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TOWARDS THE VIRTUAL CLASS: KEY MANAGEMENT ISSUES IN TERTIARY EDUCATION

by

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Victoria University of Wellington

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ABSTRACT

This study set out to identify what the key management issues are when implementing the virtual class within conventional tertiary education in New Zealand. It endeavoured to do this by establishing how the implementation of the virtual class infrastructure as well as the operations of the virtual class within conventional tertiary education are to be managed.

The expression “virtual class” as used in this study refers to the phenomenon of a class based on Internet and Intranet technologies, called networked education.

The action research approach that was followed, used the implementation of networked education at Wellington Polytechnic as its primary case study.

The outcome of this study is embodied in a set of heuristics as a tentative model for managing the implementation of the virtual class infrastructure in conventional tertiary education as well as in a description of a new tentative educational management paradigm for the virtual class, called networked educational management.

In this research it will further be suggested that the diffusion of innovation theory of Everett Rogers (1983), which proposes a bottom-up approach when the innovation emerges from outside senior management, needs to be augmented by a top-down component, which includes both senior and middle management for effective diffusion of the virtual class in conventional tertiary education.

This research questions whether conventional tertiary education is capable of adapting its management approaches and processes to the extent that is required for the effective and widespread use of the virtual class.

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I take full responsibility for any shortcomings in this research.

RELATED PUBLICATIONS AND PAPERS

A number of the interim research findings were explored by the author in publications and papers, which thus allowed for the findings of this study to be scrutinised and commented on by peers both nationally and internationally.

The details are:

Butterfield, S., Chambers M., Moseley, B., Prebble, T., Uys, P., Woodhouse, D. (1999). External quality assurance for the virtual institution. (AAU Series on Quality Number 4). Wellington, New Zealand: Academic Audit Unit.

Uys, P.M. (1999, July). Towards the Virtual Class: Technology Issues from a Fractal Management Perspective. Proceedings of the ED-MEDIA 99-World Conference on Educational Multimedia, Hypermedia & Telecommunications. Seattle, USA: AACE

Uys, P.M. (1999, January). Towards the Virtual Class in Southern Africa: Vision, Myths and Realities. Keynote address presented at the Technology in Interactive Education (TIE) Conference, Durban, South Africa.

Uys, P.M. (1998). Towards the Virtual Class: On-line Hypermedia in Higher Education, 55-72. In Hazemi, R., Hailes, S. & Wilbur, S. (Eds). The Digital University: Reinventing the Academy. 55-72) London: Springer-Verlag.

Uys, P.M. (1998, April). New Educational Technology And The Global Village: Key Management Issues In Higher Education. Proceedings of Towards the Global University: Strategies for the Third Millennium Conference. Tours, France: University of Central Lancashire.

Uys, P.M. (1998, June). From Vision to Reality: The Development of Distributed On-line Education at Wellington Polytechnic. Proceedings of TFL '98 - New Dimensions in the Application of Technology for Education Conference. Palmerston North: Massey University

Uys, P.M. (1997, October). Towards the virtual class: trends in cyberspace education.
a) Paper presented at Virtual Technologies in Tertiary Education: A Vision for New Zealand Conference, Auckland, New Zealand
and in
b) Zepke, N. (Ed.). (1998) Connections, 47, Wellington, New Zealand.

Uys, P.M. (1997a, June). Managing a hypermedia courseware development project: dynamics and conclusions. Proceedings of 18th World International Council for Distance Education Conference. Pennsylvania: ICDE.

Uys, P.M. (1997b, June). Supporting cyber students over the Web: the on-line campus of Wellington Polytechnic. Proceedings of 18th World International Council for Distance Education Conference. Pennsylvania: ICDE.

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CHAPTER 1
INTRODUCTION

This research reports the findings of a three-and-a-half year study that started in July 1995 and examined what key management issues are involved when implementing the virtual class (Tiffin and Rajasingham, 1995) in conventional tertiary education in New Zealand.

Over this period a study was also made of the endeavours to manage the implementation of the virtual class infrastructure and the operations of the virtual class at Wellington Polytechnic, a conventional tertiary educational institute in New Zealand. The interim findings of this research were compared to similar developments in New Zealand and elsewhere. The author was the project manager (a part-time role) for implementing the virtual class infrastructure at Wellington Polytechnic during the research period.

By definition, the *virtual class* equates to the process that occurs when teacher, learner, problem and knowledge interact through information and communication technologies (ICT) for the purpose of learning (Tiffin and Rajasingham, 1995). The manifestation of the virtual class used in this study occurs through the interaction of the teacher, learner, problem and knowledge by means of Internet- and intranet-based technologies called *networked education*. An intranet is an internal network on which documents are viewed by using a Web browser (Cher, 1995; Gundry and Metes, 1997). These two terms, *virtual class* and *networked education* are used interchangeably throughout this study.

The term "*management*" is used in a broad sense to describe planning, organising, leading and control (Schultheis and Sumner, 1989:65) at all levels within a tertiary educational institute. It relates to management processes of the institute, administrative departments, academic departments, the design and development of the teaching materials, the actual delivery of the teaching materials and the students' own management of their learning.

Conventional tertiary education in this study is a term referring to post-compulsory public educational institutes that are funded predominantly through the state to which it also has a central reporting responsibility. Such education further has clearly defined administrative and academic components, does not differentiate between their students on a cultural or racial base and, furthermore, has a strong focus on face-to-face education as learning and teaching occur physically "on-campus".

The virtual class is seen as integral to the operations of the emerging information society or information age (Tiffin, 1996b). The research period brought to light various pointers to the continued emergence of an information or knowledge society both in New Zealand and in the developing world at large. This information or knowledge society is emerging from an industrial society in which physical production technologies strongly influenced the forms of service and way of living, and physical means were being used to create new value for the customer. Tapscott (1996:43) states that "it is fairly widely accepted that the developed world is changing from an industrial economy based on steel, automobiles, and roads to a new economy built on silicon, computers and networks. Many people talk of a shift in economic relationships that's as significant as the previous displacement of the agricultural age by the industrial age". Marquardt (1996:6) asserts that "according to leading futurists and business leaders, we have clearly entered the *knowledge era*; the new economy is a *knowledge economy*. Knowledge provides the key raw material for wealth creation and is the fountain of personal and organizational power". Drucker (1995:65) calls the society in which tertiary education currently operates the "networked society" because of the centrality of networking with other organisations through alliances, partnerships and outsourcing. The network society is a term that also incorporates the notion of an increasing number of people networking their abilities to different firms for longer or shorter periods.

Rajasingham (1999:166) points out that despite the wide penetration of ICT in New Zealand, there is a lack of ICT in tertiary education. Financial issues need to be addressed but also the management infrastructure within tertiary education: "while New Zealand has one of the highest per capita telecommunications access in the developed world, and the highest proportion of Internet users, educational institutions and schools (primary, secondary, and tertiary) seriously lack access to ICT. In an increasingly user-pay environment and with the stringent cuts in government funding, educational institutions can simply not afford ICT. While many institutions have centrally administered e-mail, the management infrastructure to integrate ICT into curriculum is not present". Moreover, the same author cites the Victoria University of Wellington, the Open Polytechnic and the Wellington Polytechnic (through the HYDI Educational New Media Centre) as examples of virtual education in New Zealand. Electronic operations, for instance in the banking and commerce sectors, have become prevalent in New Zealand and other developed countries through the use of automated teller machines (ATMs) and electronic funds transfer at point of sale (EFTPOS). Agricultural communications in New Zealand and abroad have also started to change due to the increased use of the Internet (Bridgeman, 1998).

To Beare and Slaughter (1993) the information or knowledge society is characterized by the fact that manufacturing industry and large-scale factory production are no longer the prime employers of a country's workforce. Tapscott (1996:xiii) describes this change as a communications revolution:

> A new medium of human communications is emerging, one that may prove to surpass all previous revolutions – the printing press, the telephone, the television – in its impact on our economic and social life. The computer is expanding from a tool for information management to a tool for communications. Interactive multi-media and the so-called information highway, and its exemplar the Internet, are enabling a new economy based on the networking of human intelligence. In this digital economy, individuals and enterprises create wealth by applying knowledge, networked human intelligence and effort to manufacturing, agriculture, and services... Such a shift in economic and social relationships has occurred only a handful of times before on this planet.

The emerging information or knowledge society is having an increasing impact on the concept and practice of tertiary education. Tapscott (1996:xv) notes that "the new media is changing the way we do business, work, learn, play, and even think". Hamilton (1990:69) highlights the relationship between the development of pedagogies and production technologies and notes that up to now there has been "handicraft", "domestic" and "batch" production within education. He states that the post-Fordist phase is one of continuous production which moves away from moving students "… through the curriculum in batches" as was integral to the "… emergence of industrialism and the early factory system" (Evans and Nation, 1993:201). Hamilton (1990) links the notion of continuous production to advances in information technology, which are closely linked with the concept of the virtual class.

Drucker (1989:259) asks in the context of the emerging information society "and will tomorrow's university be a 'knowledge center' that transmits information, rather than a place that students actually attend?" Garrison (1989:121) asserts that the "…status quo as represented by much of conventional education limits the pressing need to integrate learning and living in an information society". Peters (1993:53) contends that "the definite shifts described indicate that the organization of the learning process in the post-industrial society might become entirely different in many ways". Tiffin (1996b:1) believes that the "...concept of the virtual class is the kernel of a new educational paradigm that matches the needs of an information society". Tiffin further states that the "...virtual class is an Information Technology system for education and training which could become to an information society what the conventional classroom is to an industrial society, the core communication system for preparing people for the society they live in" (Tiffin, 1996:2). These observations are linked to the work of Heinrich (1970) who investigated the possibility that a new educational paradigm would be called for by societal changes and the advent of new technologies.

The virtual class can therefore be seen as an inevitable component within an emerging information or knowledge society in countries like New Zealand where information technology plays a key role in forms of service and way of life, and where information is used to create new value for the customer (Rayport and Sviokla, 1995).

Networked education, as defined in this study, uses the Internet and World Wide Web (WWW) technologies extensively. This research coincided with a time of dramatic growth in the use and size of the Internet and WWW. According to Gray (1999) the World Wide Web grew from and estimated 23,500 Websites in June 1996 to 230,000 in June 1997 and 650,000 in January 1998; an average annual growth of more than 1000%. The Internet in 1996 (Wizards, 1997) was represented (through domain names) in 129 countries and in July 1999 in 252 countries (Internet Software Consortium, 1999b), an average annual growth rate of over 30%. This correlates with data from the longest-running survey of Internet hosts (Glave, 1998) to the effect that the Internet itself has been growing at a rate of about 50 per cent per year over the research period covered here. The size of the Internet, based on the number of Internet hosts (which is the key measurement of the size of the Internet), tripled over the research period according to The Internet Software Consortium (1999c) (*see* Figure 1.1 *below*). The dramatic growth of Internet hosts is also illustrated by the annual growth rates over the research period, which in 1995 was 73%, in 1996 101%, in 1997 57% and in 1998 58% (Internet Software Consortium, 1999a). The Internet Software Consortium (1999c) depicts the exponential growth of the Internet in their latest survey as follows:

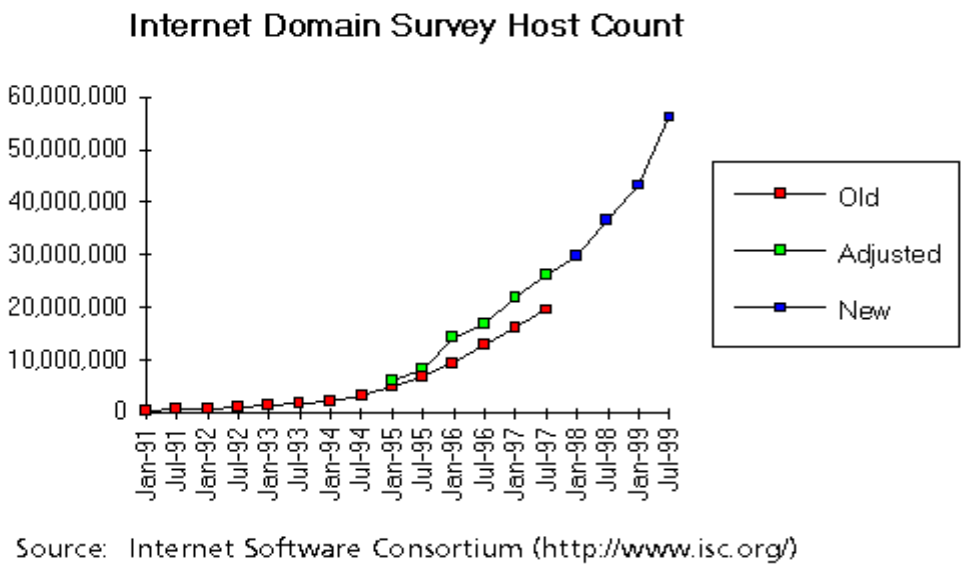

Figure 1.1 Internet growth (Internet Software Consortium, 1999c)

At the same time the profile of Internet users is undergoing a major change. McKenzie, (2000) remarks on this opening up of the original network of scientists and computer buffs to an increasingly vital communications medium serving the workplace and a rapidly growing number of households. The widespread use of and access to the Internet in New Zealand and elsewhere has contributed to the feasibility of offering networked education. The worldwide users of the Internet grew from an estimated 16 million in December 1995 (International Data Corporation, 1999) to 150 million in December 1998 (Nua Limited, 1999), which constitutes an average annual growth rate of nearly 300%. Internet Access business account holders in New Zealand increased between l995 and l996 by roughly 135% to just over 32,400 (Infotech, 1997). In New Zealand the Internet users in general grew from an estimated 327,290 in October 1997 to 561,300 in November 1998; a growth rate of 71% (IDC New Zealand, 1998).

The research period was further characterised by an exponential growth of interest in and spread of the virtual class as Farrell (1999:2) indicates "… the interest and activity in the concept we have called virtual education is extremely dynamic". Although Internet facilities like electronic mail, Gopher, Archie and UUNET, had been used widely by the academic community in tertiary education since the 1980s, the advent of the World Wide Web in 1991 has contributed to a new and wide interest in the use of the Internet in education. Berners-Lee (1999a), the inventor of the Word Wide Web (WWW) notes the steady annual rise, by a factor of 10, in the load on the first Web server ("info.cern.ch") between 1991 and 1994. In 1992 academia, and in 1993 industry, started taking notice. He was hoping that educators would pool their resources and create a huge supply of online materials; his fervent wish was for much of this to be available freely, especially to those in developing countries who may not have access to this material in any other way.

A search for the term "virtual class" for instance on the WWW search engine Alta Vista in 1995 by Tiffin and Rajasingham - when this research started - returned six documents all pointing back to themselves in New Zealand (J. Tiffin, personal communication, 18 April 1999). The same query in December 1999 returned more than 7000 documents pointing to a host of authors from countries including the United States of America, Australia, South Africa, United Kingdom, Hong Kong, Italy, Hungary, Taiwan, Spain, Brazil, Bulgaria, Germany, Norway and Japan.

The virtual class provides students with the ability to study at their own pace, and at their choice of time and place. The remarkable growth of interest in the virtual class might also be influenced by "...the emerging culture of post-modernism" (Hartley, 1995:420) which leads to increasing pressure for "...choice, flexibility and diversity" (Hartley, 1995:421). Another factor contributing to the growth of the virtual class might be the potential increase in the cost-effectiveness of delivery as Romiszowski (1993) points out that telecommunications costs are falling whereas the costs of educational space, staffing and transport are rising. This wide interest can also be linked to the pressure for change in educational policy referred to by Fullan (1991:17) as "… internal contradictions, such as when indigenous changes in technology lead to new social patterns and needs…"

The virtual class can also be seen as an educational response to the globalisation that has been occurring and accelerating in other fields like the economy (Holland, 1987; Tapscott,1996) and communications; as Frederick (1993:269) points out, "we now have the capability to communicate with virtually any other human being on our globe". In view of the globalisation and transnational exchanges in many fields (Marquardt, 1996:3), Evans and Nation (1993:7) indicate that in "… these circumstances politicians, policy-makers and citizens are making demands upon education systems to reform. Open learning and distance education are at the forefront of educational responses to the changes that are taking place locally, regionally, nationally and internationally". Networked education in particular seems to be an appropriate response to the environmental changes mentioned above.

There is optimism among many educators that the quality of learning can be enhanced through effective hypermedia environments within the virtual class. Hypermedia can be defined as multi-media (which includes text, movement, sound, pictures, colour) with hyper-links, which seamlessly transports the reader to other hypermedia materials (Uys, 1998). It could contribute to addressing two known problems in traditional distance education, which are a decrease in personal motivation and a sense of isolation (Stacey, 1997; Henri and Kaye, 1993:29-31). Both asynchronous (e-mail, message boards) and real time on-line communication facilities (voice, video, Internet Relay Chat and shared whiteboards over the Net) can be used very effectively to address these problems. Concerning educational materials on the WWW, Berners-Lee (1999b) remarked on the fact that it would show how essential people, and their wisdom, and their personal interactions, are to the educational process; a university is, after all, a lot more than its library. Effective networked courses have the potential to bridge the boundaries and limitations of time and space. It can provide for a variety of learning styles and various navigational paths through educational materials. It allows students to take more control of their learning and develop "life" skills like time management and research skills. The virtual class allows them to set their own study plans, search for WWW resources and critically evaluate its validity. Lundin (1993:13-16) argues that:

> The use of ODE [Open and Distance Education] and CIT [Communication and Information technologies] is at least as good, and in some instances better than face-to-face programs in terms of both student satisfaction and achievement as well as staff perceptions. Methods based on ODE and CIT can be effectively applied to every aspect of every subject in any curriculum given the appropriate design, media mix and learner support services.

Networked education is seen by some as a way to address the increase in the world demand for tertiary education. Daniel (1998:12) states that “one new university per week is required to keep pace with world population growth but the resources necessary are not available. Higher education must develop more cost-effective methods so that public resources can be focussed on schools and youth training”. Bates (1999) concurs that by using technology for teaching universities can serve the public more cost-effectively and in particular can prepare students better for a technologically based society.

The increased interest in the use of the Internet in education has been evident through papers and representation at national and international conferences like the International Council for Distance Education (ICDE) Conferences, the World Conferences on Educational Multimedia and Hypermedia (ED-MEDIA) and the World Conferences on Educational Telecommunications (ED-TELECOM). This interest is also evident in the extensive listings of networked courses at WWW sites like the World Lecture Hall (The University of Texas at Austin, 1998) the TeleCampus Online Course Directory (1999) and the Directory of Online Colleges, Internet Universities, and Training Institutes (Geteducated, 1999). Hanvey (1998), for instance, reported that by the middle of 1998 most Australian universities were offering some of their learning materials and courses via the WWW.

The large number of tertiary institutes in New Zealand and institutes internationally which have been engaged in implementing the virtual class have also been featuring in participation and representation of participants in electronic mail discussion lists such as DEOS-L, OCC-L and a New Zealand based list created by the author: OnLinEdu.

The interest shown in the virtual class by tertiary education institutes of New Zealand was evident at the Virtual Technologies in Tertiary Education: A Vision for New Zealand Conference held in Auckland, New Zealand in October 1997, at which more than a third of the universities and polytechnics in New Zealand were represented. Another example of this interest was the attendance at a small-scale local conference held in Palmerston North, New Zealand in July 1998 called "Technologies in Flexible Learning - New Dimensions in the Application of Technology for Education", where staff from the smaller to the largest tertiary institutes attended: Massey University, Auckland Institute of Technology, Taranaki Polytechnic, Waiariki Polytechnic, Whitireia Community Polytechnic, Waikato Polytechnic, Whanganui, UNITEC Institute of Technology, Manawatu Polytechnic, Wairarapa Community Polytechnic, Hutt Valley Polytechnic, Christchurch College of Education, Wellington College of Education and Wellington Polytechnic.

The implementation of networked education relates to a core management issue in tertiary education, as Holt and Thompson (1995:47) aptly say:

> All tertiary institutions -- whether they see themselves as being open and distance institutions or not -- are grappling with the challenge of information technology in relation to the very core of the academic enterprise: teaching and learning, research and scholarship.

Attempts to introduce any significant reform, as is the case with the introduction of networked education into the system of conventional tertiary education, will impact on all of its sub-systems. Bates (2000:196) contends that "…using technology to extend the campus on a global basis will affect all aspects of a university or college, but particularly administrative systems". Fullan (1991:349) refers to the necessity of looking at innovations within the framework of institutional development. The term "infrastructure" with reference to the virtual class in this research refers to the essential sub-systems that are required for the successful operation of the virtual class, which includes the systems pertaining to the technological architecture (the ICT systems), administration, management, instructional design, course development and delivery. Information and communication technologies (ICT) describe the collection of available information technologies and telecommunication technologies. Information technologies refer to the tools used for the "…collection, storage, processing, dissemination and use of information" (Richardson, 1979:121) and refer to entities like computer hardware, printers, servers, databases, computer programs and virtual reality. Telecommunication technologies refer to the means by which voice and data are transmitted and include technologies like telephones, modems, satellites, fibre optic cable, the Internet and intranets (Schultheis and Sumner, 1989; Stair,1992). Just as the conventional class needs a comprehensive infrastructure of roads, lecture halls, electricity, printing, administrative and management systems, the virtual class requires a similar, extensive but digital infrastructure.

A virtual organisation for Ahuja and Carley (1998) can be described as a geographically distributed organization whose members are bound by a long-term common interest or goal, and who communicate and co-ordinate their work through information technology This correlates with the concept of virtual educational institutes which "…differ from their conventional counterparts in that they rely on a telecommunication infrastructure rather than a transport infrastructure to bring together the essential elements of education…" (Tiffin, 1996b:1). Virtual educational institutes would thus deal primarily with the movement of bits of information rather than with the movement of atoms (Negroponte, 1995). Mason (1996; 1999:11) points out that those who claim to operate a global university need to have their students distributed across continents, have global operations of significance, their mission should include global education, telematics support needs to be present, materials and communications need to be available for global use. Virtual institutes in various formats have been emerging like the Global Virtual University (Global Virtual University, 1999) and Athena University (Mason, 1998:5). Butterfield, Chambers, Moseley, Prebble, Uys and Woodhouse (1999) point out that these innovations take many forms, and include the University of Phoenix, California Virtual University, DeVry Institute of Technology, Sylvan Learning Systems, Michigan Virtual Automotive College, and Jones International University. In addition, there are also diversification by existing institutions and government projects such as the Western Governors University.

1.1 Research problem

The research problem that this study seeks to address is what the key management issues are when implementing the virtual class in conventional tertiary education.

Conventional tertiary education faces the choice either of attempting to integrate the operations of the virtual class within current institutional policy and practice, or of a fundamental reform. Luke (1998) regards virtually all the rules that apply to face-to-face universities as impediments, if not total barriers to running a virtual university. Rayport and Sviokla (1995:75ff) argue that every organisation (including educational organisations) "...today competes in two worlds: a physical world of resources that managers can see and touch [the "place"] and a virtual world made of information [the "space"]". They illustrate and argue that these "...two value adding processes are fundamentally different" and that "...a company's executives must embrace an updated set of guiding principles because in the marketspace many of the business axioms that have guided managers no longer apply".

