	.245	1.476
11	52	1.27	.45	.201	1.072

Table 5.32. Round 3 Item Numbers Cross-Referenced to Themes

Item Number	Theme	Table No.Level of Consensus
1	Widespread use of web	5.14
2	Learner focus	5.16
3*	*dropped from analysis*	*n/a*
4	Learner focus	5.16
5	Student Access/equity	5.18
6*	*dropped from analysis*	*n/a*
7	Roles of faculty and staff	5.12
8	Online learning tools	5.17
9***	Competitive Market conditions	5.9
10**	Globalisation/internationationalism	5.10
11	Roles of faculty and staff	5.12
12	Competitive Market conditions	5.9
13**	Online learning tools	5.17
14	Learner focus	5.16
15***	Online learning tools	5.17
16**	Online learning tools	5.17
17**	Values in education	5.19
18	Organization and infrastructure	5.7
19	Competitive Market conditions	5.9
20**	Roles of faculty and staff	5.12
21	Roles of faculty and staff	5.12
22	Widespread use of web	5.14
23	Job security and rewards	5.11
24	Job security and rewards	5.11
25	Roles of faculty and staff	5.12
26**	Roles of faculty and staff	5.12
27***	Organization and infrastructure	5.7
28	Job security and rewards	5.11
29	Roles of faculty and staff	5.12
30	Roles of faculty and staff	5.12
31**	Intellectual Property	5.13
32	Intellectual Property	5.13
33	Intellectual Property	5.13

Table 5.32. Round 3 Item Numbers Cross-Referenced to Themes

Item Number	Theme	Table No. Level of Consensus
34	Competitive Market conditions	5.9
35	Widespread use of web	5.14
36**	Online learning tools	5.17
37	Job security and rewards	5.11
38***	Funding and Efficiency	5.8
39***	Job security and rewards	5.11
40***	Values in education	5.19
41***	Job security and rewards	5.11
42**	Student Access/equity	5.18
43	Online learning tools	5.17
44	Widespread use of web	5.14
45	Competitive Market conditions	5.9
46***	Competitive Market conditions	5.9
47**	Globalisation/internationationalism	5.10
48**	Globalisation/internationationalism	5.10
49	Competitive Market conditions	5.9
50**	Competitive Market conditions	5.9
51	Globalisation/internationationalism	5.10
52	Degrees-Certification-Accreditation	5.15
53**	Values in education	5.19
54	Globalisation/internationationalism	5.10
55	Governmental	5.6
56	Widespread use of web	5.14
57	Widespread use of web	5.14
58	Funding and Efficiency	5.8
59	Organization and infrastructure	5.7
60	Globalisation/internationationalism	5.10
61**	Funding and Efficiency	5.8
62	Organization and infrastructure	5.7
63**	*dropped from analysis*	5.7
64**	Funding and Efficiency	5.8

Table 5.32. Round 3 Item Numbers Cross-Referenced to Themes

Item Number	Theme	Table No. Level of Consensus
65	Globalisation/internationationalism	5.10
66	Widespread use of web	5.14
67	Organization and infrastructure	5.7
68	Funding and Efficiency	5.8
69**	Job security and rewards	5.11
70	Organization and infrastructure	5.7
71**	Governmental	5.6
72	Funding and Efficiency	5.8
73***	Governmental	5.6
74	Competitive Market conditions	5.9
75	Degrees-Certification-Accreditation	5.15
76	Degrees-Certification-Accreditation	5.15
77	Competitive Market conditions	5.9
78	Student Access/equity	5.18
79**	Values in education	5.19
80	Widespread use of web	5.14
81	Funding and Efficiency	5.8
82	Student Access/equity	5.18
83	Student Access/equity	5.18
84	Values in education	5.19
85	Globalisation/internationationalism	5.10

Notes:

* No consensus on probability or importance

** No consensus

***Consensus not probable