Luke 5:37-39 (the Bible, 1978) states that "...new wine should not be poured into old wineskins, because the old wineskins will break and the new wine will spill out. Those who are used to the old wine will not want the new wine because they say: "the old wine is better"." Jesus referred to the new life that He brings in contrast to the traditional religious practices of that time. This passage originally obviously did not deal with the virtual class, but it might be applicable to the emergence of the virtual class and the new management approaches it would require. The question is whether the virtual class is "new wine" or just another type of wine. Chou, McClintock, Moretti and Nix (1993) also used this metaphor to argue that he medium of print, for so long our almost exclusive means for preserving knowledge, has yielded significant ground to the remarkable storage and retrieval capacities of the computer. They further contend that, this loosening of the keystone of the modern educational past allows us to glimpse, and demands that we define, a new educational future no longer constrained and shaped by the exigencies of print/textbook-based education. Collis (1998) also reiterated this metaphor when she referred to the implementation of the virtual class at the University of Twente.

If the virtual class falls in the "new wine" category, it may have serious consequences for conventional educational institutes wishing to implement the virtual class without simultaneously reconstructing the management of their institutes. Thomas, Carswell, Price and Petre (1998) argue for a transformation of practices (both teaching and administrative) in order to take advantage of technology so as to provide needed functions, rather than superficial translation of existing practices. Bates (1999) argues that the introduction of the virtual class will prompt a thorough re-examination of the core practices of an organization, whether advertising, or registration, or design and delivery of materials, or student support or assessment of students, in order to arrive at the most effective way of providing these services in a networked, multimedia environment."

The hypothesis for this research is that tertiary education requires a new kind of educational management for managing the operations of the virtual class. Drucker (1998:100) believes that "… as soon as a company takes the first tentative steps from data to information, its decision processes, management structure, and even the way it gets its work done begin to be transformed" Paul (1990:72) argues that an institution that is dedicated to the values and practice of open learning needs to have an "open management style"

Drucker (1989:243) constructs an analogy between the introduction of computers in education and that of the book, and argues that a revolution in education based on the underlying technologies is occurring:

> The printed book, fiercely resisted by the schoolmasters of the fifteenth and sixteenth centuries, did not triumph until the Jesuits and Comenius created schools based on it in the late seventeenth century. From the beginning the printed book forced the schools however to change drastically how they were

> teaching…. We are in the early stages of a similar technological revolution, and perhaps an even bigger one.

Morrison (1995:189-190) claims that "'the late 19th century higher education model is increasingly unable to cope with the axial role higher education plays in most societies". Based on the new "… dynamics which intrude open higher education and training", Morrison argues that these challenge higher education on process issues: "*how* to access learning, *how* to organize research, *how* to manage institutions and systems…"

1.2 Objectives of this Study

This research aims to investigate the management of the implementation of the virtual class infrastructure, as well as the management of the operations of the virtual class in conventional tertiary education. It aims to address significant "how" issues as they relate to both of these aspects. Middlehurst (1993:189) supports the focus on management and states that one of the themes of change during the 1990s in the tertiary sector has been that

> … at all levels of the university, there has been an increase in the prominence of management, whether management of research, management of the teaching function, management of student learning, management within administration, self-management or the management of others.

Managing change in general and in conventional tertiary education in particular is however problematic and is poignantly expressed in the second law of Senge's Fifth Discipline(1990:58) "the harder you push, the harder the system pushes back". Senge (1990:7) ascribes this resistance to change also to our own subjectivity, stating that "since we are part of the lacework ourselves, it's doubly hard to see the whole pattern of change". It is therefore necessary, as Fullan (1991:350) suggests, "… that we explicitly think and worry about the change process" in educational reform.

This research aims to contribute to knowledge in that it endeavours to formulate a set of heuristics as a tentative model for managing the implementation of the virtual class infrastructure in conventional tertiary education (chapter 8). It further proposes a tentative new educational management paradigm for the operations of the virtual class (chapter 9).

Tiffin (1996:2) explores the term *paradigm* as “...an abstract system of integrated elements which can be drawn upon and applied in a practical manner to give substance to meaning”, for example language, and *syntagm* as a specific expression of a paradigm for example an actual discourse. Bertalanffy (1968:18) follows Kuhn (1962) in defining paradigms as “new conceptual schemas”. Management of the operations of the virtual class is considered as a new paradigm within this study, while managing the operations of the virtual class at Wellington Polytechnic is considered a syntagm that is a specific manifestation of this paradigm. This study also compares the findings over the research period at Wellington Polytechnic with syntagmatic expressions of the virtual class at other conventional tertiary educational institutes.

The paradigm and syntagm interact as management of the operations of the virtual class is being defined and tested through implementation. The interaction between paradigm and syntagm in this study also leads to a set of heuristics for managing the implementation of the virtual class infrastructure in conventional tertiary education. The research is graphically depicted in Figure 1.2 below.

1.3 Research Question

Various questions arise when considering the possible interplay between the virtual class and conventional tertiary education and the effects of this interaction on educational management. Which aspects need particular attention when managing the implementation of the virtual class in conventional tertiary education? Is it practicable for conventional tertiary education to embrace the virtual class within its current management practices, or is a totally new environment required to effectively engage in networked education? How is the management of conventional tertiary education affected and what changes are required when managing the operations of the virtual class?

The research problem translates into two related research questions:

A. how does one manage the implementation of the virtual class infrastructure in conventional tertiary education?
B. how does one manage the operations of the virtual class?

Addressing of these two research questions constitutes the overall aim of this study.

1.4 Research Approach

Action research methodology is used in this study as it reflects the interaction between paradigm and syntagm that is theory and practice. During the action research the theory influences the practice and the practice changes the theory. This is the case especially with management of the operations of the virtual class, which is a new paradigm, and its syntagmatic expressions which are essentially experimental or pilot (Tiffin, 1996).

It is typical for action research to occur as a spiral of research cycles each composed of a planning, executing and reflecting phase. Each research cycle represents a syntagmatic expression of the paradigm, which constitutes the management of the operations of the virtual class. This new paradigm changes with the execution of each research cycle as the conclusions of what occurred in practice are being incorporated in the formulation of the concept of virtual class management.

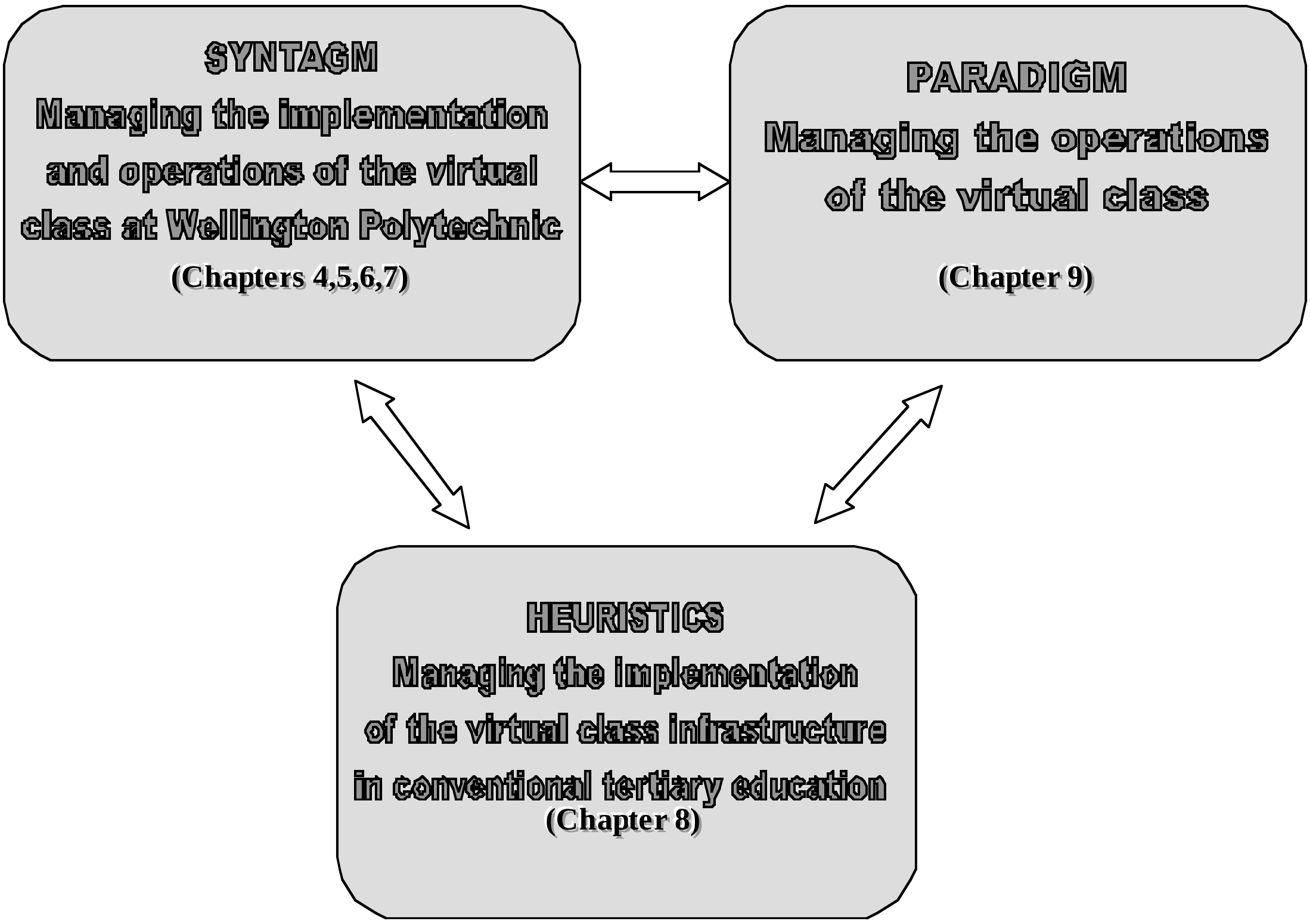

Figure 1.2 Graphical representation of the research

The execution of the research cycles was governed by the first research question, which deals with managing the implementation of the virtual class infrastructure in conventional tertiary education. This research question refers to the implementation of the virtual class infrastructure at Wellington Polytechnic, which was the central operational objective of the HYDI - HYpermedia in DIstance education - project. These cycles were envisaged from the commencement of the HYDI project as sequential operational stages (Appendix 2). The actual starting and concluding dates of the cycles were adjusted in some cases as the project progressed. Although these cycles were initially seen as sequential stages to implement networked education at Wellington Polytechnic, the pursuit of the aim of this research added an expansive cyclical dimension to these stages.

The author was the project manager for implementing the virtual class infrastructure at Wellington Polytechnic during the research period and worked closely with the HYDI team. The research objective of the author, however, led to the independent research analysis and synthesis presented in this thesis.

Any true innovation needs to be carried through from “invention” to “exploitation” (Roberts, 1997:581). Stair (1992:404) also describes an information system as being *operational* in that after systems implementation, the system will be up and running. In order therefore to address the first of the research questions, the implementation of the virtual class – being a technological innovation and also an information system - had to progress from invention to where it was being exploited commercially, that is enrolling students for networked courses. In order to address the second of the research questions, the implementation of the virtual class had to progress at least to the stage where networked education was operational, that is to the point where teacher, learner, problem and knowledge interact through Internet- and intranet-based technologies. In order to address each of the research questions, the action research therefore had to progress through four cycles to the point of fee-paying students enrolling and participating in networked courses at Wellington Polytechnic.

The implementation of the virtual class infrastructure at Wellington Polytechnic through the four action research cycles confirmed the comment by Fullan (1991:31) that "…all real change involves loss, anxiety, and struggle". Various obstacles challenged the implementation, but dealing with these obstacles ultimately contributed to the research findings. This innovation also experienced some of the problems that Fullan (1991:27) refers to when political change occurs, such as "… overload, unrealistic time-lines, uncoordinated demands, simplistic solutions, misdirected efforts, inconsistencies, and underestimation of what it takes to bring about reform." The findings of this research are based as much on what was learned from the mistakes that were made, as from the successes of the HYDI project.

This action research was carried out within the broader framework of systems thinking. Stoner (1989:56) describes this approach as one whereby an organisation is seen as a purposeful unit, which is composed of various inter-related parts or sub-systems. This corresponds directly with the definition of a system as a unit consisting of a set of inter-related components functioning together to achieve the objectives of that unit (Stair, 1992:5). Systems theory provides for feedback loops and self-correcting mechanisms that highlight the importance of control in systems design (Garrison, 1989:46). Furthermore all systems "…have a boundary that separates them from their environment" (Schultheis and Sumner, 1989:34).

Many writers like Miles (1980), Schoderbek (1985) and Stoner (1989) assert that an organisation, and the management of it, can be viewed as a system consisting of sub-systems. Senge (1990:7) endorsed this view when stating that "business and other human endeavours are also systems. They, too, are bound by invisible fabrics of interrelated actions which often take years to fully play out their effect on each other". Scott and Mitchell (1972) postulate that the only meaningful way to study an organisation is as a system. A conventional tertiary educational institute can thus be described in systems terms as consisting of five sub-systems representing the five factors of the MIT90 schema: strategy, roles and skills, structure, technology and management processes (Morton, 1991).

The systems approach, and specifically the open systems approach, is followed in this research because it has been used as a meaningful way to study an organisation (as noted above) and because it has been commended for its potential usefulness in synthesising and analysing complexity in organisations (Simon, 1969). The modern tertiary education institute is an open system and the complexity and speed of change in its environment is so vast, that questions may be asked as to whether chaos theory might not also be appropriate to use for this study (J. Tiffin, personal communication, 24 June 1998). However, the complexity of the modern organisation and its environment - which is also true of conventional tertiary education - and its interdependence with its environment, is integral to the open systems approach which emphasises the fact that the organisation is an open system, which exists in interdependence with its environment and where "… principles of multivariable interaction … become apparent, a dynamic organization of processes…" (Bertalanffy, 1968:154). Leavitt, Pinfield and Webb (1974) also recommended an open-systems approach for studying contemporary organisations which today exist in a fast-changing and turbulent environment; this has also become the case in conventional tertiary education. Bertalanffy (1968) argued that closed system theory cannot apply to what he called *open systems*, which is typical of living entities, including organisations in which the external environment is essential for their maintenance, survival, and growth. A systems approach to organisations acknowledges that they are open systems that engage in various modes of exchange over its boundaries with a complex environment (Katz and Kahn, 1966).

The systems approach emphasises that "a system is a whole that cannot be taken apart without loss of its essential characteristics, and hence must be studied as a whole" (Ackhoff, 1972:40). This emphasis also influenced the presentation of the research findings in terms of the MIT90s schema. This schema was defined during the "Management in the 1990's" research program (Morton, 1991). Yetton (1993) used it effectively in a study of the management of information technology (IT) in twelve Australian universities.

The MIT90 researchers investigated the impact of information technology on different types of organisations from a managerial perspective. The MIT90 schema is based on the concept that "an organisation can be thought of as comprised of five sets of forces in dynamic equilibrium among themselves" (Morton, 1991:18). These forces are strategy (that is how an organisation attempts to accomplish its objectives), roles and skills of individuals, organizational structure, technology and management processes.

This schema seemed appropriate because it highlights the centrality of management processes in the life of an organisation, it follows a systems approach, it provides an holistic framework for the analysis, and it has to do with the impact of IT - which is central to the implementation of the virtual class infrastructure in organisations.

The research findings relating to the first research question (*How does one manage the implementation of the virtual class infrastructure in conventional tertiary education?*) deal with four of the elements within the MIT90 schema: strategy, roles and skills of individuals, organizational structure and technology (*see* Figure 1.3). The findings are presented as a set of heuristics that represents a tentative model for managing the implementation of the virtual class infrastructure in conventional tertiary education (Chapter 8).

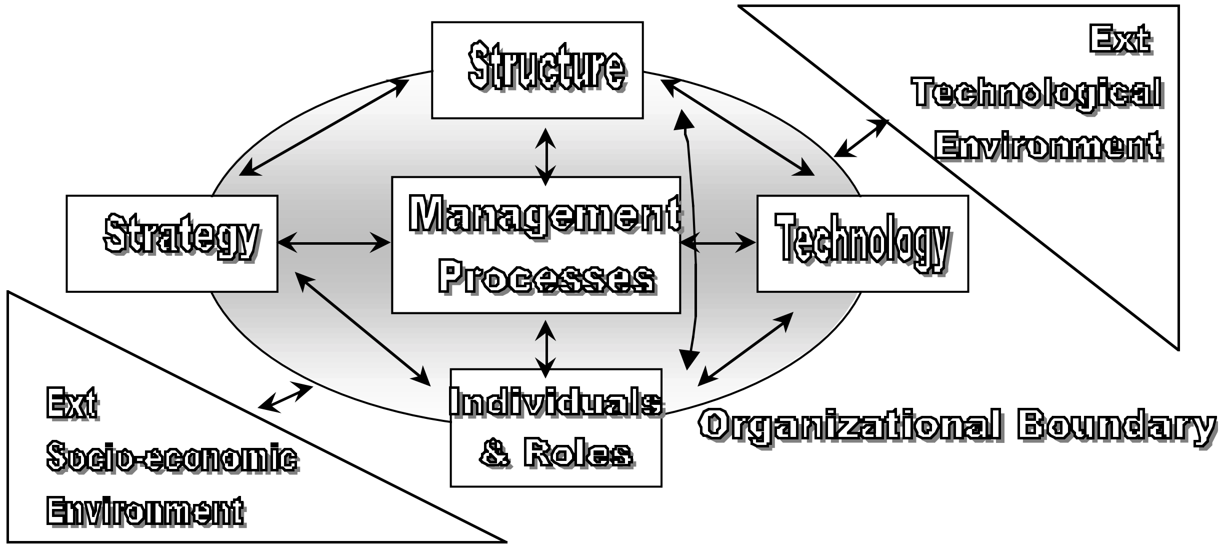

Figure 1.3 MIT90 Schema

The research findings in addressing the second research question (*How does one manage the operations of the virtual class?*) address the element of "Management Processes" within the MIT90 schema. The findings are presented as the dimensions of a new tentative management paradigm for managing the operations of the virtual class.

This research was undertaken within the *New Zealand* context, but it is proposed that the findings of this study may be generalised to institutes with a similar profile elsewhere (Chapter 3).

The author believes that the relative immaturity of developments in the area of the virtual class precludes any conclusive approach. This study is a deductive study that aims to uncover and highlight management issues when implementing the virtual class in conventional tertiary education in New Zealand and other institutes with a similar profile. It does not seek to present the findings as definitive "solutions", but rather to uncover key management issues involved and suggest relevant management approaches.

CHAPTER 2
LITERATURE REVIEW

Chapter one provided an introduction to this research study. In view of the research problem and the two research questions, Chapter two presents a review of relevant literature, using the MIT90 schema (*see* Figure 1.3). This review of the literature focuses on the following, each of which will be discussed subsequently:

2.1 external technological environment

2.2 external socio-economic environment

2.3 management processes

2.4 strategy

2.5 roles and skills of individuals

2.6 structure and

2.7 technology.

2.1 External Technological Environment

This section accentuates the *virtual class* as the most pertinent aspect of the external technological environment in relation to this research.

Tiffin and Rajasingham (1995) defined the *virtual class* as the process that occurs when teacher, learner, problem and knowledge interact through ICT for the purpose of learning. Vygotsky (1962) identified three factors in the educational process: learner, teacher and a problem to be solved. Tiffin and Rajasingham (1995:24) take a neo-Vygotskian approach in which they identify an implicit fourth factor, which is knowledge to solve the problem.

Farrell's (1999:2) perception of virtual education aligns itself to the definition of Tiffin and Rajasingham above: "as development takes place, the definition may become more focused on those teaching and learning interactions mediated entirely through the application of information and communication technologies".

The virtual class can thus be seen as an educational experience of real people in a virtual dimension. In the virtual class, teaching and learning is performed without the movement of physical objects (eg getting students and lecturers into a physical venue). The virtual class is thus primarily based on the movement of bits of information in contrast to the movement of atoms (Negroponte, 1995) which forms the central base of conventional education. Tiffin (1997, April:8) underlines the fundamental difference between the infrastructure of the conventional class and that of the virtual class:

> The promise of the global information infrastructure that is coming into place and its manifestation today in the Internet is that the critical components of education: teachers, students, knowledge and its applications can come together not as atoms but as bits of information.

The specific manifestation of the virtual class referred to in this study is the virtual class predominantly based on Internet or intranet technologies. The author describes this expression of the virtual class with the term: *networked education*. Networked education emphasises the high level of connectivity across space and time that is enabled through creating a network between student and student, student and teacher, student and resources, teacher and resources as well as the past and the present (through availability of on-line resources of one course occurrence for a next occurrence). It also indicates that the education is network-based (Internet or intranet) and computer mediated, that it includes teaching, learning and research ("education"), and highlights the distribution both of the control of learning and of the on-line learning and teaching materials among the students and teacher(s).

Networked education has a global dimension to it since the Internet in 1996 (Wizards, 1997) was represented in 129 countries (through domain names) and in July 1999 in 252 countries (Internet Software Consortium, 1999b). The Internet representation spans a diversity of nations, philosophies, cultures, stature, size and development stages of countries and groups as illustrated by the following list of countries (with their domain names): Ascension Island (.ac), Antarctica (.aq), Liechtenstein (.li), Viet Nam (.vn), Gabon (.gn), New Zealand (.nz), Cuba (.cu), Japan (.jp), South Africa (.za), China(.cn), Lao People's Democratic Republic (.la), Israel (il), Syrian Arab Republic (.sy), Vatican City State (Holy See) (.va) and Saudi Arabia (.sa). Tapscott (1996:xiii) describes this ability of students in networked education to access other students, lecturers and resources globally in paradigmatic terms:

> A new medium of human communications is emerging, one that may prove to surpass all previous revolutions – the printing press, the telephone, the television – in its impact on our economic and social life... Interactive multi-media and the so-called information highway, and its exemplar the Internet, are enabling a new economy based on the networking of human intelligence... Such a shift in economic and social relationships has occurred only a handful of times before on this planet.

Farrell (1999:2) describes the problematic use of the term *virtual* in a broad context:

> The label *virtual* is widely and indiscriminately used around the world…. Furthermore, it is used in some regions to refer to systems that combine broadcast and interactive teleconferencing technologies that operate in real time. With such broad use of the term, you need to know what the information and communication technology applications are in order to know what virtual education means in any given context.

Various terms are used to describe networked education, for example “distributed learning” (Dede, 1995 July), “tele-learning” (Collis, 1996), "virtual education" (Farrell, 1999; Butterfield *et al.*, 1999 July), “networked learning” (Gundry and Metes, 1997) as well as ones that are "…frequently used interchangeably with other labels such as *open and distance learning, distributed learning, networked learning, Web-based learning,* and *computer learning"* (Farrell, 1999:2).

Holmberg (1977:9) formulated an enduring definition of distance education as “… the various forms of study at all levels which are not under the continuous, immediate supervision of tutors present with their students in lecture rooms or on the same premises, but which, nevertheless, benefit from the planning, guidance, and tuition of a tutorial organisation". Networked education is different from distance education in that networked education is solely enabled through the Internet and intranets, that a telepresence can be created among teacher and students (Mason, 1999 July) and that it represents a paradigmatic focus on the educational needs of the information society (Tiffin, 1996b November). This research further deals with conventional tertiary education that excludes single distance mode or dual mode educational institutes.

Distance education nevertheless has to contend with various aspects in networked education. Like networked education, distance education has to bridge geographical (Garrison, 1989:119) and transactional distance (Moore, 1993), explore innovative uses of communication systems (Garrison, 1989:17; Henri and Kaye, 1993), cater for individualised learning (Garrison, 1989:27; Peters, 1993:46), use communications technology (Bates, 1984b; Garrison, 1989:2), procure sustainable commitment of students to their studies (Garrison, 1989:99), address the needs of adult learners (Garrison, 1989:103) and lifelong learning (Garrison, 1989:107).

Lewis (1992:14) defines "open learning" as a conglomeration of educational approaches that aims to transcend the traditional barriers of conventional tertiary education, namely physical, educational, individual and financial barriers. Lewis points out that specific locations and times, sequencing of the content and method of delivery, lack of awareness of what is available and costs of course materials are some of the examples of these barriers that open learning needs to address. Lewis further points to the learner centred nature of open learning. The virtual class can identify with open learning, as it also has to address these barriers.

Tiffin and Rajasingham (1995:10) distinguish the concept of the virtual class from that of the "virtual classroom" originating with Hiltz (1986), since the former concept "... suggests that the place a virtual class is held is an electronic simulation of a conventional classroom", while for Hiltz (1986:95) the latter was the use of computer mediated communications “...to create electronic analogue of the communications forms that usually occur in a classroom including discussion as well as lectures and tests”. A software product, the Virtual Classroom, based on Hiltz’s (1995, March) work, was in fact created and is described by her as a teaching and learning environment that is constructed in software to support collaborative learning among students who participate in a flexible manner through computer networks.

Chambers (1998:9) shares the reservations about using the metaphor of a ‘virtual classroom” when he states that "today we make the same kind of mistake when we glibly speak of the ‘virtual classroom’. This metaphor conjures images of students who soon shall congregate in cyberspace to receive their lectures from the electronic semblance of some sage professor". Chambers then explains that "the idea of the ‘virtual class’ is misguided because emerging telecommunications and information technologies promise something far greater than forming classrooms in cyberspace: the new technologies enable quality universities to provide one-on-one tuition cost effectively".

The virtual class can lead to fully virtual institutes as Butterfield *et al.* (1999, July) could foresee. Although the term 'virtual institution' is not yet well defined, it is an attempt to capture the sense of a further dispersion. The word 'open' came to be prefixed to the word 'university' to qualify an institution that in some ways resembled a 'traditional' university but not in other ways; likewise the word 'virtual' in relation to an institution signals a further difference: the students and staff are likely to be in distant locations and hence the programmes are provided and serviced primarily on-line through some form of computer mediated communications. Furthermore, the staff who develops programmes may not be the ones to support or assess them. As an institution without a campus, it may be dubbed 'virtual'. Virtual education is not just distance education: there are many fundamental differences, including changes in the role of students, academic staff and support staff.

The external technological environment needs to be contextualized within an even wider system, namely that of the emerging information or knowledge society. Tiffin (1996 February) regards the virtual class as an Information Technology system for education and training in an information society, one whose function could be likened to that of the conventional classroom in an industrial society: as the core communication system for preparing people for the society in which they live. For Tiffin (1996a, November:1) the "...concept of the virtual class is the kernel of a new educational paradigm that matches the needs of an information society".

The information society is, however, not a universal state of societies: "everyone talks about the information society. Yet there is evidence that global communication has led more to divergence and division than to unity" (Frederick, 1993:267). This view is supported by Negroponte (1997, June) who highlighted as a contributing factor to divergence within the information society the fact that the Internet (on which networked education is based) is a decentralised phenomenon that encourages diversity

This information society in which the virtual class and tertiary education operate at the beginning of the new millennium is exceptionally dynamic and volatile. This can be attributed largely to the emergence of a global information or knowledge society, which many view to be "… as significant as the previous displacement of the agricultural age by the industrial age" (Tapscott, 1996:43). Drucker (1989) draws an analogy between the introduction of computers in education and the advent of printing by contending that a revolution of similar or even greater proportions in education is occurring. Even the nature of the change process from conventional education to the virtual class itself is not stable; Morrison (1995) even describes this evolutionary process dislocations, dilemmas and uncertainties rather than progression from 'what is' to 'what is needed'.

Ponder and Holmes (1999) similarly comment on the turbulence of the marketplace and the adaptive management structures this environment requires of the school system, which also seems to be highly relevant to conventional tertiary education. They claim that new technologies and scientific break-throughs will cause a constant reshaping of the 21st-century marketplace, and the ideal school system will be capable of rapidly reinventing itself to accommodate this continuously changing world. Therefore educational institutions and structures will be malleable and constructed in a way that allows them to be easily and quickly reorganized and rebuilt.

Tiffin (1996, February:6) describes the problematic nature of operations and management in this immature ICT environment:

> When our Virtual Classes had communication problems we tended to blame the technology in front of us rather than looking at the wider system in which it operated. We were trying to operate as though we were in an information society when in fact we were still in an industrial society.

The virtual class needs to further contend with information availability that is exponentially increasing. There are estimates that "information is doubling every eighteen months and that by the year 2012 it will be doubling every day. A significant new insight in human knowledge is made every 60 hours" (Nugent, 1996:264).

The growth in the Internet on which the virtual class is based is dramatic (*see* Figure 1.1). There are furthermore sustained, revolutionary changes in the ICT that underpin the virtual class (Bates, 1995:45; Szabo *et al.*, 1997). The computer *per se* has expanded from being an information management tool to being a communications instrument (Tapscott, 1996). Some thinkers say that in a decade from now the technologies used in the virtual class will be superseded – already there are pointers to a hyper class being constructed in hyper reality (Tiffin, 1997 April).

The external technological environment can therefore be seen as one that is becoming increasingly digitised, volatile, transitory and divergent. It demands an appropriate response from conventional tertiary education in terms of its processes and the way in which it is managed. However, the information society is not yet fully established, and hence the virtual class - also in its management - needs to contend with a high level of immaturity, instability and change in many of its underlying systems.

After an examination of literature on the external technological environment and specifically the virtual class, which is referred to as a new educational paradigm (Tiffin, 1996b November), the focus now turns to the conventional educational paradigm as the core of the relevant external socio-economic environment.

2.2 External Socio-economic Environment

The socio-economic environment in which this research occurred is that of conventional tertiary education in general and New Zealand in particular.

Conventional tertiary education in this study describes post-compulsory public educational institutes that are funded predominantly through the state to which it also has a central reporting responsibility. These institutions normally adhere to public sector financial accountability processes and are controlled by their own council. "Tertiary education is generally understood to mean a level of studies beyond secondary schooling that is broader than higher education traditionally associated with the universities" (Ministry of Education, 1997 June). Rebore's (1985:36) description of secondary schools in the United States as "service rendering public sector organizations" aptly describes conventional tertiary educational institutes.

Conventional tertiary educational institutes normally have clearly defined administrative and academic components that are subdivided into units often called departments. Conventional tertiary education, for the purposes of this research, does not differentiate between students on a cultural or racial base and furthermore has its main focus on face-to-face education where learning and teaching occur physically "on-campus". This study therefore excludes autonomous (or single distance mode) and mixed (or dual mode) institutes as described by Garrison (1989:115):

> Autonomous institutions are those totally committed to distance education while mixed institutions are those distance education deliverers found within conventional tertiary education institutions".

Conventional tertiary education is still a description of the predominant way of tertiary education internationally (Garrison, 1989:121) – and certainly in New Zealand - today. This is evident in the common values and sometimes remarkably similar nature and structure of conventional tertiary education across the world. This contention was strikingly illustrated when the "Towards the Global University: Strategies for the Third Millennium" conference (held over four days in April 1998 in Tours, France) summary speaker, Dr John D Welty (President, California State University, Fresno, USA), who based his summary on the participants' responses to a questionnaire collected the previous evening, remarked on how amazed he was by the transferability of experiences over the institutes which represented all the continents with more than 100 mainly management (eg vice-chancellors, directors, deans) delegates from more than 30 countries.

Universities have a long and established tradition. Johnston and Challis (1994:72), after having studied the changes in the working lives of a few academics who moved from teaching a Master's degree course in a traditional face-to-face tutorial format to one in which they also taught the same program in a distance mode, commented on the concern that the changing patterns of teacher workload and student participation associated with distance education "...might undermine the whole tradition of a university as a group of scholars discovering knowledge by a process of discussion and interaction".

Van der Molen (1996) also points to the long tradition of universities when describing a concern of the liaison committee of the Rectors Conferences of the European Community (EC) and the Standing Conference of Rectors, Presidents and Vice-Chancellors of the European Universities (CRE) on the memorandum on Higher Education in the European Community, in which they identify "values which over the centuries have been associated with universities, such as independent judgment, creativity, cultural and ethical dimensions".

Moreover, Laurillard (1993:4) identifies the pursuit of scholarship and research, the advancement of learning, and academic freedom that is the freedom to conduct a radical critique of knowledge, as being shared by academics across the world. Collis (1998) identifies four values shared by universities:

1. Values related to academic moulding (or developing of intellectual expertise)
1. Values relating to good teaching
1. Values related to the interaction of local and global perspectives and
1. Values related to the university being a focal point of knowledge and expertise.

The similarity among tertiary education institutes internationally allows researchers like Rajasingham (1988:5) to write about a global problem in conventional education:

> "New Zealand shares the world-wide problem of conventional education and training systems having been set up, *inter alia*, to provide for the traditional major economic sectors in societies (the primary and manufacturing industries) although these industries are no longer the predominant employment industries".

Universities have changed very little and seem to be resistant to change. Patterson (1997:7) studied the university's evolutionary dimensions and suggests that

> The historic continuity of the institution is unbroken, and many of the medieval university's unique features remain characteristic of today's universities: features, for example, such as the university's status as an autonomous corporate body; its legal identity; recognition by others leading to the award of recognised degrees or diplomas; the degree structure and levels, e.g. bachelors leading to masters, and doctorates; testing by examination; and structures of governance, such as the division of major branches of learning into faculties, and the hierarchical positions such as deans, chancellor and rector.

Trow (1996) also provides a picture associated with typical university life: Remarkably conservative and enduring institutions, in some important respects very much like their medieval ancestors, where learned seniors spend their time reading books and talking to young men (and now young women), lecturing to them in large halls and talking more informally with them in small seminar rooms close to collections of books. The teachers - masters and doctors today as in the thirteenth century - are organised in groups of specialists around bodies of knowledge or professional practice, in what in many places are still called 'faculties'; departments came later.... Universities are still largely governed by the guild of teachers - the masters or professors - with a rector (or chancellor, vice-chancellor or president) presiding over the institution and managing its relations with its environment and its sources of support.

There are, however, also commentators pointing to diversity among modern universities such as Cass (1996:10) who believes in the context of postmodernity that at least in Australia "no single idea of the university is possible any longer" and that we need "… plural ways of thinking about them." Weber (1996:46) refers to "… how diverse universities in different countries can be..." based on his experience of having taught at universities in different countries.

These comments are seemingly not representative of the predominant view that institutes in tertiary education are very similar in their governance, structure, mission and finance. Chambers (1998) points to contemporary universities as institutions that still bear a close resemblance to their antecedents of centuries past where classroom lectures have reigned supreme, while Trow (1996) comments on how American higher education is still remarkably "similar in basic structure, diversity, mission, governance and finance to the system at the turn of the century."

The investigation now turns to tertiary education in New Zealand, which is defined by the Ministry of Education (1994b) as consisting of universities, polytechnics, colleges of education, and wananga (focusing on Maori tradition according to Maori custom) which serve both the school leavers and those already in the work force.

According to the Ministry of Education (1994c), polytechnics (45%) and universities (49%) had comparable shares in 1993 of the tertiary sector in New Zealand. The Ministry of Education (1997, June) indicates that for "...65% of 18-24 year olds, tertiary education and training is provided by the system of state tertiary institutions; universities, polytechnics, colleges of education and wananga." At the same time, the distinctions between New Zealand universities and polytechnics are diminishing (Ministry of Education, 1997 June).

A guide by the Ministry of Education (1997, June) provides a concise overview of tertiary education in New Zealand:

> Arrangements for the establishment, governance and funding of tertiary institutions are set out in legislation, and are identical for universities, polytechnics, colleges of education, and wananga. The distinguishing characteristics of the four kinds of tertiary institutions are also defined in legislation.
>
> Currently there are seven universities, 25 polytechnics, four colleges of education, and three wananga, which between them enrol over 200,000 students each year.
>
> Tertiary institutions are Crown entities and are required to follow standard public sector financial accountability processes.
>
> Each tertiary institution is controlled by its own council, established under legislation intended to maximise its autonomy consistent with the standard requirements of accountability for public funding.
>
> Each tertiary institution determines its own programmes. All matters relating to governance and management are the responsibility of the council, which represents the interests of staff, students, and the wider community.
>
> Universities are primarily concerned with advanced learning, the principle aim being to develop intellectual independence; their research and teaching are closely interdependent; they meet international standards of research and teaching; they are a repository of knowledge and expertise; they have a role as critic and conscience of society.
>
> There are seven universities in New Zealand: the University of Auckland, the University of Waikato, Massey University, Victoria University of Wellington, the University of Canterbury, Lincoln University, and the University of Otago.
>
> Currently over 80,000 full-time equivalent students enrol each year for university study.
>
> Polytechnics provide a wide range of academic, vocational and professional courses, including vocational training, which contributes to the maintenance, advancement, and dissemination of knowledge and expertise and promotes

community learning. They also promote research - particularly applied and technological research - which aids development.

There are 25 polytechnics in New Zealand. Many are now accredited to offer their own degree programmes.

Currently almost 60,000 full-time equivalent students enrol each year for polytechnic study. Taking short courses into account, the actual number of students enrolled at polytechnics is several times this figure.

While most polytechnics continue to provide traditional trade and basic vocational courses, an increasing number of professional courses offered at degree level are reducing the distinction between the respective roles of polytechnics and universities.

Colleges of education provide teacher education and research related to the early childhood and compulsory sectors of education and provide associated social and educational service roles.

There are now four specialist colleges of education offering courses in early childhood, primary, and secondary teacher training, situated in Auckland, Wellington, Christchurch and Dunedin.

Wananga are teaching and research institutions that maintain, advance, and disseminate knowledge, develop intellectual independence, and assist the application of knowledge regarding ahuatanga Maori (Maori tradition) according to tikanga Maori (Maori custom).

Three wananga are established tertiary institutions.

All tertiary institutions (universities, polytechnics, colleges of education, wananga) are governed by their own councils.

The main functions of a council are to set the strategic direction and policies of the tertiary institution, determine its programmes, set its budget including tuition fees, and appoint its chief executive officer.

The main functions of a chief executive officer (who may be alternatively designated a vice chancellor, director, principal, or president) are to implement council policies and decisions and to manage the academic and administrative affairs, including the employment of teaching and support staff.

University degrees are approved by the New Zealand Vice Chancellors' Committee, and have international recognition.

> Degrees awarded by polytechnics, colleges of education, wananga and private training establishments are approved by the New Zealand Qualifications Authority, and have international recognition.

Not included in this study on account of the definition of conventional tertiary education are the wananga institutes in New Zealand that focus on Maori tradition and custom, as well as Massey University (with a large percentage of their students learning in a distance mode) and the Open Polytechnic (which has only distance students).

Conventional tertiary education in New Zealand focuses on local (or perhaps national) students, while often also attempting to attract international students to come to New Zealand to physically study on-campus. Part-time (evening) classes are often seen as a fringe activity.

Most of the 39 tertiary institutes in New Zealand (excluding Massey University, the Open Polytechnic and the three Wananga institutes) could therefore be classified as conventional tertiary educational institutes.

The Wellington Polytechnic itself is a representative conventional tertiary educational institute in New Zealand with a long-standing record of offering various qualifications on the diploma, graduate and post-graduate degree level. It was established as a tertiary institution in 1962, operates as a Crown Agency and its degree programmes have been approved and accredited by the New Zealand Qualifications Authority (Wellington Polytechnic, 1998 July).

The Wellington Polytechnic is one of 25 Polytechnics in New Zealand and is a public institute, funded predominantly through the state to which it also has a central reporting responsibility, it adheres to public sector financial accountability processes and is controlled by its own council. It does not focus its education on any specific culture or race and has a clear distinction between its administrative (called "allied") and academic components. It operates under the legislation that applies to all tertiary education institutes in New Zealand.

Wellington Polytechnic strongly focuses on face-to-face education where learning and teaching happens physically “on-campus”. Only a few courses in the field of education are being offered at a distance. Its main focus is on New Zealand students, while the Wellington Polytechnic also attempts to attract international students to come to New Zealand and study physically on-campus (Wellington Polytechnic, 1998 July). Less than 40% of courses are also offered in a part-time (mostly evening class) mode. The polytechnic consists of five academic schools and a specialist educational department. Paper based communications was the norm at Wellington Polytechnic in 1995 and many academic staff did not have personal access to computers at that stage (Appendix 7:10).

The implementation of the virtual class in Wellington Polytechnic started in July 1995. This occurred mainly through the activities of the HYDI Educational New Media Centre (Wellington Polytechnic, 1998 June) that developed the On-line Campus of Wellington Polytechnic and also networked courses.

The Ministry of Education (1994a) in New Zealand report that education is seen as an important contributor to the success of New Zealand in the new millennium:

> The rapid pace of technological change, and the explosive growth in communications we have seen over the last ten years, will accelerate as we enter the new century. New Zealand must compete in a global marketplace in which success will depend in large measure on the investment we make in education and training. The aims we set now for our education system must be far-sighted. The systems we put in place to achieve those aims must be flexible enough to adapt to rapid change.

In New Zealand the importance of the tertiary educational system in preparing school leavers for the emerging information society is recognised and described in “A Guide to tertiary education in New Zealand” published by the Ministry of Education (1997, June):

> To prosper, New Zealand in the future must become a knowledge-based society. New Zealanders will need the workplace skills required for local industry to be internationally competitive. They will also require the skills to function successfully in an international environment and to take advantage of new opportunities. Intellectual skills will become more important than manual skills. Information will become as important as raw materials.
>
> The goal of preparing school leavers for this new environment is a challenge for the tertiary education system.

Successful conventional tertiary education institutes of the future therefore will need to operate with new levels of flexibility. Beare and Slaughter (1993:35) indeed believe that in the context of Australian schooling organisations in the post-industrial economy need to be "… flexible, which can make quick, strategic decisions, which encourage innovation and entrepreneurship…" Esquer and Sheremetov (1999, July:1607) point to an emerging consensus that successful universities of the future will be those that operate with high flexibility:

> The educational institutions seek to obtain strategic advantages by redesigning the way they educate to reflect the rapidly changing state of the art in the education domains and tutoring methods and techniques as well. The emerging consensus is that successful Universities of the next millennium will be those that embrace continuous change as an education paradigm. Such Universities will be able both to adapt to changes in the social market for their students and to lead this market in directions optimal to the society's goals by continually adapting their education plans, methods and strategies of teaching, and educational infrastructures to changes in the environment.

Conventional tertiary education therefore needs to have more open boundaries with boundary management becoming more relevant as "… the external environment has impinged more directly on university operations..." (Middlehurst, 1993:56).

Conventional tertiary education in general and in New Zealand in particular, operate in a very traditional way and is remarkably similar in structure, management and organisation. This indicates unresponsiveness to the societies they serve. There is however now a clear and urgent need for a new flexibility, openness and responsiveness in preparing school leavers and life-long learners for a more digitised and knowledge based society.

The relationship between the virtual class and conventional tertiary education therefore seems a complex and unlikely one. This is especially true when the management processes within conventional tertiary education are examined.

2.3 Management Processes

Conventional management can be described as the process of planning and decision making, organising, leading and control of an organisation's human, financial and information resources to achieve the objectives of an organisation in an effective and efficient manner (Griffin, 1987). Peter Drucker (1998:157) describes the fundamental task of management as one of empowerment and place it in the context of change: "… to make people capable of joint performance by giving them common goals, common values, the right structure, and the ongoing training and development they need to perform and to respond to change".

Many writers like Boone and Kurtz (1984), Newman, Warren and McGill (1987), Schultheis and Sumner (1989) and Van Dyk, Palmer, Smit, Vrba and De Klerk (1991) divide the management process into four functions namely planning (decide what must be done), organising (decide how it must be done), leading (ensuring that it is done) and control (determine whether instructions have been followed). Other writers identify additional functions of management for example staffing and communication (Koontz and Weirich, 1990). Van Dyk *et al.* (1991) state that the following dimensions of management are also included in, and are present in all management functions: communication, decision-making, coordination and negotiation. Mintzberg (1973) postulates that a manager has interpersonal, informational and decisional roles. Mintzberg includes the leadership function in the interpersonal roles while the organising, planning and control functions feature in the decisional and interpersonal roles.

There has been a clear and consistent call from prominent writers on management and organizational design like Drucker (1985, 1989, 1995), Senge (1990), Peters (1988), Marquard (1996), Tapscott (1996), Limerick and Cunnington (1993) to heed the necessity to practice these functions and dimensions of management in an entirely new way in the context of the emerging global information or knowledge society.

2.3.1 Conventional educational management

Management in education is often equated to “administration” (Rebore, 1985:39). However, “management” in this research does not refer only to administration within tertiary education. To limit the notion of management to administrative practices only and thus exclude the academic area would be to argue that planning and decision making, organising, leading and control do not occur in the area of teaching, but only in administration.

Tiffin and Rajasingham (1995) point out that every educational system has a *control* sub-system. Rajasingham (1988) depicts management as control in examining the sub systems of a distance education institute of New Zealand. This research focuses on this sub system, but rather calls this sub system the "management" sub system because control can be seen as one of the four functions of management (described above).

Tiffin and Rajasingham (1995:37) argue that communications have a fractal dimension that is "a node in a communications network can prove, on closer examination, to be a communications network itself”. Tiffin and Rajasingham (1995:64) identify the following levels within education in general: national authority, regional authority, institute, class, student-teacher interaction and the student. A conventional tertiary educational institute and its management processes might also be viewed as having a fractal dimension, namely management processes of the institute, administrative departments, academic departments, the design and development of the teaching materials, the actual delivery of the teaching materials that is the "class" and the student's management of their own learning.

Using a fractal view to analyse management in tertiary education is particularly apt since academic staff members typically perform their duties like operational managers instead of operational workers. Academics often operate fairly autonomously without direct instructions due to their status as being professionals, the one-to-many relationship between teacher and students and the principles of academic freedom (Paul, 1990:32).

Management and its related governance and organisational structures in conventional tertiary education have remained fairly static and centralised. Patterson (1997:7) studied the university’s evolutionary dimensions and points out that

> The historic continuity of the institution is unbroken, and many of the medieval university’s unique features remain characteristic of today’s universities: features, for example, such as … structures of governance, such as the division of major branches of learning into faculties, and the hierarchical positions such as deans, chancellor and rector.

Trow (1996) also highlights the rather stagnant management approaches within conventional tertiary education.

Universities are often highly bureaucratic. Garrison (1989:38) points to higher education when contending that as “…formal education grew in size and complexity, bureaucracies became the controlling mechanism”, while Paul (1990:31) shares this view that “…universities exhibit many of the characteristics of bureaucratic organizations” . A statement by Rebore (1985:33) reflects this preference also in secondary schooling in the United States for the traditional hierarchical management structure:

> Line administrators have supervisory responsibilities that emanate from the superintendent down through the pyramid to the building level. While many different models have been used, this is the most successful and effective in school districts.

A description of school organisation in Australia (Beare and Slaughter, 1993:35) also seems to be relevant to conventional tertiary education:

> … draws upon the factory model of organisation… Schools abound with the characteristics of bureaucracy, like hierarchy and positional status; they encourage upward mobility and promotion through graded ranks; they teem with rules and regulations, with specialists and division of functions.

In the British universities during the 1990s "… there has been a steady increase in bureaucracy and a steady decrease in the amount of time available for core academic activities particularly at senior levels" (Middlehurst, 1993:189). This is a common complaint from academics heard in the hallways at national and international conferences.

This description of management in conventional tertiary education aligns itself clearly to what Burns and Stalker (1961) call a *mechanistic* control process in contrast to an *organic* control process. The mechanistic management structure links to a stable external environment. According to Daft (1989:61) this structure has the following characteristics:

(i) Tasks are broken down in specialized, separate parts.
(i) Tasks are rigidly defined.
(i) There is a strict hierarchy of authority and control, and there are many rules.
(i) Knowledge and control of tasks are centralized at the top of the organization.
(i) Communication is vertical.

In contrast to the institutional management structures, the teaching and research functions of academic staff as professionals are typically more client oriented, less formal and less concerned with hierarchy (Paul, 1990). While institutional conventional educational management operates on a largely bureaucratic model, academic staff operate on a "collegial model" (Paul, 1990:32). This collegial model is under attack as tertiary educational institutes compete with each other and with private enterprise, and also because of the bureaucratic environment in which it operates (Paul, 1990).

Another model operating in universities is the political model which recognises the "…predominance of power groups' (Paul, 1990:35), but does not explain the workings of the university in terms of its governance or collegial aspects.

The anarchic model (Cohen and March, 1974) depicts the modern university as an organised anarchy that, according to Paul (1990:37) illustrates such ambiguities and uncertainties that it renders the traditional forms of management meaningless or inept. Cohen and March (1974:83) assert that:

> Although a college or university operates within the metaphor of the political system or a hierarchical bureaucracy, the actual operation of either is considerably attenuated by the ambiguity of college goals, by the lack of clarity in educational technology and by the transient character of many participants".

The anarchic model has not been without critique (Paul, 1990), and does focus more on self-management of academic staff than on the institute as a whole. Cohen and March (1974), in suggesting how to deal with running an "organised anarchy", highlight the importance of framing university operations in academic terms when they satirically propose that experience needs to be treated as theory, goals as hypotheses, intuition as real, hypocrisy as transition and memory as an enemy.

It seems, however, that the bureaucratic elements of conventional tertiary education are pre-eminent and in constant conflict with the self-management ideals and processes of academic staff.

Conventional tertiary education has changed sporadically as it responded to shifts and movements in society. It again faces the challenge to respond to the educational needs of the knowledge society - also through entrepreneurship. Drucker (1985:21) maintains that the "... creation and development of the modern university" is a case study in entrepreneurship. It was a response to "… a major shift in the market…" and "… represent entrepreneurship."

The generic conventional management paradigm in tertiary education acknowledges the contrasting ideals of academic self-management and that there are exceptions to rules.

The conventional educational management paradigm can thus be described as being largely mechanistic, formal, centralised, focussing predominantly on the local environment, insular, inflexible, rigid, bureaucratised, with strong institutional control and segmented, with a high degree of division of labour, variable participation, and often politicised.

At the same time there is a need for transformation in response to the educational needs of the emerging knowledge society and to alter its management process to effect this transformation. There is little clarity in conventional tertiary education on how to manage the virtual class as an integrated system.

2.3.2 New forms of educational management

Literature on tertiary distance education, newer forms of tertiary education and private enterprise is reviewed to analyse responses in educational management to the educational requirements of the information or knowledge society.

Tertiary distance education

Management of distance education institutes may provide pointers to approaches in managing the operations of the virtual class. Rumble (1992:95) refers to the operations of distance education as a "highly distributed system" which "looks very different to the residential or non-residential campus-based university". Networked education is based on distributed networks and the management of networked education might therefore correlate with the distributed nature of the operations of distance education.

The effective and widespread use of networked education in conventional tertiary education might facilitate a multiple-mode approach due to its differences with distance education (as pointed out in 2.1 above). Garrison (1989) restricts organisational models in distance education to two models. Autonomous (or single distance mode) institutes are those totally committed to distance education while mixed (or dual mode) institutes offer distance education as an integral and important part of their teaching.

There is a growing awareness in distance education that on-campus and off-campus education is converging. Bates (1984a) points to a possible convergence of on-campus and off-campus education through computer mediated education. Garrison (1989:117) notes that this convergence is "…blurring the boundaries between conventional and distance education". Bates (1984a) also suggests that many dual mode institutes will emerge as conventional education move into distance education.

The use of ICT in distance education is growing. With reference to the increasing and widespread use of ICT in tertiary education, and particularly in distance education Bates (1993b:189) postulated that using ICT, "…'meetings' could be held without any staff having to travel from their desks" (- foreshadowing the operation of virtual teams in tertiary education.

An organisational model that moves away from centralised control is possible through the use of ICT. Bates (1984a) described the organisational model of traditional distance institutes as being centralised but asserted that these new technologies offer the possibility of an alternative model to the large, centralised and specialised distance education system. Garrison (1989:38), in view of the new technologies and the coming of the information age, postulated that education "…is experiencing a shift from formal, centralised, and segmented operations to increasingly complex, decentralised, and integrated levels of organisation". He furthermore foresees the potential of computer based distance education to "…both decentralise education and individualise or personalise it at the same time" (Garrison,1989:88). Peters (1993:53) contends that in the post-industrial society there will be in distance teaching institutions a "departure from a highly centralized organization of the teaching-learning process and a move to small decentralized units which can be made transparent by the means of new technology".

Distance education also links to the globalisation possibilities in education. "Globalization is a feature of later modernity which has been embraced by distance education, especially as educational institution and their political bosses and business allies in developed nations seek to extend their influence and sources of revenue into developing nations" (Evans and Nation, 1993:213).

Newer forms of tertiary education

The management of open learning provides pointers to possible management approaches for the virtual class. By using open universities as case studies, Paul (1990) provides an integrated proposal for the management of open learning. Paul (1990:22, 66-68) asserts that it applies in a more generic sense to "knowledge institutions in a knowledge society" and suggests that a value-driven leadership approach can address the different models of educational management discussed above and that in this approach, leadership is committed to ensure that people find meaning in life through their work by creating things of value. Paul (1990:22,72) further argues that an institution dedicated to the values and practice of open learning needs to have an "open management style" and that "those responsible for the leadership and management of these institutions must emulate the principles they espouse in the performance of their day-to-day activities". This relates to the hypothesis of this research (*see* Chapter 1) - and is based on systems theory - that a new type of management for the operations of the virtual class is needed due to the radical differences between the virtual and the conventional class. However, Paul is concerned with "open universities" while this research looks at tertiary education and specifically at the interplay between the virtual class and conventional tertiary education.

Paul (1990:66) asserts in the context of employing what he terms “open management” that a value-driven leadership approach is required to address the different models of educational management. Paul (1990:71) highlights the distributed nature of open management when he describes its operations:

> Under such an approach, the top management team of an institution or business, defines and articulates a clear set of guiding principles which form the basis for decision making. However much is subsequently delegated and however decentralized the distribution of power and authority, it is always the chief executive officer’s primary responsibility to ensure that these central values drive all decision making in the organization… a fundamental set of mutually consistent values which drive all decision making in the institution… The real skill of management is knowing when - and when not to intervene .

The distributed nature of open management as energised by value-driven leadership, has positive pointers to the management required for the operations of networked education which are based on distributed computer networks and facilitates distribution of control throughout an institute.

Networking and collaboration are important aspects of tertiary education. Morrison (1995:199) asserts that there is a “…need to interact on learning highways across borders….all nations, in future, will have to design their educational systems in such a way that they not only have internal coherence but also have an open architecture - that they can network with other educational and learning systems”. This also correlates to one of Fullan’s (1991:349) six themes of educational change namely "from going it alone to alliances”. He believes that “… some of the most powerful strategies involve inter-institutional partnerships - between school districts and universities, businesses and districts, coalition of schools…”. Many universities and colleges are indeed positioning themselves for effective participation in distance and particularly networked education through collaborations at the institutional level. *Universitas 21* (1999) for instance comprises 21 universities in Europe, Australasia and north America and includes Auckland University in New Zealand and plans to develop and use multimedia technology in education. Another example is the European Consortium of Innovative

Universities (ECIU, 1999) which is a co-operation of 10 European universities with a focus on the development of new forms of teaching, education and research. Other examples are National Universities Degree Consortium (NUDC, 1999), comprising 9 Universities each of which "…was established in response to widespread requests from potential, non-traditional age students for high quality, integrated, external degree programs that are delivered in flexible, off-campus formats, readily available to adults and part-time students" and the Corporation for Education Network Initiatives in California (CENIC, 1999) which "…will represent the common interests of California's higher education academic and research communities in achieving robust, high capacity, next generation Internet communications services". ADEC Distance Education Consortium (ADEC, 1999) is an international consortium of some 59 state universities and land grant institutions "…providing high quality and economic distance education programs and services via the latest and most appropriate information technologies". In Malaysia eleven public universities formed the Multimedia Technology Enhancement Operations Sdn. Bhd., METEOR to "… focus on the development and use of multimedia and technology in education. The three main areas Meteor will concentrate on are distance learning, research and development consultancy in IT and multimedia applications development" (Indramalar, 1999 April 23).

The collaboration is however wider than just among educational institutes. It could include private enterprise, entertainment and others. There is "… an increasing convergence between institutions that have previously remained separate. The change will not just be technological but organizational, economic and cultural" (Evans and Nation, 1993:19).

This networking needs to find expression within a well-designed organisational structure. Bates (2000) describes an extensive and workable model as a practical organisational structure to marry centralised and decentralised management. This model includes a fairly large professional center while each faculty (or school) or large department will have a small flexible unit of technical support and generalist educational technology support. The center will operate on a project management model with many of its staff seconded to work in the faculties on a continuing basis while the units will provide immediate support and find appropriate support from the center for bigger projects.

There is a need for flexibility in technologically based course production. One of the critical success factors proposed by Daniel (1998:155) in implementing a technology strategy is that the "…course production-presentation process that is responsive to curriculum development pressures, and flexible in its team-building, project management and creative collaboration processes".

Distance and networked education provides a mechanism for global education. Tiffin (1997, February:3) points out that "education as we have known it in this century was designed to support the nation state… Knowledge and research are directed towards the needs of the national and the cultural norms of the nation". Tiffin (1996, February) asserts that "...if the Virtual Class was going to be distance independent then like the information society it was going to be global rather than national". Mason (1998:3-4) contends that "there are a good many economic, socio-political and technological reasons for underpinning current developments both of the plans for and the practice of global education…Undoubtedly there is a case to be made for global courses on purely educational grounds…reach of the course, the access to the course and the development of the course". Tiffin (1997 April:5)) states that the virtual class "...carries a vision of knowledge that is international not national, of a global community of scholars addressing global research issues and creating at a global level the network of friends and colleagues who share a common understanding".

ICT has become an agent in education of the convergence of what has been traditionally been called on-campus or distance education. ICT therefore creates the possibility for conventional tertiary education to realise the benefits of dual-mode institutions. Evans and Nation (1993:211)) refers to "mixed-mode" or "dual-mode institutions" and the advantages in "… flexibility of their teaching strategies and the wider range of courses they can offer". Lundin (1993:12) describes this convergence as follows:

> It is now becoming common for the whole field of ODE [open distance education] and CIT [Communication and Information technologies] to be discussed in terms of 'flexible distributed learning'. That is, the external-internal, on-campus-off-campus and other categorisation of learners based on modes of delivery are being abandoned because they no longer represent what is being practised. All forms of delivery, including face-to-face, are now recognised as valid options to meet identified needs of learners.

It is envisaged that the management of education, being based on ICT, would have to contest with an openness of huge proportions. Garrison (1989:121) theorises that "the momentum towards greater openness in education and learning will grow as new communications technology are developed and adopted". This openness can also apply to collaborations with other institutes as Forsythe (1984:60) contends: "….the use of such communication systems is seen as part of a large learning system that may well be a network of institutions".

This openness is also applicable to networking among students, which Hodgson, Mann and Snell (1987:165) refer to in the context of open learning as "expert networking". They perceive the use of "…new technology as a vehicle for the sharing of discoveries, developments and reference materials among an expert network of peer specialists".

It is however a challenge to create a congruity between centralised and decentralised management aspirations in tertiary education. Bates (2000:181) acknowledges this complexity:

> When it comes to organizational structures, the challenge is to develop a system that encourages teaching units to be innovative and able to respond quickly to changes in subject matter, student needs, and technology. At the same time, redundancy and conflicting standards and policies across the institution must be avoided.

Information is becoming a major building block in distance education. Garrison (1989:39) also points to the information base of education that matches the needs of the information age when indicating that these institutes would exercise control through information and communication and not through bureaucracy.

Students in the newer forms of tertiary education can be more in control of their learning. Mason (1998:157) indicates that the new technologies in global education give prominence to students who construct their own knowledge. Students through networked education further is “...no longer confined to our campus and its teachers and students and activities” (Tiffin, 1996a November:2). Garrison (1989:49) points to possible greater control for students through the use of educational technology, while Bates (1994:223) points to the potential of the new technologies to provide “…greater student control”. Peters (1993:43) points to an assumption of management in a post-industrial society in which control will occur through “employee self-control”, which he interprets as referring to the student. Peters (1993:52) contends that the expected disintegration in hierarchies in private enterprise will impact on the relationship between the learners and their distance-teaching institution and its representatives and postulates that learners could well “…insist on determining themselves what and how to learn”.

Private enterprise

Private enterprise is concerned with, and heavily involved in education (Drucker, 1989:243). Corporate universities are emerging and business and industry in the United States were in 1987 already spending more on education than what was spent on higher education by all the states combined (Garrision, 1989:38). Peters (1993) sees a causal effect between changes in the management structures in private enterprise and that of tertiary education.

Underlying values in education however might come under threat as private enterprise become increasingly active in education. Tapscott (1996:36) frames this issue as a rhetorical question: "as educational activity shifts from schools to firms, will businesses continue to emphasize social responsibility, humanism, liberal arts, and political and moral values, or will they shift values to competitiveness, profit, and materialistic goals?".

There is a call to more decentralization and less bureaucratic management approaches. Drucker (1998:117) asserts that the "…need to organize for change also requires a high degree of decentralization" in the structure of the "new society of organizations". Beare and Slaughter (1993:35) contend that "… a business which operates on bureaucratic lines cannot compete in a post-industrial economy…" This clearly calls for a move away from bureaucracy and hierarchical management in conventional tertiary education.

This decentralization, however, needs to lead to an integrated system. Porter contends that "competitive industries are clustered … are linked as customers and suppliers, through people, research institutions, university programmes and related diversification. This is typical. It is how a competitive industry is created and sustained" (Caulkin, 1990:53).

Networking has been identified as a new way of management. Two of the ten major transformations (or megatrends) in society, which Naisbitt (1982) identified are a transformation from centralisation to decentralisation (in effect distribution), and secondly from hierarchies to networking. This distributed nature of management is supported by Limerick and Cunningham (1993:227) who indicates that "… a central idea of the new organisation …that of emancipated, autonomous, empowered individuals managing their own collaboration towards a common goal".

There is an emerging form of organisational design called a "network structure" in which a small central organisation links through relationships with other organisations to perform its essential functions, called "outsourcing" (Robbins and Barnwell, 1998). Drucker (1995:68) identifies outsourcing as a central example of managing in what he calls the "networked society" and also (1995) postulates that "…in another ten to fifteen years, organizations may have outsourced all work that is 'support' rather than ‘revenue producing’ ”. Tertiary education might follow suit in exploiting the distributed nature of computer networks to outsource some or part of its essential functions like teaching, learner control, research and administration.

This networked approach also has an internal dimension to integrate and connect an organisation's functions and activities. The integrative approach is one that Michael Porter (Pastore, 1995, October 1:10) regards as critical to competitive advantage in organisations:

> Companies with sustainable competitive advantage integrate lots of activities within the business: their marketing, service, designs, customer support. All those things are consistent, interconnected and mutually reinforcing. As a result, competitors don’t have to match just one thing, they have to match the whole system. And until rivals achieve the whole system, they don’t get very many of the benefits.

Management in the information or knowledge society has a strong global disposition because of its information-base (Drucker, 1989). Globalisation is seen as a generic feature of later modernity (Evans and Nation, 1993) which is occurring in areas like the economy (Holland, 1987; Tapscott, 1999) and communications (Frederick, 1993). Tapscott (1996) contends that "in the digital economy, competition doesn’t come from competitors only – it comes from everywhere” .

Managing in a global environment calls for knowledge of differences between cultures and sensitivities for these differences. Woodhouse (1999) points out that education is definitely not culturally neutral. Management is embedded within the (internal) culture of an organisation. Drucker (1998:172) states that management is “… deeply embedded in culture...” because it deals with “... the integration of people in a common venture…” Gundry and Metes (1997) postulate that:

> Online communication can unite the organization, but it can also highlight fundamental cultural differences. Suddenly, people used to working with their countryfolk can find themselves working closely, online, with people from different national cultures. These are often cultures in which taken-for-granted perceptions of communication, time, power and information are quite different…Training in cross-cultural working is now a necessity, not an option…

> Understanding each other's world view, biases, and preferences will be essential to building trust and shared perceptions, and maintaining the communication that drives the work.

A new requirement for management in the information or knowledge society is managing the dynamics of communication in a virtual environment (Gundry and Metes, 1997). Tapscott (1996:55) highlights networking and collaboration as a modern management issue and points to the application in education:

> Networks of networks along the Internet model are beginning to break down walls among companies – suppliers, customers, affinity groups, and competitors. We will see the rise of internetworked business, internetworked government, internetworked learning, and internetworked health care, to name a few.

Boundary management is becoming more important in newer private enterprises. Peters (1988a) highlight the importance of boundary management in the organisation of the future in which the boundaries are described as wavy, thin and transparent. Boundary management deals with the "… nature of boundaries between systems and sub-systems, and the levels of dependency and integration of their transactions and interactions" (Middlehurst, 1993:56). Tapscott (1996:55) contends that the "… boundaries inside and outside are permeable and fluid" when describing the "Internetworked enterprise". Daft (1989571) comments that these "… characteristics induce regular movement and communication across the boundary in both directions. The new organization engages customers and suppliers in the production process, thereby encouraging them to communicate inward. The organization engages in a partnership with outsiders". Marquardt (1996:83) describes the learning organisation as being "boundaryless", while Limerick and Cunningham (1993:89) indicate that to "develop your boundary roles" is an "essential element of effective network management".

Immediacy and adaptability are themes of the new economy. Tapscott (1996:63) refers to these as follows: "the new enterprise is a *real time enterprise*, which is continuously and immediately adjusting to changing business conditions through information immediacy". This is also the case in networked education as Web based materials (be it on the Internet or intranet) can be updated continually and immediately. The immediacy within enterprises facilitates just-in-time (JIT) shipping and manufacturing (Tapscott, 1996) and might lead to similar approaches in learning, teaching and administration.

In the increasingly digitised environment, there is less control and more risk-taking. Tapscott (1996:v) holds that "far more than the old western frontier, the digital frontier is a place of recklessness, confusion, uncertainty, calamity and danger."

Burns and Stalker (1961) indicate that an *organic* control process, in contrast to a *mechanistic* control process, is appropriate in an unstable external environment. According to Daft (1989:61) this structure, which is appropriate for the modern organisation operating in a turbulent environment, has the following characteristics:

1. Employees contribute to the common tasks of the department.
2. Tasks are adjusted and redefined through employee interactions.
3. There is less hierarchy of authority and control, and there are few rules.
4. Knowledge and control of tasks are located anywhere in the organization.
5. Communication is horizontal.

In learning organisations the management needs to be highly adaptive. Marquardt (1996:1) indicates that learning organisations "enjoy greater knowledge, flexibility, speed, power, and learning ability to better confront the shifting needs of a new environment, more demanding customers, and smarter knowledge workers. This new species of organization will be the *learning organization* and will possess the capability to anticipate and adapt more readily to environmental impacts…". Marquardt (1996:xv) further contends that in this "…faster, information-thick atmosphere of the new millennium… 'old' companies [cannot] compete with more agile and creative learning organizations". A learning organisation has a streamlined, flat hierarchy and is seamless and boundaryless (Marquard, 1996:83ff). It is further built on networking and "…realize[s] the need to collaborate, share, and synergize with resources both inside and outside the company… they provide a company with a form and style that is fluid, flexible, and adaptable". Learning organizations will:

enjoy greater knowledge, flexibility, speed, power, and learning ability to better confront the shifting needs of a new environment, more demanding customers, and smarter knowledge workers. This new species of organization will be the *learning organization* and will possess the capability to:

- anticipate and adapt more readily to environmental impacts
- accelerate the development of new products, processes, and services
- become more proficient at learning from competitors and collaborators
- expedite the transfer of knowledge from one part of the organization to another
- learn more effectively from its mistakes
- make greater organizational use of employees at all levels of the organisation
- shorten the time required to implement strategic changes
- stimulate continuous improvement in all areas of the organization. (Marquardt, 1996:1).

Information plays a central role in virtual operations. Rayport and Sviokla (1995:75) write about the "marketspace", that is a virtual market place. They characterise it as being “virtual” because the value adding processes “...are performed through and with information”. Drucker (1998:101) conceptualises an information-based organisation where every participant needs to take “information responsibility” – responsibility both to others and to oneself. Drucker describes the shift from the command-and-control organisation to the information-based organisation as the third major evolution in the concept and structure of organisations since modern business enterprise first arose. Marquardt (1996:6) states that “information is created continuously in every corner of the globe, and doubles every three to four years”. Managing real information overload in the global information explosion has become essential to function without increased stress levels induced by the overload of valid, current and relevant information. Gundry and Metes (1997) points out that information overload, a primary cause of stress in online workers, is fuelled by electronic communication; therefore communication protocols, along with filtering devices, are required. Victor (1999, July) furthermore asserts that information overload can be addressed through the effective use of information architecture. If we live in an age of “information overload, marked by increasingly advanced communication tools, including the Internet and digital telecommunication technologies, which allow us to transmit more and more information at faster and faster rates, some counter-measure is needed. A discipline, known variously as information design or information architecture and embracing such diverse fields as business administration, computer science, cognitive psychology, graphic and typographic design, and technical communication, evolved to meet the challenge of using information in order to provide meaningful communication.

In private enterprise there is also a convergence, which Tapscott (1996:58) notes as one of the themes of the new economy. He holds that "the dominant sector in the new economy is the new media, which are products of the convergence of computing, communications, and content industries”. Tertiary education in this context represents the “content industry” which converges with ICT to form the virtual class.

Innovation requires a market focus. Drucker (1985:127) points to the required market focus of management when asserting that innovation “…always has to be close to the market, focused on the market, indeed market-driven”.

The characteristics of the management required in tertiary education to match the educational needs of the information or knowledge society can be described as being complex, decentralised or distributed and having a strong team focus. It need to allow for life-long learning, networking of peers, personalised delivery, the student more in control of their own learning, the content more effectively sequenced, transcending specific locations and times, addresses lifelong learning and the costs of course materials for students.

It need to manage a drastically increase in the use of computers and virtual communications. It needs to deal with networking and collaboration internally and with other institutes, integrates all its systems towards a common goal, increased boundary management, and an integration of on- and off-campus learning. It further needs to address open boundaries with a global aspect to it, different cultures and increased global competition. Management strategies could include outsourcing and operating in dual mode. It needs to be highly dependent on information usage and processing, has to deal with real information overload, and ensures control through information and communication.

It further has to address a new immediacy, learns more effectively from mistakes, competitors and collaborators and is highly adaptive and flexible in a volatile external environment.

Conventional management of tertiary education therefore struggles between the desperate need to reform its management because of the external environment but is often ineffective to do this because of its current management approaches. It seems from the above that the inefficiency of the current models of managing conventional tertiary education calls for a meta-model or a new management paradigm to transcend the discrepancies between these management models. Open management seems to indicate the way ahead but focuses on higher education not tertiary education, and does not deal sufficiently with the virtual class - the new educational paradigm for the information or knowledge society.

The above are generic characteristics of the management required in tertiary education to match the educational needs of the information or knowledge society. It is however not clear how these characteristics relate to the nature of management of the virtual class. It is furthermore a challenge to create a congruity between centralised and decentralised management aspirations in tertiary education that has not been adequately addressed.

A new educational management paradigm is sought for managing the operations of the virtual class. In the context of an emerging information society, the management of tertiary education needs to guide the activities and policies of the institute to a proper response to the needs of the information society. The literature indicates that a proper response to the educational needs of the information society requires a transformation in the management of conventional tertiary education on all its levels. It seems from the literature that a proper response is limited in conventional tertiary education, more evident in distance education and open learning, and well articulated in private enterprise. Private enterprise involvement in education however threatens traditional values found in conventional tertiary education and therefore necessitates an aggressively response from conventional tertiary education. Conventional tertiary education needs to respond with a fitting management approach to meet the real societal needs of the new millennium.

The need to find a new, comprehensive educational management paradigm for managing the operations of the virtual class has been indicated above. Conventional tertiary education however has to deal with another major problem first, which is to identify appropriate strategies to implement the virtual class within seemingly incompatible existing management processes and structures.

2.4 Strategy

Strategies for educational reform, implementing innovation and managing technological innovations are reviewed.

Educational change or educational reform is a suitable departure point in reviewing the literature on managing technological innovation in tertiary education. Effective implementation of the virtual class infrastructure, as technological innovation, in conventional tertiary education induces educational reform. Tillema (1995) asserts that the move to adopt more flexible modes of delivery is clearly a move to reform the delivery of tertiary education.

2.4.1 Educational reform

There is no neatly formulated theory of generic change (Goodman and Kurke, 1982). Cannon (1986) further points to the absence of a general theory of educational development and notes that educational developers therefore draw on theories from other disciplines to inform their educational practice.

Tertiary educational institutes in general are very conservative and have been highly resistant to change and reform over the centuries (Evans and Franz, 1998 April; Richardson, 1979). Educational institutions in general "…which exist to open minds and challenge established doctrine, are themselves extremely resistant to change" (Robbins and Barnwell, 1998). Conventional tertiary education can be described as largely bureaucratic and "…bureaucracies by definition resist change…" (Tapscott, 1996:36).

Technological innovation has often been implemented as an isolated, bottom-up initiative of academic staff for efficiency purposes. In this scenario the wider systems within tertiary education are often not considered and neither affected by the innovation. The management of an institute may thus feel justified in disregarding the innovation. Systems theory calls for an integrated approach to technological innovation: "a system is a whole that cannot be taken apart without loss of its essential characteristics, and hence must be studied as a whole" (Ackhoff, 1972:40). Michael Porter's notion of competitive advantage also supports an integrated, strategic approach: Companies with sustainable competitive advantage integrate a large number of activities within the business: their marketing, service, designs, customer support. All these activities then are consistent, interconnected and mutually reinforcing (Pastore, 1995, October 1).

Technological innovations have also experienced difficulty in education because of a problem that Michael Porter calls "metrics" (Pastore, 1995, October 1). Conventional tertiary education, similar to other sectors of society, has often responded to new ICT applications on the basis of efficiencies rather than using more strategic considerations.
Porter (Pastore, 1995, October 1) describes this problem as follows. The traditional criteria by which IT applications have been chosen have been ones of operational effectiveness—How many people can we save? How much faster can we process the

paper?—rather than more strategic measures, such as how much have quality or service levels gone up. That needs to change.

David (1994:169) similarly calls for strategic approaches to ICT use in schools of the United States, which seem apt for what has been occurring in conventional tertiary education:

> The primary reason technology has failed to live up to its promise is that it has been viewed as an answer to the wrong question. Decisions about purchases and uses of technology are typically driven by the question of how to improve the effectiveness of what schools are already doing-not how to transform what schools do".

All changes in education have not been equally successful. Fullan (1991) refers to first order (or first level) and second order (or second level) changes to explain this phenomena. He believes that most changes in education in the twentieth century have been first order changes, which are aimed at improving efficiency and effectiveness of current practices. Fullan (1991:29) states that "… second order reforms largely failed", which are those changes that aim at fundamentally changing the ways that organisations are put together.

New technologies however can be absorbed into an old paradigm without bringing about any real change. Harris' (1987:44-45) critical view of the use of educational technology at the British Open University (UKOU) provides an example:

> … since educational technology became an important part of the process whereby educational aims and processes became defined in purely operational terms…. The progressives and the OU – including the progressive educational technologists – have succeeded in creating only a progressive appearance for what is the old educational domination.

To ensure ownership by academic staff as well as sound educational quality in networked education, it is important that educators and educational principles drive the implementation of the virtual class infrastructure (Szabo *et al.*, 1997; Willmot and McLean, 1994; Caladine, 1993). The structures supporting the virtual class have to ensure an educational focus and pre-eminence of educational principles rather than administrative desires or technical possibilities. This also highlights the importance of following bottom-up and more organic approaches when implementing the virtual class infrastructure in conventional tertiary education. Tillema (1995) consider engaging academics in the reform process as one of the two significant management issues to address in educational reform in education in general. He asserts that reform has to be based on the development of 'learning communities'. That means that the actual process of reform must engage academics in local communities of discourse about their educational practices.

In educational reform in particular the reward systems need to be tied to involvement in that which brings reform. To enable the wide implementation of the virtual class infrastructure in conventional tertiary education, it needs to be stated as a strategic objective and direction, and then to tie the reward systems to its implementation (Munitz, 1997). The institute's reward systems should encourage academic staff and students to become and remain involved in networked education if it desires to implement the virtual class infrastructure widely within the institute. Marquardt (1996:97) contends that "one of the most powerful management principles in the world is 'That which get rewarded gets done' " and asserts that

> Rewards should be made for actions that directly or indirectly lead to organizational learning, such as risk taking, commitment to learning and personal mastery, teamwork, encouraging new experiences and ideas, being a teacher/trainer, and passing lessons learned on to team mates and the broader network.

Quality assurance in networked education is highlighted by Butterfield *et al.* (1999, July) who believes that as virtual institutes emerge, the attention to quality assurance (QA) is more necessary, but may be more difficult. They believe that attention must come from the institutions themselves as well as from the external quality agencies (EQAs). Quality assurance also relates to the complexities of national and international accreditation and certification as networked education creates more options for students. A solution might be to use outcome based education which focuses on assessing learning and learners instead of courses or other instruction units delivered by providers, and which is based on specific, standardised, and widely accepted competencies (Jones, 1995). Woodhouse (1999) highlights that open and distance learning (ODL) in general lends itself to transmission of education across national boundaries which raises questions of the maintenance of quality, and the guarantee that it is being maintained, internationally. He states that at present, some courses have to answer to two EQAs (at home and abroad) while others slip between the cracks and answer to no-one. Woodhouse also points to the difficulties in determining what constitutes “equivalent quality” since education is not culturally neutral. New organisations have been created to deal with accreditation and certification issues across national borders like the Global Alliance for Transnational Education (GATE, 1999) which is dedicated to “principled advocacy for transnational educational programs”. GATE states the need for addressing these issues. The rapid globalization of higher education arises partly from the global marketplace and new technology. Today's business draws its professional work force from all over the world. That means that human resource development divisions of multi-national corporations increasingly facing the challenge of evaluating courses and degrees from other countries when identifying personnel. Furthermore, higher education is no longer provided solely within national borders. Provided by both higher education and business, transnational education can be found in multiple forms, provided both electronically and through traditional instruction and training programs. Issues of quality, purpose and responsibility abound in this new “borderless educational arena”.

2.4.2 Implementing innovation

An innovation can be described as “...an idea or behaviour that is new to the organization adopting it" (Swanson, 1994:1070). In this study the implementation of the virtual class in conventional tertiary education is regarded as an innovation.

The term *innovation* in this study uses a widely accepted definition of innovation, which describes all of the stages from the technical invention to final commercialisation (Top research managers speak out on innovation, 1970 November). Fullan (199:37) describes innovation in education as "multi-dimensional" and identifies three aspects of change, which he believes "are all necessary because together they represent the means of achieving a particular educational goal or set of goals"; these are "the possible use of new or revised materials", "the possible use of new teaching approaches" and "the possible alteration of beliefs". This research postulates that each of these three aspects is present in the implementation of the virtual class infrastructure in conventional tertiary education.

Innovation diffusion theory (Rogers, 1983) provides a general explanation for the manner in which new entities and ideas like IT and the virtual class over time, disseminate through social systems, in this case conventional tertiary education. Rogers reviewed studies of diffusion of innovations from many technological contexts and forwarded a model for adoption of innovations describing key roles and behaviours in the adoption. Innovation diffusion theory is essentially a bottom-up approach based on individual responses.

A top-down innovation process is important. Drucker (1985) points to the importance of a top-down process for a successful innovation aims at leadership. He believes that if it does not aim at leadership right from the outset, it is unlikely to be innovative enough, and therefore unlikely to be capable of establishing itself. This statement is made within the context of the business world, but with the increasing competitive nature of the educational milieu this advice is becoming more relevant for conventional tertiary education.

A combination of top-down and bottom-up processes seems possible in the learning organisation. Marquardt (1996:218) contends in the context of the learning organisation that "…it is possible for any member to be an awareness-enhancing agent or an advocate for new competence development. In this way, both top-down and bottom-up initiatives are made possible". Gunn (1998:142) asserts that

> An effective technology strategy works in both directions. From the top down, it is articulated through institutional objectives, sensitive to existing culture,

> constraints, strengths and weaknesses, and presented as a coherent, achievable set of goals with appropriate incentives and rewards. It must also move from the bottom-up where knowledge of teaching strategies, learning contexts and disciplinary expertise can be translated into action plans geared to achievement of institutional strategic objectives and so creating a sense of ownership at all levels of the institution..

The point of implementation of an innovation needs to be defined. According to Rogers (1983), implementation occurs when the decision-making unit puts the innovation into use. Roberts (1997:580-1) states that "innovation is composed of two parts (1) the generation of an idea or invention, and (2) the conversion of that invention into a business or other useful application" and provides a useful formula:

"Innovation = Invention + Exploitation"

The implementation of the virtual class in this study refers to the process of introducing the concepts and processes of the virtual class into a conventional tertiary educational institute in New Zealand to the point where it becomes operational. Implementation therefore includes both the initial introduction of the virtual class into a conventional tertiary educational institute, and the further processes until the virtual class is operational.

The utilisation or implementation of the virtual class in a conventional tertiary educational institute might therefore be partial, embryonic or it might be comprehensively used throughout the organisation. The central criterion of "being implemented" is whether the virtual class is *being used in a non-experimental manner* in a conventional tertiary educational institute.

The implementation of networked education being based on ICT can also be described in the context of information technology (IT) systems implementation. The traditional or waterfall systems development life cycle (SDLC) includes systems investigation (identify the parameters of a problem), systems analysis (understanding the problem), systems design (determine the best solution to the problem), systems implementation (place the solution into effect or operation) and systems maintenance and review (evaluate the results of the solution) (Stair, 1992:405). In the traditional life cycle systems development approach it is emphasised that each of the six phases that is systems investigation, systems implementation, systems analysis, systems design, systems implementation (which includes construction, testing, maintenance, review) occurs consecutively for the whole system (Stair, 1992:405). Stair (1992:410) describes the factors that are present when using this approach: a high degree of certainty about input and outcomes, high user experience, immediate results are not desired, there is a low degree of risk, a small number of alternatives, and a low degree of complexity.

Another SDLC model is the spiral or prototyping approach in which each of the six systems development life cycle phases is essentially executed per module / prototype in an experimental and incremental manner. The factors that point towards using the prototyping approach are: a low degree of certainty about input and outcomes, low user experience, immediate results are normally desired, there is a high degree of risk and a large number of alternatives. Burch (1992:15) contends that

> Prototyping is best used to develop systems that are poorly defined. Prototyping is also appropriate for unique small systems applications, In almost any case the prototypes enhance visualization and communications. In many instances what the users ask for is not what they want, and what they want is not really what they need. [The writer's experiences also indicate that what the users ask for is not always what they get!] Prototyping helps solve this double [perhaps triple?] dilemma.

Roger's diffusion of innovation curve (*see* Figure 2.1) can be used as a starting point to depict the implementation of the virtual class in conventional tertiary education. Initially there is a take-off stage (that is introduction) during which an innovation is introduced in a social system. An entrepreneurial group called the innovators often then adopts it. During the next phase of maturation the "early adopters", who are change agents or opinion leaders among the social system, will enter the process thereby legitimising the innovation and opening the potential for adoption to all members of the system. The final saturation stage in an innovation's adoption is characterised by widespread adoption. The innovation saturates the social system and growth tapers off. This process can be plotted as an S-shaped growth curve.

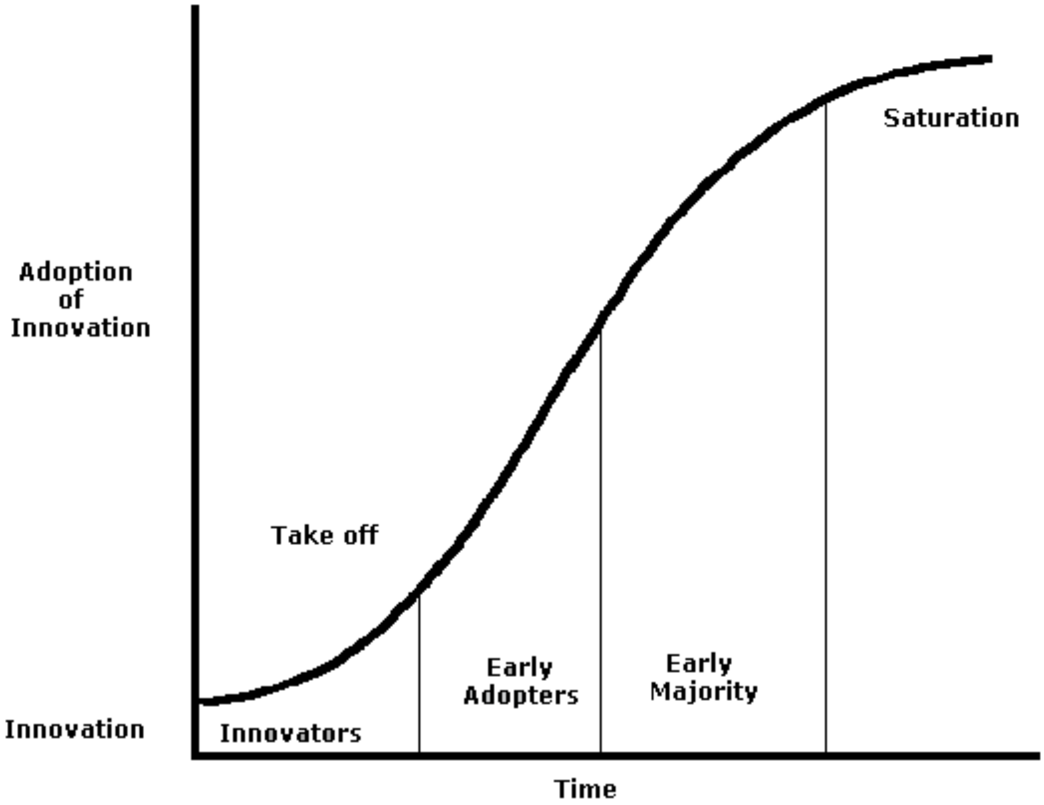

Figure 2.1 The Innovation Adoption Curve
(Adapted from Rogers, 1983)

This research links to Roger's diffusion of innovation theory in that it views the virtual class as an integrated technological and educational innovation within conventional tertiary education.

Goldenfarb (1995) similarly used Roger's diffusion of innovation theory at the University of Melbourne, Australia, where a campus wide information system (CWIS) was implemented.

Another change model to provide overall structure for implementing the virtual class infrastructure in a conventional tertiary educational institute is the Lewin and Schein's model for organizational change (Stair, 1992:396). They propose the following stages:

1. *Scouting*: Identify potential areas or systems that may need change
2. *Entry*: Stating the problems and the goals
3. *Diagnosis*: Gathering data and determining resources required
4. *Planning*: Examining alternatives and making decisions
5. *Action*: Implementing the decisions: decisions were followed through in a consistent manner
6. *Evaluation*: Determining whether the changes satisfied the initial objectives and solved the problems identified
7. *Termination*: Transferring the ownership of the new / changed system to the users and ensuring efficient operation.

Nixon (1996:13) identified four pre-conditions for successful change in educational institutes as

(i) the importance of collegiality and the need for mutually supportive relationships with colleagues;

(i) the importance of having a clear sense of where their institution was going; a sense of its priorities and long-term commitments;

(i) the need for structures to support their development as teachers and writers; and

(i) the need to resolve tensions between their teaching responsibilities and research commitments.

It needs to be tested whether these apply to networked education in conventional tertiary education.

Innovation in conventional tertiary education – as with most innovations - takes place within the context of the organizational and management structures. According to Daft (1989:274) "... organic organizations encourage a bottom-up innovation process" which is seen as typical for technological innovation. This position aligns itself with Roger's diffusion theory that also proposes a bottom-up approach when the innovation starts from outside management. Daft (1989:274) however also indicates that administrative innovations follow a top-down direction of change within a mechanistic management structure. Daft (1989:570) observes that "… the trend over the last thirty years has been toward more organic structures" which he partly attributes to "… greater environmental uncertainty and nonroutine technologies". In contrast, as has been illustrated above, it seems that conventional management of tertiary education does not provide the required organic structures that foster innovation. Fullan (1991:349) refers to this dilemma as the tension of "… combining individual and institutional development..." and the necessity of having both in tandem for successful educational change

2.4.3 Managing technological innovation

Taking cognisance of the culture of an educational institute when implementing technological innovation seems to be critical as Pettit and Hind (1992:119) contest "… change strategies which ignore the specific cultural context do so at the risk of creating massive conflict." The "culture" of an organisation refers to "…the values, beliefs, practices, rituals, and customs of an organization" (Marquardt, 1996:24).

Access is an issue that relates deeply to the implementation of the virtual class in conventional tertiary education. Ljoså (1992:91) raised the concern of equitable access to computer mediated education. Ljoså asserts that "every time we introduce a new technology in a distance education system, we run the risk of introducing a new barrier to participation and learning". Bates (1983:283) points to the ease of access as an important criterion for the success of technologies in future distance education. Equity of access poses as a major issue for networked education as it requires students to use the Internet or intranets and related tools for participating in courses. Mason (1999:86) highlights this issue in the European context as follows:

> And although the rhetoric about virtual education is that it will extend to the disadvantaged, the remote, the housebound, and the unemployed, those who are signing up for virtual education are the advantaged, the upwardly mobile, the "over-employed" (i.e, those who are already incredibly busy), and the well educated. There is evidence from practitioners that virtual education is more appropriate and more successful for the advantaged learner: one who is motivated, has good learning skills, and has easy access to technology.

Technological innovation carries a threat to the privacy of the individual, which needs to be managed using appropriate mechanisms like user identification. Tapscott (1996:33) describes the magnitude of this management challenge in relation to the information highway that "…has the chilling potential to destroy privacy in an unprecedented and irrevocable manner… As human communications, business transactions, working, learning, and playing increasingly come onto the Net, unimaginable quantities and types of information become digitized and networked. How can we safeguard privacy in an economy that is digital?"

The review of the literature regarding managing technological innovation in tertiary education indicates that it may use the traditional or the prototyping SDLC approaches, Lewin and Schein's change model, the TIES model or Roger's diffusion model to provide structure to the change process. It does not specifically relate these approaches to the implementation of networked education in conventional tertiary education.

It often requires a bottom-up and top-down process, use an organic control process, address values and beliefs of staff, focus on core issues in education and ensure management support. It needs to engage academics, frame university operations in academic terms, ensure ownership and ensure that educational and policy decisions precede technological decisions. It needs to cater for changing professional roles through training and support, and can use an integrated, parallel or distributed approach to institutionalise technology. Although various models exist for course development, it proposes the use of a team-model consisting of a sponsor and highly specialised team members, including subject specialists, specialists in instructional design, media, technical production, editors and gatekeepers. It also needs to carefully consider the internal culture of the institute. It further needs to manage WWW technologies and consider access of students to courses.

The literature points to technological innovation in general within tertiary education. It needs to be tested whether the above apply to the implementation of networked education in conventional tertiary education.

2.5 Roles and Skills of Individuals

Change in conventional tertiary education seems to be largely dependent on inducing change among academic staff since they are the primary institutional agency for directly effecting teaching. Tillema (1995), in dealing with the issue of reform, searched the literature that primarily deals with teachers within the schooling sector, and he believes that the messages also appear relevant to academics. He points out that historical studies, based largely on experience in schools, show that 'top down' attempts to achieve educational reform have failed, and suggests that they will be doomed to failure until they 'confront the cultural and pedagogical traditions and beliefs that underlie current practices and organizational arrangements' (Goodman 1995:2). Goodman's work points to the largely unexamined influence of traditions and belief systems as sources of resistance to reform.

Szabo *et al.* (1997) call it the "empowerment" phenomenon since "ADS [alternative delivery systems] require ownership (commitment, not just compliance) on the part of those who will ultimately implement it". Molinaro and Drake (1998) similarly found in a study of successful educational reform in a secondary school in Canada, which might be applicable also in conventional tertiary education, that This school's success could be ascribed to the fact that it recognized that teachers are at the crux of successful educational reform. Therefore, teachers have been given the freedom to grow and develop.

In implementing the virtual class infrastructure in conventional tertiary education, it therefore seems necessary to address the concerns and perceptions of academic staff in the light of the need for changing their attitudes and to ensuring ownership by academic staff (Evans and Franz, 1998 April; Taylor, Lopez and Quadrelli, 1996); this, however, needs to be verified.

Tillema (1995) similarly points to two significant management issues to be addressed in educational reform in education in general, namely focusing on core issues and engaging academics in the reform process. In describing these two management issues, he sounds a word of caution as to attainability. Consensus about educational reform, particularly at the schooling level, requires consideration of two central issues. Firstly, as identified by Goodman (1995), is the need to address core issues. Secondly, for reform to adequately address these issues, it must be based on the development of 'learning communities': the actual process of reform must engage academics in local communities of discourse about their educational practices. It would obviously be an advantage to involve multiple perspectives -- academics, academic managers and support staff -- in those communities. Whether these two issues can be adequately addressed within a sector and with individuals experiencing an identity crisis remains uncertain. The existence of such an identity crisis, suggests a challenge to core issues. Whether that challenge can be translated into an opportunity is still to be seen. This literature suggests that there is little reason for optimism, but that there is increasing understanding of how this might be achieved.

The role of the teacher in networked education is changing (Collis, 1998; Thompson, 1997 June; Zepke, 1998; Leslie, 1994). There is a perception that the teacher will become more like a facilitator than being a provider of information (Hodgson, Mann and Snell, 1987; Mason, 1998; O'Donnell, 1996). Luke (1997:12) explores the notion of ‘net work” as “the new kind of intellectual and institutional labour needed to transform the existing national/industrial/traditional university into an informational operation with new transnational/postindustrial/innovative capabilities ”; the term “net work” focuses on “how thoroughly academic work is changing.”. This research also addresses the changing role of academic work in the virtual class and finds some positive links with Luke’s (1997) concept of “net work”. This study, however, relates the changing role of the academic to an Internet and intranet based environment and furthermore places it within the context of conventional tertiary education.

Academic staff in particular has a strong resistance to change since it deals with changing traditional beliefs and practices. Taylor, Lopez and Quadrelli (1996) found in a study of two big Australian Universities that “research on conceptual and belief change has found a strong resistance to change.” A study by Tillema (1995:312) concluded that:

> ...the knowledge structures of professionals are very difficult to change by mere presentation of information. Conceptual change, and training as a means to achieve it, needs to engage the pre-existing ideas, orientations, ways of thinking and perspectives of professional teachers; otherwise the hegemony of those knowledge structures will remain unchallenged.

Szabo, Anderson and Fuchs (1997) developed a specific change model called the training, infrastructure and empowerment system (TIES) for implementing alternative delivery systems at the University of Alberta in Canada. They similarly commented that "the driving force behind TIES stems from the conviction that bringing people to actually change their practices with respect to new teaching approaches is extremely difficult."

Training of academic staff is critical in the implementation of the virtual class. Szabo *et al.* (1997) holds that "the three sequential stages of innovation are play, use, and creativity." Their TIES model uses the following five phases: Vision Building, Identification of Departments, Development of TIES Workshop and Modules, TIES Leadership Task Force (TLTF), Training and Follow Up Support.

The level of resistance of staff to integrating networked education in their teaching in learning will need to be gauged.

In order to ensure long term involvement of academic staff, it seems important to ensure that the scholarship of teaching is recognised and appreciated, because this is where the impact of the virtual class is probably most visible (Nixon, 1996). Unless this happens, academic staff might not be motivated to pursue networked education (Barnard, 1997; Taylor, Lopez and Quadrelli, 1996). In referring to academic staff Nixon (1996:13) identifies "… the need to resolve tensions between their teaching responsibilities and research commitments" as one of the four pre-conditions for successful change in educational institutes towards networked education. Mason (1999:86) highlights this issue in the European context as follows:

> However, in those countries that are in the forefront of virtual teaching (e.g., the U.K.), there is a severe workload issue that needs attention. Many academics are under great pressure to produce research results at the same time as deliver courses to vastly increased numbers of students.

New definitions of "contact time" or "office time" (Barnard, 1997; Johnston and Challis, 1994) points to alterations required in the workload formula for teachers in networked education. Exactly what these changes are will need to be researched. This management strategy aligns itself to an assumption in post-industrial organisations that wages are no longer paid for time that a person gives to an organisation but rather for doing a job or rendering a service" (Handy, 1985).

Bates (1984b:227) asserts that "… the introduction of new technology in distance education requires major changes in professional roles". Bates (1984b) points to the need for specialised roles and the need for academics to gain the skills and knowledge for effective use of the new technologies, and the requirement for extensive training. These aspects would be amplified when managing the implementation of networked education with its ICT base and range of technical options. Mason (1998:157) asserts that the new technologies in global education point to "… a new role for the teacher, for the student and for course material. It centres on the construction of knowledge by the student... a teacher as facilitator… information is no longer something to organise, transmit and memorise, but something to work with, think with, discuss, negotiate and debate with partners".

Academic staff may act as the content experts in the course development team. (Holmberg, 1995:135) contends that "…the various tasks are divided between a group of highly specialized team members, among them subject specialists, specialists in instructional design, media, technical production etc. and editors". Paquettee, Ricciardi-Rigault, Paquin, Liegeois and Bleicher (1996, June) describe the team roles in terms of "five actor categories", namely learner, trainer, content-expert, manager and designer. Katz and Tushman (1997:331) further highlighted the importance of the role of gatekeepers in the "… effective transfer and utilization of external technology and information". Gatekeepers can be defined as key individual technologists who have a strong connection to both external sources of information and internal colleagues. Katz and Tushman asserts that boundary spanning gatekeeping has been recognized as one of the more important elements of effective leadership in Research, Development, and Engineering (i.e., RD&E) settings. Roberts (1997:584-585) identifies four critical innovation roles, namely that of idea generators (those who come up with ideas), ideas-exploiters (those who do something with the ideas generated), the gatekeepers (special communicators who are the link-pins and bring external information messages into the project group) and sponsor or coach (who provides encouragement and assist in finding resources). Furthermore, Roberts describes gatekeepers as "…human bridges [who] join technical, market, and manufacturing sources of information to the potential technical users of that information".

The above aspects do not particularly address the implementation of networked education in conventional tertiary education but provide pointers to possible implementation approaches and strategies.

2.6 Structure

In terms of an organisational structure to support the implementation of technological innovation, Taylor, Lopez and Quadrelli (1996) propose three possible implementation approaches of "flexible delivery options" in higher education:

> The integrated approach with a central unit managing the integration of teaching and learning with IT, emphasising support for professional development in educational and information technologies and linking it to university goals. The parallel approach, creating an IT-based teaching and learning unit which operates separately and in parallel with existing staff development units. The distributed approach, which is more 'bottom up' and devolves responsibility for IT-based teaching and learning developments to local innovators across a range of faculties and units.

The team-concept in management and organisational structure is proposed by Peters (1988) for the modern organisation in order to be more responsive. Peter Drucker (1998:125) asserts that because information-based organisations consist of knowledge specialists, "… the modern organization cannot be an organization of boss and subordinate. It must be organized as a team". Hayes and Watts (1986:34) describe work in the post-industrial firm as work that "… will be undertaken in small, semi-autonomous, task-oriented units linked by computers to a central base". Tapscott (1996:54) indicates that "…the business team is central to the new enterprise".

The specialized skills needed to develop technology based learning materials further point to the rationale for using development teams. Bates (1993a:232) asserts that producing good quality technology based learning materials "…will require people who can combine good pedagogic practice with an understanding of the strengths and weaknesses of different media and technologies". Garrison (1989:98&117) points to "…course design teams… as the accepted model in distance education" and that the British Open University uses course development teams extensively. Holmberg (1995:98) confirms the predominant course-team model in distance education and that the main advantage of this model is that it operates to high professional standards.

Garrison however also indicates that in distance education this model is not always considered “…feasible or appropriate for all distance education enterprises”. Holmberg (1995:135) described the drawbacks of the team model as impeding personal approaches and also dealing with knowledge as a finished product instead of a complex process of “knowledge under development”. A team approach for developing electronic course materials was proposed by a DEC working party (1989:34) consisting of members of Monash University and Gippsland Institute in Australia who agreed that "the Institute should move quickly to accept the course team as the basic unit for course development and delivery". Taylor, Lopez and Quadrelli (1996) who investigated the relationships between diversification in modes of delivery, use of ICT, academics' teaching practices, and the context in which those practices are employed, in two of the three large universities in Brisbane, namely Griffith University and the Queensland University of Technology strongly recommends that teams should be used when developing more flexible modes of delivery.

Organisational structure is not removed from organisational culture. Taking cognisance of the culture of an educational institute particularly is an important aspect of change management. Szabo *et al.* (1997) point out that "critics of education, of which there is no short supply, often contend that: students are poorly prepared (for the work force), education has become bureaucratized, politicized and centralized...". Garrison (1989:38) points out that education “…is experiencing a shift from formal, centralised, and segmented operations”.

The impact of implementing networked education within the organisational structure within conventional tertiary education has not been resolved.

2.7 Technology

The virtual class can take many forms but is based per the definition above on ICT. It might occur as on-line education using the Internet or an intranet, meeting in virtual reality as telepresences, through Internet based video-conferencing or HyperReality. "Virtual reality (VR) is a computer-based technology which provides visual, auditory, and tactual stimulation from a real-time computer generated world-while severely restricting sensory input from the real world. The person interacts with this artificial works as *if* it were the real world" (Chambers, Mullins, Pantelidis, Gay and Loeffler, 1996 June:729). HyperReality can be defined as "… the technology that seeks to blend virtual reality with physical reality. It inter-relates virtual reality and real reality in a way that appears natural and seamless." (Tiffin, 1997 April:6).

The specific manifestation of the virtual class referred to in this study is when the virtual class is predominantly based on Internet or intranet technologies. The writer describes this expression of the virtual class with the term: *networked education*.

The library particularly needs to be transformed to provide most of its services electronically and to provide increased access to external electronic resources rather than local paper-based materials (Barnard, 1997; Odlyzko, 1994). Tiffin (1996a, November:1) contends that it "…is libraries which anchor the location of universities and preserve the form of curricula" and the electronic base of the new library has the implication "…that knowledge can be accessed from anywhere at any time" (Tiffin, 1996a, November:2).

In contrast with the virtual class, conventional tertiary education is not based on ICT but on a physical infrastructure that includes transport, media, electricity, buildings, and clothing. Computer technologies are often used in a very limited way for course delivery. The description of Richardson (1979:123) seems still applicable to the role of information technology (IT) in conventional tertiary education:

> …they are ill prepared to respond and are falling ever farther behind in responding to the needs of an increasingly complex and rapidly changing social order, this is nowhere more evident than in the field of information technology where they have failed utterly to develop the institutional forms and curricula which would prepare students to function effectively in a post-industrial society".

Networked education can impact negatively on the mobility of course materials. ICT has made geographical proximity and time constraints irrelevant for the teacher and student (National Center for Higher Education Management Systems, 1995; WA Telecentres, 1995). "Distance" in the virtual class is no longer defined in terms of physical proximity but in response time (Negroponte, 1997 June). However, in a personal conversation with a staff member on the British Open University campus (April 1998), it was related to the writer that the most significant loss students experienced from paper-based to networked education is the mobility of the study materials which now resided on computers. This naturally impacts on the mobility of the students. Mason (1999-86) highlights this issue in the wider European context:

> One of the interesting facts about technology-based virtual teaching as opposed to traditional distance teaching is that it is *less* flexible. (Traditional distance education in Europe consists of print-based materials plus tutorials in local study centres). Reading from screen, having to study near a computer with network access, and certainly carrying out collaborative work online—all these factors make a course less flexible than reading specially prepared study texts.

Managing technological innovation in education needs to consider the wider implications for education. Caladine (1993:7), who reviewed the literature on non-traditional modes of delivery in higher education using state-of-the-art technologies, indicates that the extensive use of ICT in education "...poses previously unencountered problems in pedagogy and andragogy". Bates (1992:265) contends that "… technological decisions need to be preceded by policy and educational decisions..."

The World Wide Web (WWW) would seem to play a central role in networked education. Mason (1998:156) indicates that the "current revolutionary possibility centres on the Web" but indicates that the WWW might be "oversold as an educational tool". Taylor, Lopez and Quadrelli (1996) point to the important role of technology in distance education by referring to Caladine's (1993:10) three generations of open and distance education:

> The first is 'correspondence teaching', characterised by the use of a single medium -- text -- and the postal service as a means of delivery. This remains a

> central mode of ODE delivery. The next generation involved 'multimedia distance education' -- of which the Open University (United Kingdom) is one of the best-known exponents. Typically this involves the use of text resources supplemented by interaction with tutors, either in face-to-face settings or via telecommunication technologies. He refers to this approach as an 'industrial model' (1993: 10) of distance education, alluding to the high fixed costs involved in producing the teaching/learning resources, and relatively low variable costs associated with supplying those resources to any single student. As a result of this ratio, there is significant pressure to maximise student enrolment in any subject offering. The third generation involves 'interactive multimedia distance education' (1993: 10). Here the emphasis is on the use of CIT to facilitate interaction, and as a medium for information delivery. This approach 'allows courses to be custom designed for relatively small numbers of students'.

Any innovation, especially if it has the dimensions of a paradigm shift like the virtual class (Tiffin and Rajasingham, 1995), faces the classic problem that "…whenever a new technology is introduced, be it printing press or a horseless carriage, individuals' first inclination is to use it as they used the traditional technology it replaces" (Means, 1994:3). In networked education this approach is evident in electronic versions of class handouts being presented as "on-line courses", or providing students with extensive content in courses without linking to the vast resources on the WWW. Conventional tertiary education needs to contemplate the new management approaches that the wide implementation of the virtual class might require.

ICT can change the nature of distance education. Bates (1992:265) foresaw that "technology will change the nature of the distance learning experience".

It is clear from the literature that the management of the library will change dramatically. It is furthermore important in the implementation of networked education in conventional tertiary education that policy and educational issues determine technology decisions. It remains unclear however from the literature review what the management issues regarding technology are when implementation networked education in conventional tertiary education.

This literature review points to the necessity to pursue the two research questions:

A. How does one manage the implementation of the virtual class infrastructure in conventional tertiary education?

B. How does one manage the operations of the virtual class?

The methodology that was used to address these research questions is now outlined.

CHAPTER 3
METHODOLOGY

In Chapter two the literature that pertains to this research was discussed to provide along with Chapter one the context for this research.

In this Chapter the methodology that was used in this research is outlined.

3.1 Action Research

The term action research was coined in the United States by the social psychologist Kurt Lewin (1946). He held that action research could be used to simultaneously achieve advances in theory and needed social change. Theoretical advances in the management of networked education could therefore be achieved while simultaneously impacting the management systems at Wellington Polytechnic.

Anderson (1987) argues that action research is a subset of qualitative research where the researcher is actively engaged in the practice of his study. According to Cunningham (1993) action research is a continuous process of research and learning where the researcher has a long-term relationship with the problem.

The purpose of action research in organizational settings is to develop and discover aspects of the system's operation which can lead to improvement and change (Cunningham, 1993). Elliot (1991) states that the "...fundamental aim of action research is to improve practice rather than to produce knowledge". However, Lewin (1946) clearly indicated that action research can be used to simultaneously achieve advances in *theory* and needed social *change*. Action research therefore allows the exploration in two dimensions, that is to say theory and practice. It explores this intimate relationship between theory and practice, where the theory influences the practice and the practice changes the theory.

Chein, Cook and Jarding (1948), working under Lewin's guidance, outlined four varieties of action research:

- Diagnostic action research: the goal is to diagnose a problem in need of change, and to seek and find cures which are feasible
- Participant action research: the participants are actively involved in the research
- Empirical action research: the goal is to use recurring experiences to gradually develop generally valid principles
- Experimental action research: a variety of techniques in identical situations are studied in a controlled way to determine their relative effectiveness.

The action research process typically occurs as a spiral of sequential research cycles. This process was initially defined by Lewin (1946) and further developed by others including Carr and Kemmis (1986) and Zuber- Skerrit (1992).

The spiral nature of action research is due to each cycle of the research building onto the previous one. In action research, the maturation of the research is typically evident in clearer goals within each progressing cycle. In this study the spiral effect led to more heuristics in regard to managing the implementation of the virtual class infrastructure in conventional tertiary education being discovered in each cycle – these are summarised in chapter 8. At the same time, as this research progressed, more characteristics of virtual class management emerged, which were consolidated into a new educational management paradigm for the virtual class called networked educational management (Chapter 9).

In this cyclical process it might be that even the problem, variables, hypotheses, and methods may undergo modification as interim results are validated or invalidated (Clark: 1976).

There are typically four interrelated steps or elements within each cycle that do not necessarily occur sequentially, but can be a continuous process as the four elements (plan, observe, act and reflect) may occur in parallel. Clark (1972) developed eight case studies that provide evidence that that these four elements may all be occurring in parallel.

The action research centered on the implementation of the virtual class at Wellington Polytechnic as the primary case study.

3.2 Rationale for Using Action Research

Action research seems appropriate for this research, as it caters well for dynamic change, provides research outcomes that have a high degree of relevance, is pragmatic, and can address complexity of systems well. These aspects are described below.

The context and domain of the virtual class is a dynamic one as described in Chapters 1 and 2. It is based on the emergence of a global information or knowledge society and is, for instance, reflected in the exponential growth of the Internet, which is one of the central technologies in networked education. For Cunningham (1993) the traditional approaches in scientific research "...do not seem to recognize the dynamic nature of organizational problems."

A high degree of relevance to current issues in conventional tertiary education was pursued in this research as it sought to identify what the key management issues are of implementing the virtual class in conventional tertiary education in New Zealand. Action research has been gained recognition mainly in the social sciences and especially in educational research where reproducible, controlled experiments are often impossible since the field have to do with real-life settings. However, controlled experiments belong to traditional "quantitative methodologies" (Anderson: 1987); in contrast, this research has to do with real-life organizational change as conventional tertiary education implements the virtual class. In line with the observation by Cunningham (1993) that there was a growing recognition of the difficulties of applying the positivistic research paradigm to carry out research and change in real-life settings, a qualitative methodology like action research was therefore deemed more appropriate to the research problem.

In Chapter 1 of this study a real-life problem has been identified in terms of the research construct to discover what the key management issues are when implementing the virtual class in conventional tertiary education, and in terms of the two research questions *"How does one manage the implementation of the virtual class infrastructure in conventional tertiary education?"* and *"How does one manage the operations of the virtual class?"*

The interplay between conventional tertiary institutes and the virtual class is a complex and open real-life system owing to the presence of a large number of factors and management issues (as illustrated in Chapters 8 and 9) in which cause and effect are not necessarily closely linked. This relates to the notion in chaos theory that one interaction may have a domino effect of interactions, which leads to unexpected synergies that disturb the normal cause-effect relationship. Adding to this complexity is the notion in this research (discussed in Chapter 1) that a conventional tertiary educational institute and its management processes can be viewed as having a fractal dimension, that is to say management processes of the institute, administrative departments, academic departments, the design and development of the teaching materials, the actual delivery of the teaching materials that is the "class", and the students' management of their own learning. Action research can, as Cunningham (1993) argues, address this level of complexity through its holistic disposition since organizational problems are best understood by understanding the relationship of various activities as they interact.

3.3 Validity

3.3.1 Perspective

Cunningham (1993) argues that while each operationalization of a construct and perspective of a researcher provides certain biases, each method, perspective and operation has a degree of truth associated with it so that an action science would not rely solely on standards of internal and external validity.

The action research process within Wellington Polytechnic therefore has a specific degree of truth associated with it, but these truths had to be evaluated, compared with, validated and further developed in relation to similar developments in other conventional tertiary institutes in New Zealand and beyond.

The primary case is the implementation of the virtual class in the Wellington Polytechnic, New Zealand, and aimed at meeting the criteria of an "...exemplary case study" (Bridgeman, 1998:42) by being significant, complete, considering alternative perspectives, displaying sufficient evidence, taking into account feedback from those involved, and composed in an engaging manner.

3.3.2 Improvement of practice

Cunningham (1993) also insists that, in responding to organizational problems, good research is determined by the degree to which the results are used in improving organizational practices. He maintains that unless the results of action research positively contribute to practice, it cannot be said that the action research has been valid. The implementation of the virtual class at Wellington Polytechnic as illustrated within the four action research cycles indicates that this study has contributed to research and teaching at Wellington Polytechnic. At the end of the research period, however, a critical mass of those involved in networked education has not yet been reached.

3.3.3 Internal validity

Internal validity in general relates to the use of an experimental group and control group to establish correct causal relationships. This is extremely difficult, if not impossible, in real-life organizational change; Cunningham (1993) highlights this when he points out that variables are generally defined, interrelated, ambiguous and hence an experimental condition once introduced, changes the field setting even if that condition is withdrawn.

Action research therefore acknowledges the complexity of reality by allowing the research to progress within a *series* of cycles. This allows the research to mature while it is possible that the problem, variables, hypotheses, and methods may undergo modification as interim results are validated or invalidated (Clark, 1976).

Action research acknowledges the reality of a complex relationship between cause and effect by having the element of "reflection" in each action research cycle to reflect on what emerged in a specific cycle, which then stimulates the "planning" element of the next cycle.

3.3.4 External validity

External validity refers to the degree to which the findings may be generalised when extended to other actions and settings (Anderson, 1987) and in case studies specifically rely on analytical generalisations (Jasperse, 1992).

The external validity of this exploratory research, which is based on a central, primary case study, is inevitably lower than would have been the case if a large number of in-depth case studies on management of the operations of the virtual class and its implementation within conventional tertiary education in New Zealand and elsewhere had been available. This, however, is not the case at present. In as far as possible, however, the findings derived from the action research on the primary case were compared with and informed by findings at other conventional tertiary educational institutes where technological change has occurred and aspects of the virtual class have been implemented.

There are possibilities of generalising the primary case study of implementing the virtual class in a conventional tertiary educational institute in New Zealand to other conventional tertiary educational institutes (universities, polytechnics and colleges of education) in New Zealand, that is to say to approximately 40 tertiary education institutes which can be defined as *conventional* according to the definition given in Chapter one. This possibility is based on a number of factors described below.

The overall organisational structure and focus of the polytechnics are essentially the same since the specific focus and structure of Polytechnics in New Zealand are defined in legislation (Ministry of Education, 1997 June).

The 25 polytechnics in New Zealand are, however, diverse in their size, ranging as they do from around 138 equivalent full-time students (EFTS) to 3900 EFTS (Ministry of Education, 1998 July), and in their activities and stage of development. The Wellington Polytechnic, with around 3000 EFTS (Ministry of Education, 1998 July) is very similar, though, to the larger, urban polytechnics.

Furthermore, in “A Guide to tertiary education in New Zealand” (1997, June) the Ministry of Education states that "the distinctions between New Zealand universities and polytechnics are diminishing” for although “...most polytechnics continue to provide traditional trade and basic vocational courses, an increasing number of professional courses offered at degree level is reducing the distinction between the respective roles of polytechnics and universities.”

This guide (Ministry of Education, 1997 June) furthermore indicates that

> A central feature of the reforms, as they affect tertiary institutions, has been the introduction of common systems of governance, funding, accountability, and

> reporting. This included a consistent and coherent funding system for all universities, polytechnics, colleges of education, and wananga.

The Association of Polytechnics in New Zealand (1998) explains that

> "Polytechnic" is the generic name for the tertiary education sector that comprises the 25 polytechnics and institutes of technology in New Zealand.
>
> Polytechnics and institutes of technology deliver technical, vocational and professional education. They offer programmes at all levels - community interest courses, certificates, diplomas, degrees and some post-graduate opportunities. Some also deliver the first one or two years of selected university degree programmes.

Wellington Polytechnic however does not offer community programmes, but degrees and diplomas only.

Yet a second generalisation may be possible: to apply the research findings from conventional tertiary education in New Zealand to its counterparts in other countries with a similar profile. Admittedly, as described above, the potential for this generalisation is limited.

This latter potential generalisation is based on a few factors, the first of which is the development of the openness and internationalisation of tertiary education in New Zealand within the framework of the internationalisation of the New Zealand economy as described in “A Guide to tertiary education in New Zealand” (Ministry of Education, 1997 June):

> The first of these major factors is the internationalisation of the New Zealand economy. Significant changes to the direction of economic policy in New Zealand have taken place since 1984. The regulation of financial markets was substantially reduced and foreign exchange controls were removed. Controls over goods and services markets were also substantially reduced.
>
> New Zealand has become one of the most open, deregulated economies among developed countries of similar type. Its social and economic systems, including its tertiary education system, have changed rapidly in order to improve international competitiveness.

> The goal of preparing school leavers for this new environment is a challenge for the tertiary education system. Nevertheless, the system is well-advanced down a path of internationalisation. The internationalisation of the New Zealand tertiary education system is reflected in its curriculum and qualifications which are internationally recognised, and by the strong linkages between education providers in New Zealand and in other countries.

This internationalisation of tertiary education is also illustrated by its participation in and hosting of international conferences. An example of this participation occurred at the first world congress of colleges and polytechnics that was held in May 1999 in Quebec (The Association of Polytechnics in New Zealand, 1998).

A second factor contributing to the possible generalisation of research findings on conventional tertiary education in New Zealand to its counterparts in other countries is that tertiary education shares some common values and is sometimes remarkably similar in nature and structure. This aspect has been discussed in depth in Chapter two (*see para* "2.2 Conventional Tertiary Education").

A third factor contributing to the potential generalisation of research findings on conventional tertiary education in New Zealand to its their counterparts in other countries is the global nature of the virtual class. Tiffin (1997b:5) states that the virtual class "...carries a vision of knowledge that is international not national, of a global community of scholars addressing global research issues and creating at a global level the network of friends and colleagues who share a common understanding". The virtual class through the use of educational technologies like the Internet, which is a global and expanding phenomenon, crosses national borders and occurs in a "space" which is accessible from anywhere in the world that access to the Internet is possible (Uys, 1998).

Finally, interim research findings have been examined and commented on by the research community after the presentation and publication of papers nationally and internationally (Uys, 1997a June, 1997b June, 1997a October, 1998, 1998 April, 1998

June, 1999, 1999 January). The feedback obtained suggests in a qualitative sense that there is a degree of generalisability between the findings of this research and conventional tertiary educational institutes elsewhere with a similar profile to that of Wellington Polytechnic.

3.3.5 Reliability

Reliability of research in the traditional scientific paradigm has to do with the degree of comparability between outcomes when an event is repeated under similar conditions.

In action research that deals with complex real-life organizational change, this is highly improbable if not impossible to achieve since a field setting changes irreversibly once an experimental condition is introduced and cannot be restored by the removal of the condition (Cunningham, 1993). This means that as action research progresses through its cycles of plan, act, observe and reflect, each cycle has different conditions not only because of the "action" element of the previous cycle, but also because of the open and dynamic nature of organisations that respond to other external and internal prompts.

The identified heuristics in regard to managing the implementation of the virtual class infrastructure in conventional tertiary education as well as characteristics of virtual class management are compared to similar projects in New Zealand and elsewhere.

Jasperse (1992) and Richmond (1997) suggest that the accepted procedure to meet the demand of reliability in action research (which is a form of qualitative research) is to provide full documentation on all aspects of the process by which conclusions were drawn. The extensive collection of appendices provided in this study is a direct response to this requirement. In addition, all the relevant electronic messages and replies (3024 in total) over the research period have been retained and collectively provide an extensive action research log of how the implementation of the virtual class infrastructure and the operations of the virtual class at Wellington Polytechnic were managed. Key electronic mail messages are included as appendices 7, 11, 13 and 24.

3.4 Research Execution

Lewin (1946) said that action research can be used to simultaneously achieve advances in theory and needed social change. This goal is pursued in this study by the implementation of the virtual class infrastructure within Wellington Polytechnic, of which the Wellington Polytechnic On-line Campus (1998, June) formed the centrepiece. At the same time the theoretical aspects of management within the virtual class are being explored.

The specific type of action research used in this study would be termed “diagnostic action research” since management within conventional tertiary education in New Zealand, and particularly within Wellington Polytechnic, has been diagnosed as being in need of change at the time of implementing the virtual class. This study then proposes a set of heuristics as a tentative model for implementing the virtual class infrastructure in conventional tertiary education (Chapter 8), as well as a tentative educational management paradigm for the operations of the virtual class called: networked educational management (Chapter 9).

The leadership and sometimes singular actions of the author in introducing this change within Wellington Polytechnic have also aligned this study more with “diagnostic action research” than with “participant action research” – the former being strongly advocated for use in the educational sphere (Kemmis and McTaggart, 1988; Zuber- Skerrit, 1992; Elliot, 1991). The author was the project manager for implementing the virtual class infrastructure at Wellington Polytechnic during the research period. The research analysis and synthesis presented in this study is the independent work of the author. Seashore (1976) claims that within the action researcher’s role in organizational life advocacy is inevitable since the action researcher’s services are often sought precisely because of the trust that the client or sponsor places in what the action researcher will advocate and how single-mindedly that we be implemented.

However, this does not imply that this research was done in isolation. Members of the HYDI team (*see* Chapter four) that worked with the author to develop networked education at Wellington Polytechnic were involved in each of the action research elements of planning, acting, observing and reflecting. This related more to the operational matters of the HYDI project than to the research analysis and decisions, which were predominantly that of the writer. The collaborative reflecting of the team was mostly done on an informal basis although some formal evaluation sessions were held (Appendix 16). The team used electronic mail extensively and also had regular team meetings (often weekly or fortnightly) to discuss progress and plan further action.

The research started in July 1995 and was carried out over a three-and-a-half-year period. The following cycles were analysed.

<u>Cycle 1 - Towards the virtual class</u>

July 1995 - December 1995

Cycle one represents the first steps towards implementing the virtual class infrastructure at Wellington Polytechnic. The overall objective for this action research cycle was to manage the implementation of the virtual class infrastructure so that the feasibility of the vision of networked education at Wellington Polytechnic could be tested.

It was the start at Wellington Polytechnic of the hypermedia (HYDI) project during which the Wellington Polytechnic Website was developed as a pilot project. Cycle one is described in Chapter four.

<u>Cycle 2 – First networked course</u>

January - December 1996

The overall objective for this action research cycle was to manage the implementation of the virtual class infrastructure at Wellington Polytechnic from the preliminary pilot stage to the infrastructure required by the institute to offer networked education.

In cycle 2 the Wellington Polytechnic On-line campus was created and the first networked course offered as a free sampler course. The hypermedia project became an established but still experimental project after the completion of the pilot project in 1995. Cycle 2 is described in Chapter 5.

Cycle 3 - First commercial networked courses

January 1997 - December 1997

The overall objective for this action research cycle was to manage the implementation of the virtual class infrastructure at Wellington Polytechnic to the stage where networked education could be offered commercially.

The first commercial networked courses were developed and the hypermedia (called HYDI) project became the HYDI Educational New Media Centre. A few students did participate in one of the commercial networked courses in an experimental way when it was offered as an alternative to the traditional on-campus version. Roles and responsibilities in the centre became more formalised and the virtual class infrastructure became part of the organisational processes of the Wellington Polytechnic in a non-experimental albeit small way. Cycle 3 is described in Chapter 6.

Cycle 4 - Networked education in operation

January - December 1998

In this final action research cycle the overall objective was to assess the effectiveness of the virtual class infrastructure and to extend this virtual class, where necessary, to support commercial networked education.

Networked education went into operation as students enrolled for the courses. Additional commercial networked courses were also developed in other academic areas. Cycle 4 is described in Chapter 7.

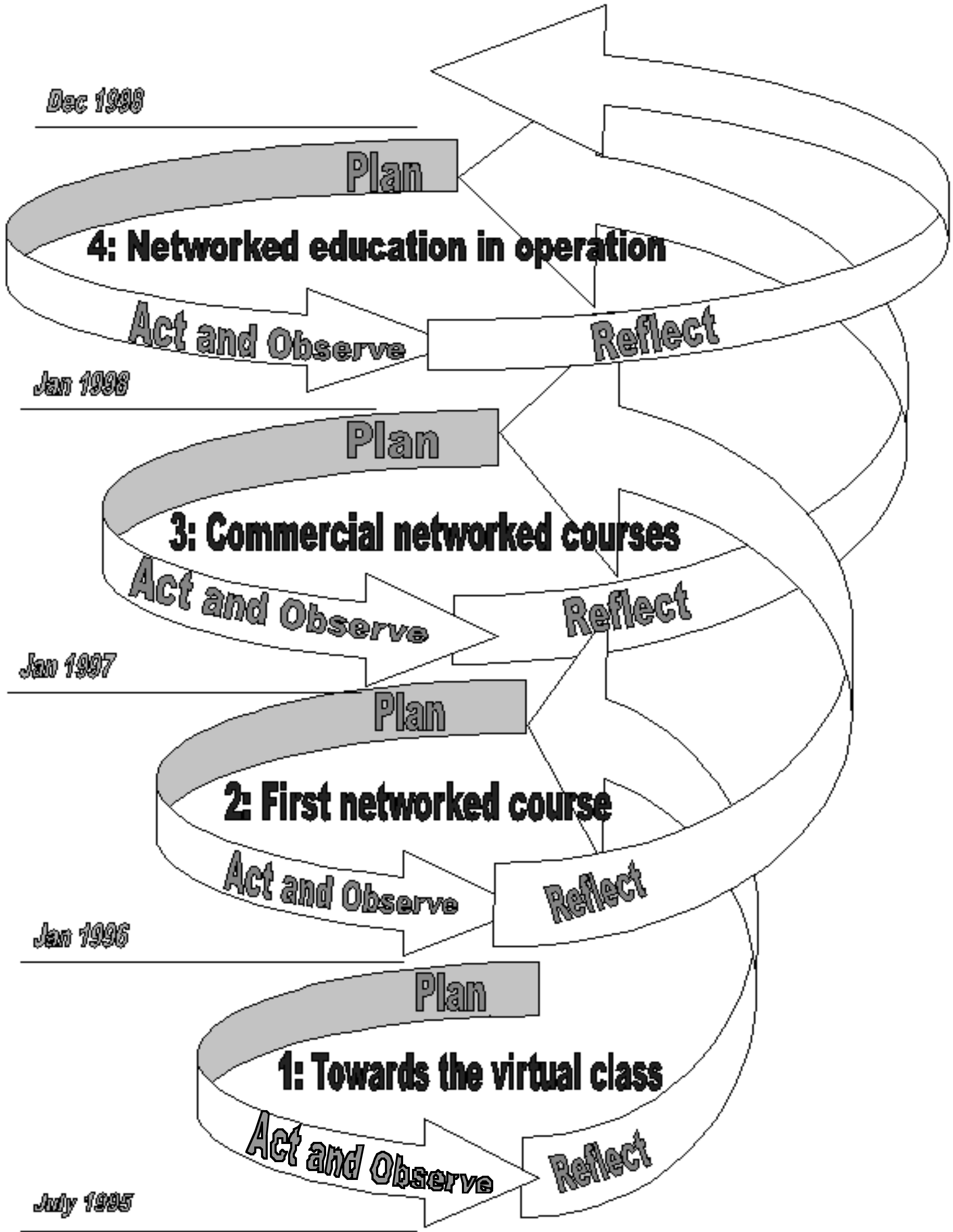

Figure 3.1 Action research process

CHAPTER 4

CYCLE 1 - TOWARDS THE VIRTUAL CLASS

Chapter three provided an overview of the action research methodology. In Chapter four the first of four action research cycles, which occurred from July 1995 to December, 1995 is described.

During cycle 1, the vision to implement the virtual class infrastructure at Wellington Polytechnic was initiated and the first steps towards this goal were taken. This process started when the HYDI project at Wellington Polytechnic commenced early in cycle 1. Networked education at this stage was a totally new concept within this Polytechnic.

At Wellington Polytechnic most teaching (excluding a few courses in education) at this stage used the face-to-face mode on the physical campus in Wellington with students from Wellington and its environs. The campus experience was based on students being physically together in time and on the local campus. The strategy regarding the internationalisation of education was to have international students come to Wellington. The Wellington Polytechnic in general also preferred to have paper-based communications and many academic staff did not have personal access to computers (Appendix 7: 10).

In July 1995 the Educational Development Department invited Lobodzinski (1995) to conduct a workshop on hypermedia and the World Wide Web (WWW) at which five departments were represented, indicating an initial interest in WWW-based education (Appendix 1). This author attended this workshop and saw potential benefits in using the WWW and hypermedia for tertiary education - the vision of the virtual class at Wellington Polytechnic was born. At this stage the author saw the virtual class particularly as a mode for facilitating distance education.

This chapter has been structured according to the typical phases in action research:

4.1. plan

4.2. act and observe

4..3. reflection.

This action research log for cycle one consists of 619 electronic mail messages of which key messages are included in Appendix 7.

4.1 Plan

The overall objective for this action research cycle was to manage the implementation of the virtual class infrastructure so that the feasibility of the concept of networked education at Wellington Polytechnic could be tested.

In the draft project proposal to the President (Appendix 1) the author stated the aim of the HYDI project as " …to establish the initial feasibility of the vision for the Wellington Polytechnic". In this draft proposal the author acknowledged the uncertainty which surrounded this innovation: "this report is a 'draft' proposal due to the strategic focus of this report, the early stages of conceptualising and the great number of variables and parameters of this project due to its wide scope and the speed of changes in the underlying computer technology" (Appendix 1).

If the outcome were to be positive, cycle 1 would form a solid basis for the further implementation of the virtual class infrastructure at Wellington Polytechnic because it was perceived that resources and support would then become more readily available.

At the same time it was intended that pursuit of this objective would lead to the early identification of heuristics for managing the implementation of the virtual class. The possibility of identifying some of the characteristics of managing the operations of the virtual class was limited owing to the early stage of implementing the virtual class infrastructure.

As this was the initial introductory phase of implementation, or the take-off phase in the S-shaped adoption of innovation curve (see Figure 2.1), for the virtual class infrastructure at Wellington Polytechnic, it was expected that the findings and conclusions in cycle 1 would be preliminary and could well be superseded by those in further cycles. This is often the case in action research as interim results are validated or invalidated.

To meet the overall objective, the following strategies were formulated as the *modus operandi* for cycle one:

4.1.1. Define the vision of the virtual class at Wellington Polytechnic in such a way that the vision can be effectively communicated

4.1.2 Communicate the vision in such a way that management and other support for the implementation of the virtual class can be obtained

4.1.3 Implement the vision by

4.1.3.1 securing resources for the initial introduction of the virtual class and identify detailed resources and skills requirements for the next phase of implementing the virtual class infrastructure at Wellington Polytechnic;

4.1.3.2 carefully selecting and managing the first steps in creating the technological architecture for the virtual class at Wellington Polytechnic; and

4.1.3.3 analysing how the organisation responds to this new paradigm of the virtual class

4.1.3 Forge closer links with institutions, organisations and individuals already conducting research and involved in networked education.

These strategies were closely linked to the operational plan for implementing the virtual class at Wellington Polytechnic (Appendix 1).

4.2 Act and Observe

This section contains a discussion of how the strategies above were carried out.

4.2.1 Define the vision of the virtual class at Wellington Polytechnic in such a way that the vision can be effectively communicated

Shortly after the hypermedia workshop late in July 1995, which ignited the vision of the virtual class, the author started working on a proposal to define the vision of implementing networked education at Wellington Polytechnic. In the draft project proposal the author defined the vision as "Combining hypermedia on the World Wide Web as a distance learning medium with current educational strategies to provide education to both overseas and New Zealand students" (Appendix 1). The Internet and the WWW were identified as key technologies in delivering education internationally.

The use of the virtual class was seen as a way to reach off-campus students through the WWW. It was thus seen to be particularly applicable to distance education because intranets had at that stage not gained much prominence.

The advantages of networked education were highlighted in the draft project proposal (Appendix 1) as well as in the communication of the vision that followed. These advantages included the prospect of reaching and retaining more clients (students) in foreign countries as well as in the wider New Zealand, overcoming physical space restrictions in Wellington, building a reputation of technological innovation and addressing the client's needs in an international market as well as increasing the productivity of our staff by adding the concept and application of hypermedia to content and facilities that already existed

A number of factors were identified in the draft project proposal (Appendix 1) as being critical for the implementation of networked education at Wellington Polytechnic. These factors included support from senior management; ensuring confidentiality of the project; a speedy implementation; controlling access to educational materials on the WWW; bridging the gap of ESL to penetrate the Asian market; working with SEACC in making the Internet more acceptable in a large number of Asian countries by addressing their concerns such as freedom of speech, pornography, terrorist activities; basing material on the NZQA Framework, thereby ensuring the availability of resources and thorough planning and management of the project. It was important to test these in cycle 1 so that the management of the project could be targeting appropriate goals.

Senior management support was deemed important to ensure that resources could be made available and also because the author believed that networked education would impact the institute on academic and administrative levels. The President of Wellington Polytechnic provided managerial and financial sponsorship for this project, shared this vision with his directorate colleagues and senior management, and promoted the interests of the HYDI project. Having the president as sponsor was central to the early successes of the project.

Managing the project through a project group instead of a committee was proposed by the author and accepted by the President to ensure that the implementation of the virtual class infrastructure could be actioned speedily. A committee could,, however have provided wider ownership and participation from the start.

The new international possibilities of networked education emerged and closer links with the South East Asian Computer Confederation (SEACC) was seen as an important strategy to capitalise on the new opportunity of offering education internationally via the Internet. Contact was made with the Secretary-General of SEACC at a conference in August 1995 and he indicated that opportunities for New Zealand educational institutions had greater potential in South East Asian countries than before (R. Lau, personal communication, 1995 August). SEACC was seen as a potentially important contact in promoting the Wellington Polytechnic's networked courses in Asia.

Differences in languages and culture are management issues to be addressed in networked education. The author did not foresee that the Wellington Polytechnic networked courses would be translated into foreign languages. It was therefore important to ensure in some way or another that speakers of languages other than English would be able to gain proficiency in English to participate in networked courses.

The confidentiality of the project was deemed critical, as the author believed that the HYDI team might be creating a unique educational experience for the students. As more information about similar developments nationally and internationally emerged, it became clear that the combination of hypermedia presentations, visits by lecturers to major centres of students in networked education, and inviting students to attend annual/semester workshops locally would not be a “unique approach” (as initially perceived). Other institutes in tertiary education in New Zealand and abroad were also experimenting with the virtual class. At Victoria University of Wellington Tiffin and Rajasingham in the Communications Department were continuing with a virtual class experiment in their Master of Communications course, using on-line communications and sources, visiting students off-campus and inviting students for local workshops which started in 1986 (Tiffin, 1996). Widespread interest in networked education was becoming evident through publications on similar projects at, for instance, the University of Melbourne, Australia (Goldenfarb, 1995), University of Alberta (Canada) (Szabo, 1996), George Mason University (Virginia) (Gabel and Feeg, 1996), Hong Kong Polytechnic University (Jones and James, 1996) indicated that "universities worldwide are implementing new technologies into their curricula for a variety of reasons”.

4.2.2 Communicate the vision in such a way that management and other support for the implementation of the virtual class can be obtained

The author believed that the implications and possibilities of the virtual class would involve the entire institution and that it should not be localised to any specific academic department or grouping. The author also realized that financial resources would most probably not be able to come from a school or departmental budget as the project commenced at the end of a financial year. Therefore the draft project proposal (Appendix 1) to implement the virtual class infrastructure at Wellington Polytechnic was presented to the President in 1995. At this meeting the author indicated a personal willingness to lead the implementation.

The President of Wellington Polytechnic at that time, Mr Bob Bubendorfer, accepted the draft project proposal and appointed the author shortly thereafter as project manager. Unbeknown to the author, the President had previously expressed a desire to move the Polytechnic in this direction (Finance Registrar, personal communication, 1996). The President became the sponsor of the project and took personal ownership of the project (Appendix 7:3), which became known as project HYDI (Appendix 3) since it was then aimed at the use of hypermedia in distance education.

Key individuals and groups identified by the author included members of the Directorate and of the Senior Management Group (SMG) consisting of the Directorate, Registrars, Heads of academic schools and some administrative managers. The vision was communicated on 12 October 1995 (Appendix 7:3), using a computer mediated presentation (Appendix 2) at a special breakfast meeting with members of the Directorate and other senior staff that the president had invited. Later that same day the vision was communicated to the SMG during their weekly meeting, using the same presentation.

At the same time, a bottom-up approach was also followed whereby general sessions were held to which administrative (also called allied) staff, heads of academic departments and general staff were invited to attend (Appendices 7: 4 and 7: 5).

As the development of the Website progressed, two public sessions were held to which the directorate, the SMG and Heads of Departments were invited and which were well attended, to demonstrate progress, to obtain feedback and create a sense of ownership.

4.2.3 Implement the vision

This strategy had three supporting action plans:

4.2.3.1 Secure resources for the initial introduction of the virtual class and identify detailed resources and skills requirements for the next phase of implementing the virtual class infrastructure at Wellington Polytechnic.

4.2.3.2 Carefully select and manage the first steps in creating the technological architecture for the virtual class at Wellington Polytechnic.

4.2.3.3 Analyse how the organization responds to this new paradigm of the virtual class.

4.2.3.1 Secure resources for the initial introduction of the virtual class and identify detailed resources and skills requirements for the next phase of implementing the virtual class infrastructure at Wellington Polytechnic

The request for the required resources was presented to the President in the initial project proposal (Appendix 1). A project group to implement the vision, rather than a committee, was proposed. Staffing was described according to the four roles identified by Lobodzinski (1995), namely a producer (performing project management duties), content director (organising and ensuring the quality of the content), graphics/design artist (ensure quality presentations) and a software specialist (expertise in hypermedia and the related software, hardware and networks). The ICT specified included multi-media computers, good network links, development software like Hyper-G (Hyperwave, 1998), a type of UNIX (Lynux was available through the Computer

Studies department and a multi-media authoring package (which was available via the Computer Studies and Graphic Design Departments).

Financial support was requested on an as-needed basis since the HYDI team needed to experiment and since networked education was a new paradigm at Wellington Polytechnic. The president made approximately NZ$40,0000 available from his development budget for the acquiring of software and hardware and for the project manager to attend two relevant conferences in order to rapidly learn more about educational hypermedia applications.

Obtaining time release from academic teaching duties was not possible at the stage when the project commenced. The author did request that the team members be formally appointed to the team, but the President did not agree to this and indicated that the pilot project should be executed with volunteers. At that stage the President also indicated that the author's description or employment conditions could not be revised as requested in a memo (Appendix 3).

The HYDI team was informally formed from Wellington Polytechnic staff early in September 1995 by personal invitation from the author who trusted that success in the pilot project would lead to formal time allocation to the project. The team was based on the roles put forward by Lobodzinski (1995) and drawn from the Polytechnic staff who attended his Hypermedia Workshop in July 1995. The author identified a fifth role of "educational adviser" to ensure that educational considerations had a high priority in blending the technical, design and administrative considerations, and therefore a staff member from the Academic Staff Development Department (which was later renamed to the Educational Development Department) was also invited.

All the staff members invited accepted the challenge and indicated that they were enthusiastic (Appendix 5 and Appendix 7: 1 contain typical responses) to explore the new possibilities that the Internet offered. Each person invited was asked to think carefully about the invitation, discuss the matter with relevant managers and notify the project manager of their decision. Eight staff members voluntarily formed a project team: two staff members from the Department of Computer Studies, one from the School of Design, one from the Academic Staff Development Department, two from the Course Information Centre and two Library staff.

Some team members were relieved from some of their duties to be involved in this project. Others, however, did not have any reduction in their duties and no additional remuneration was provided in any of these cases.

The writer was warned that voluntary commitments beyond and above normal duties by HYDI team members could attract negative reaction from the academic and allied staff unions. A negative reaction by the unions could have impacted the feasibility of continuing with the implementation of the virtual class infrastructure, but this fortunately did not occur. It was a challenging opportunity to navigate the culture of the institute since the author was a newcomer to Wellington Polytechnic and New Zealand (the author joined Wellington Polytechnic in May 1994 after arriving in New Zealand a month earlier). Furthermore, English is not the writer's first language. Difficulties in appreciating the sometimes subtle differences in culture contributed to some of the difficulties experienced in managing this project.

The author foresaw that, based on a systems approach, all administrative departments and groups like the library, computer support, the international student office, learning support and the course information centre would be involved in this project in the longer term. These groups were at this stage dealing with on-campus students only, but the virtual class would require of them to deal in future with students in networked education. The communication sessions included specific invitations to representatives from each of these groups.

The HYDI team had to operate within the conventional reporting structure of the institute, and thus the roles of a sponsor (supporting the progress of the project), external contacts adviser (who advises on external relations and implications), academic adviser (advises on all academic matters) and operational adviser (managing the budget) were identified and input was sought from these senior staff members during cycle 1. These staff were seen as important gatekeepers of this project.

The team approach seemed to have worked well, but at the end of cycle 1 it was not clear which team members would remain on this voluntary team while formal allocation was being sought for involvement in project HYDI in cycle 2. The project manager was allocated a reduction in teaching time of 30% in 1996. Other staff members negotiated some recognition for their involvement while yet others had to withdraw from the team in 1996 because of their full-time duties. The two Library members of the team who participated in order to learn more about WWW publishing did not continue in 1996. It was clear that new team members would have to be found for the next cycle.

The skill requirements of team members became clearer as the cycle progressed, and the various roles identified seemed appropriate to continue within the next cycle.

During cycle 1 the project team identified and learned how to use some of the technologies involved in networked education. The strategy of using a pilot project was very helpful in this regard. By developing the Wellington Polytechnic Website, the HYDI team established that both PC and MAC multi-media computers, multi-media authoring packages, graphic design software, Web browsers, software to convert word processing documents to HTML (Hypertext Markup Language), access to the Internet, the World Wide Web and a Web server were needed for networked education. Cross-platform and cross-browser testing of on-line materials proved to be necessary to ensure that the on-line materials had a consistent appearance and behaviour for Web users on different computer platforms (like MAC and PC) and using different versions of Web browsers.

The focus at this stage in creating Web-based materials was on the front-end technologies, that is to say the technologies that facilitate the computer-user interaction. At this stage database-driven software for WWW development was not seen as critical, and the HTML pages were stored in flat files within directories. This strategy proved helpful in quickly getting material on-line.

The outcome of the pilot project suggested that the hardware and software obtained during cycle 1 was a reliable platform for the further implementation of the virtual class infrastructure in the next cycle. As the technology base (that is computer language, web server, Internet access) of the Website and Web-based materials for education do not differ, it was assumed at this stage that the hardware and software used to develop the Website were the same as for networked education. The budget for 1996 was therefore based on the expenses that were necessary to create the Website.

4.2.3.2 Carefully select and manage the first steps in creating the technological architecture for the virtual class at Wellington Polytechnic

A pilot project (Appendix 3) to create the Wellington Polytechnic Website (Wellington Polytechnic, 1998 July) was carried out because the author had observed that the team did not have a sound knowledge of the required technologies to do networked education. The use of inter-disciplinary teams to facilitate projects was not a common practice within the Polytechnic and the concept of the virtual class had to be tested within a real organisational environment. The team's successful performance and achievement in the pilot project could furthermore lead to gaining the ongoing support of the President, while establishing support from other senior managers for the project.

The pilot project required the Wellington Polytechnic (which already had a domain name registered) to select an external Internet Service Provider for hosting the Website since an internal web server did not exist. This new relationship needed to be managed as part of the implementation of the virtual class infrastructure.

Printed copies of the content materials on the Website were sent to all the relevant groups and departments for comments and changes. Besides ensuring that the correct information was posted on the Website, this was also an attempt to ensure wide participation from the outset in the implementation of networked education at Wellington Polytechnic.

The HYDI team realised that managing the dynamic nature of changes to on-line materials is different than managing changes to print-based materials. A change procedure for alterations to the Website was designed and distributed (Appendix 4). The document stated that: "it is important to keep the Home Page alive by updating materials regularly. This can be done much more quickly than waiting for the next print run of brochures or for print advertising deadlines."

Team members were regarded and respected as being expert in their areas. Individual objectives were reviewed on a regular basis. The project management philosophy was that decisions within the team were to be made on the lowest possible level. This approach was unlike the managerial approach at Wellington Polytechnic that tended to be bureaucratic and hierarchical. These differences sometimes led to conflicts between team members and other Wellington Polytechnic staff members. Some of these conflicts remained for most of the research period as a clash of expectations and "cultures". The emphasis in the project management approach was on achieving the desired goals in cycle 1 in a very limited time and a positive, goal-oriented approach was therefore followed within the team to meet the deadline.

A prototyping development methodology was followed. Incremental development occurred, as sections of course contents were placed on-line, evaluated and changed, while further sections were being prepared to go on-line. With on-line materials, the

HYDI team found that the publication can be continuous and changes can occur frequently and regularly. In the spiral that is the prototyping approach, each of the six systems development life cycle phases (investigation, analysis, design, implementation, maintenance and review) is essentially executed per module/prototype in an experimental and incremental manner. Implementing the virtual class infrastructure in conventional tertiary education is characterised by factors which point to using the prototyping approach: a low degree of certainty about input and outcomes, low user experience, immediate results are normally desired, a high degree of risk, a large number of alternatives (although the degree of complexity is average owing to the ease of WWW publishing and the availability of Web servers and technologies through Internet Service Providers) (Stair, 1992:405; Burch, 1992:15). The nature of the on-line media and the large degree of intrinsic flexibility of the virtual class technologies facilitated prototyping. This flexibility also allowed the team to experiment with different approaches to development and design as well as with the ICT at hand.

The speed of developments in the underlying ICT was demonstrated in the on-line page creation process. When the project started the HYDI team had to code HTML using basic text editors. Within three months the HYDI team was using extension programs of two of the most popular word-processing programs to convert documents directly into HTML. Changes in the way different computer platforms and Web browsers rendered on-line materials further complicated the management of the development of the Website.

The team members had offices in different parts of the Polytechnic campus and therefore operated for most of the time as a virtual team with a high dependence on electronic mail, as is illustrated by the many (619) e-mail messages between the project manager and others during cycle 1. Lipnack and Stamps (1997:7) define a virtual team as "a group of people who interact through interdependent tasks guided by common purpose" that "works across space, time, and organizational boundaries with links strengthened by webs of communication technologies", which accords with the macro view that. global virtual teams operate as a temporary, culturally diverse, geographically dispersed, electronically communicating work groups (Jarvenpaa and Leidner, 1998). Electronic communication also allowed the author to manage the project across the conventional limitations of time and space (Appendix 7: 6). In addition, a number of face-to-face meetings were also held. This was a challenging experience and the entire process worked fairly well despite the fact that team members didn’t know each other well, that it was an interdisciplinary group, and that limited time was available to complete the pilot project. However, some team members felt that the lack of face-to-face communication and the vast amount of electronic mail communication impacted negatively on operations and relationships within the team.

The pilot project to develop the Wellington Polytechnic Website (July 1998) was fully implemented in less than three months and on the Internet by 4 December 1995. A public launch, which was well attended, was held to publicise the existence of the Polytechnic’s Website and to promote the HYDI project to implement the virtual class infrastructure at Wellington Polytechnic (Appendix 7: 11 and H: 12). The launch was also designed as a non-financial way of rewarding team members through public recognition.

A few workshops for allied staff with basic e-mail skills were held soon after the launch in order to assist them in the various schools to deal with any international inquiries as the Website made the Wellington Polytechnic immediately more accessible internationally.

A second pilot project to develop a CD-ROM with the "Web home page" information for the Wellington Polytechnic by July 1996 was also envisaged at this stage because an integrated CD-ROM and WWW delivery model for networked education was envisaged for addressing the limited Internet bandwidth available at this stage.

A planning meeting of the HYDI team at the end of 1995 identified aspects of the Website that needed attention in 1996. One of the tasks was to have the Website mirrored outside New Zealand to reduce the cost to international viewers (including future students) of the on-line material. The plan was also to establish an intranet to make on-line materials available internally; at this stage the HYDI team thought mainly about the website materials.

Among the tasks to be pursued in the next cycle was one to transfer ownership regarding department information to departments and to transfer ownership regarding school information to schools. Ownership regarding the Website seemed to be a significant issue to address, and also one that would have an impact on the acceptance of the vision for networked education at Wellington Polytechnic. The response from schools to a call for them to provide information for the Website indicated that the Website was not yet seen by the schools and departments as a medium that they were responsible for keeping current and to developing further. Ownership of Website information was not properly established at this early stage and remained a problem in 1999.

The author proposed to the President that the Senior Management Group (SMG) jointly formulate the criteria for the selection of the first networked course to be developed for distance education in 1996 (Appendix 7: 8). This was an attempt to create wider ownership of the implementation of networked education at Wellington Polytechnic and to do a thorough market evaluation but was not successful. The President already had a specific study course in mind, which was based on perceived general marketability. This course was linked to a Polytechnic stand-alone certificate in education which already used distance education (Appendix 7: 8). This course, however, had not been delivered by distance education and had a strong face-to-face content. The President's preference for this course was discussed at a SMG meeting.

Another aspect in the marketing of future networked courses was using the most appropriate branding. This illustrated an increased emphasis on having a market orientation when offering networked education. The author felt that the units/courses would be more marketable if they were New Zealand Qualification Authority (NZQA) approved (Appendix 1).

A serious drawback in setting up the technological virtual class infrastructure was that the internal computer services group was not able to support the HYDI project with an evaluation of appropriate software or with the technical computer teething problems, as their focus was more on operational matters as against the HYDI focus on innovation. This again was a clash of cultures and also a demonstration of the inflexibility of bureaucratic systems versus the more flexible approaches within the HYDI project. The centrality of ICT in offering materials via the WWW emerged very strongly. Fortunately the computer specialist within the HYDI team was sufficiently skilled and managed to work through the various technical computer challenges encountered.

4.2.3.2.1 Analyse how the organisation responds to this new paradigm of the virtual class

At the end of cycle 1 the first pilot project towards implementing the virtual class infrastructure (the Wellington Polytechnic's Website) was completed. The general response at this stage to the Website and the vision of using the WWW in education was favourable. For instance, at the launch the sponsor of the project (that is the President) complemented the team on implementing the Website in less than three months and held a well attended public reception for all staff as part of the launch.

The computer services group at this stage indicated to the author that the project had not been properly costed and that they did not have adequate time to attend to some of the requests.

A serious attempt was made by the implementation team to work, as far as possible, within and comply with the Polytechnic systems and culture. The HYDI team, for example, created a graphic design document (Appendix 7: 2) which was presented to the appropriate directorate member and the HYDI team obtained permission to proceed.

There were instances, however, where clashes of the team culture and the institutional culture seemed inevitable due to the differences in flexibility, deadlines, and perceptions and also because of the politics involved in establishing this project. The Polytechnic's operational systems were typically that of a conventional tertiary educational institute and tended to operate more slowly and more bureaucratically than was the case within the project to implement the virtual class infrastructure. The project did sometimes run across formal reporting lines, hierarchies and procedures because of the very limited time period available in which to achieve the pilot project's objectives. Contributing factors to the conflict with some heads of schools were that the project did not run from within a school, but ran directly under the auspices of the President's office (and thus contrary to the conventional hierarchical reporting lines) and received substantial financial support from the President. This was seen by some as money that could have been spent on operational aspects within Wellington Polytechnic instead of on an unproven and unchartered cause led by a relative newcomer to the institute.

4.2.4 Forge closer links with institutions, organisations and individuals already conducting research and involved in networked education and commercial activities on the Internet

The writer realised that the possibilities and feasibility of providing networked education could not be tested only through the limited pilot project at Wellington Polytechnic during cycle 1. The strategy to forge closer links with others was therefore necessary to ensure a proper evaluation of the implementation of the virtual class infrastructure within Wellington Polytechnic. Furthermore, a tertiary education institute is an open system that interacts with, for example, government and industry in its external environment and needs to be aware of changes in this environment in order to respond appropriately to these.

In establishing links with others involved in similar projects, the HYDI team was also learning about the pitfalls and possibilities of implementing the virtual class infrastructure. Contact via electronic mail and by conference attendance was initiated with visionaries, developers and educationalists in hypermedia both in New Zealand and internationally. The importance of networking was illustrated when the writer attended the New Media and On-line Commerce conference (September 1995) in Brisbane, Australia and met with the Executive Officer of the Western Australian Telecentres (WA Telecentres) who issued an invitation to the Australian National Telecentres Conference (October 1995) in Perth.

The author also attended the 1995 New Zealand Computer Society (NZCS) conference in August 1995, which contributed significantly to the writer's ideas on creating the initial project proposal through the papers of three contributors. Recker (1995) conveyed her conviction that the Internet was going to revolutionise education internationally. It provides through hypermedia a highly natural and truly interactive means of communication by using multi-media. It facilitates group interaction among the students and with the lecturer through the use of on-line communications. The Internet was growing exponentially in public and business awareness, in the number of users and in the number of Web servers.

Another view that impacted on the author's vision to establish networked education at Wellington Polytechnic was that of Spence (1995). He stated that according to industry experts in the United Kingdom, most of the current hardware limitations in using ICT would be removed by the year 2020.

According to Lau (1995) the opportunities in South East Asian countries for New

Zealand educational institutions had greater potential than before due to the high regard for New Zealand's educational standards, and deregulation and liberalisation sweeping across South East Asia. This encouraged the writer to pursue networked education with an international focus as part of the project.

The Internet and specifically the World Wide Web were seen as central technologies with tremendous potential in networked education. Myburgh (1995), admitting that it is always risky to predict the future particularly where technology is concerned, indicated clearly that teaching and learning were undergoing a revolution based on the extraordinary capabilities of the Internet. This was a typical reflection of the optimistic sentiments expressed by the HYDI project team during cycle I.

The WA Telecentres project also positively considered the use of the Internet and saw government sponsored access to the Internet as opening up new communication options for them. This service included a bulletin board facility, on-line education units, electronic mail and WWW search facilities (WA Telecentres, 1995).

While the advantages of education via video-conferencing was being strongly utilised in the Western Australian Telecentres project (WA Telecentres, 1995), it appeared to be an expensive option and is further based on the traditional classroom model which perpetuates the inflexibilities regarding dates, times and places (Latchem, 1995:105). The writer envisaged that effective on-line video-conferencing over the Internet would be possible in the future. Perceptions at that time about the cost of developing networked course materials were optimistic because most of the WWW tools themselves were available at low cost. Cher (1995) for instance indicated that Web applications, in terms of cost-effectiveness, were surprisingly inexpensive, in initial purchase, in training, and in its deployment. Cher costed Web applications at less than AU$40 per user on an interdepartmental or company wide basis, which comparatively was far less than the cost of most other communications or work group systems.

At the New Media and On-line Commerce conference in September 1995, Mark Shearer

(1995), General Manager, Telecommunications and Media Industries, IBM Asia Pacific emphasised that most governments in Asia want to realise educational benefits from global networks.

During the Australian National Telecentres Conference (October 1995), visits to telecentres demonstrated how telecommunications could be used successfully to enable distance learning. The networking at the conference led to a meeting in Perth with Prof. Colin Latchem, Head: Teaching and Learning Group at Curtin University of Technology who at that stage already had extensive experience in distance and open and flexible learning. A meeting with a representative of Open Learning Australia (OLA) (Appendix 7: 7) indicated that Australia had a strong national vision and strategy for distance education and that collaboration between Wellington Polytechnic and OLA through networked education would be a possibility. Approximately 7 Australian universities work together under OLA to deliver distance education in Australia and internationally.

The contacts described above strengthened the vision of networked education and encouraged the author to further research this area and to continue with the HYDI project.

4.3 Reflection

4.3.1 Managing the implementation of the virtual class infrastructure

These findings address the following elements of the MIT90 schema (see Figure 1.3):

4.3.1. strategy;

4.3.2. roles and skills of individuals;

4.3.3. organizational structure;

4.3.4 technology.

4.3.1 Strategy

Using technology-based education seems to require a firm base and widespread use of ICT throughout an organisation. The Wellington Polytechnic at the stage when the pilot project was launched, in general preferred to have paper-based communications and many staff members did not have access to computers, which in turn made the newly developed Website inaccessible or irrelevant for many of them. At the University of Melbourne, Australia, where a campus-wide information system (CWIS) was implemented, Goldenfarb (1995) similarly noted that one barrier to the successful implementation of the CWIS was low IT skills, but if this problem could be identified, it could be overcome to enable any department to become a successful adopter. It therefore seems important to increase the level of computer literacy of staff members and the use of ICT in general within a conventional tertiary educational institute when implementing the virtual class infrastructure.

Implementing the virtual class infrastructure as early as possible was a critical success factor identified in the draft project proposal. This was confirmed because many other tertiary educational institutes were also experimenting with networked education. In order to have a significant impact in the growing area of networked education, early participation of an institute in networked education seemed a better approach than not responding to the possibilities and threats of networked education. Kenichi Ohmae asserts that "to prevent competitors from getting there first, a company must launch in the key markets simultaneously. Globalisation will not wait" (Caulkin, 1990:29).

At Wellington Polytechnic the advantages that networked education would create for the institute, teachers and students were emphasised in the draft project proposal and in communicating the vision of networked education. Highlighting these benefits seemed important to increase the interest of and participation by administrative managers and academic staff in the implementation of the virtual class infrastructure. Goldenfarb (1995) reported similar findings regarding successful departmental adoption of networked education:

(a) Departments that recognized the low skills as barrier found solutions to this problem and rated highly in the ranking order.

(a) Departments that had very high IT skills but did not see a clear advantage in adopting networked education, ranked last. The reason might be that in the absence of a clear relative advantage they did not have full commitment from the head of the department. Many departments reported success in obtaining commitment from the leader, when clear benefits were demonstrated in trial/pilot projects.

Productivity increases were envisaged for academic staff because of the scalability of networked education. Approximately the same input in creating a face-to-face course could possibly yield a greatly enhanced output due to the potential of international and national delivery of a course via the Net to a much larger audience. At this early stage of having only done a pilot project, this seemed to be feasible as the visitor statistics to the Wellington Polytechnic Website demonstrated that a single source document could reach large numbers of people across the globe. Although the input to create the Website was similar to creating a comprehensive paper brochure, the output, in terms of readership and reach, was much higher and easier to facilitate. This correlates with the wide expectation of leaders both inside and outside higher education that technology can enhance "...the overall productivity of the educational process" (National Center for Higher Education Management Systems, 1995:3).

Selecting appropriate methods for promoting the virtual class internally to the relevant parties seem to be an important management issue in implementing the virtual class infrastructure in conventional tertiary education. What might be necessary, as was the case at Wellington Polytechnic, is to follow both a top-down and bottom-up approach simultaneously. If it is only top-down, academic and allied staff might not be aware or convinced of the possibilities of networked education and the impact it might have on their work and ownership could be a problem. Again, if it is only bottom-up, senior managers might not support it and resources might be difficult to obtain while it could also potentially lead to uncoordinated localised efforts.

The prominence of the project at Wellington Polytechnic and the level of resources made available would not have been possible without the support of senior management. When internal political problems were encountered, the President was there to step in and direct matters. When the initiative for moving towards the virtual class comes from senior management (top-down), this support is implicit. Goldenfarb (1995) similarly found that a critical success factor in the diffusion of innovation was obtaining senior management support, citing the example of the head of Information Technology that demonstrated some early achievements to the Vice Chancellor and his deputies. Their awareness and interest in the project provided the top-down pressure on heads of departments to support the project, which gave the project the legitimacy and full acceptance into the everyday operation of the institution.

This illustrates the central role that senior management plays in bringing about organisational change, and in this case for the introduction of the virtual class in a conventional tertiary educational institute. The backing from a group of managers in senior positions seems to be necessary if progression towards the virtual class is to be an institutional one with strong budgetary support.

The vision was communicated to senior and middle management to obtain their support for this project and to create a sense of ownership. Although the response from senior and middle management was positive regarding the Website development, they did not demonstrate a sense of ownership but merely received the information and did not actively participate - even though there were evaluation sessions to which they were invited and input was requested of them. Ownership, which is substantial personal commitment by the relevant administrative, academic and allied staff, is a significant objective when implementing the virtual class infrastructure in conventional tertiary education. Not enough was done to ensure ownership by senior management especially in view of the initiative for the development of the virtual class coming from outside the administration, the high work pressures senior management often work under and the traditional tussle between administration and academia. This lack of ownership was illustrated by the limited response from schools and departments within Wellington Polytechnic to requests (for a typical request see Appendix 7: 9) to provide information for the project in their respective areas for placing on the Website. The limited time frame in which the pilot project occurred negatively impacted on activities to ensure ownership. Therefore strategies such as one-to-one and small group discussions, demonstrations and explanation of the benefits of using the WWW could and should have been used in the early implementation stages of the virtual class infrastructure at Wellington Polytechnic to ensure ownership by senior and middle management. As was noted by Goldenfarb (1995), the overarching objective of their project was "adoption" which can also be described as "ownership". At this stage, the top-down support was primarily that of the President, while the bottom-up component was essentially within the HYDI team. Both aspects were not addressed properly in this first cycle and needed more attention in following cycles.

Goldenfarb (1995) similarly found that a critical success factor in the diffusing of innovation was following a top-down and bottom-up approach simultaneously:

(i) The CWIS project started by setting up a Steering Committee with representatives from four of the twelve academic faculties in the University, the Library and Information Technology staff. Those invited to participate were mainly lead users, who had already some relevant expertise, or were recognised as stakeholders who could benefit largely from the use of the new technology.

(ii) The head of Information Technology demonstrated some early achievements to the Vice Chancellor and his deputies. Their awareness and interest in the project provided the top-down pressure on heads of departments to support the project. This gave the project the legitimacy and full acceptance into the everyday operation of the institution.

(ii) When departments were asked to identify what was critical to their adoption of CWIS, all ten departments nominated their product champion, who drove the project through all the critical steps of the implementation process. Seven of the ten departments identified the support of their leader as having played a major role.

The initial findings in Cycle 1 and that of the study at the University of Melbourne mentioned above, thus suggest that a top-down component might also be necessary for the effective diffusion of information technology in conventional tertiary education.

In following both approaches simultaneously, preference was given to an organic implementation model rather than an institutional implementation model to implement networked education at Wellington Polytechnic after the project was authorised by the president. By an "organic model" the author means that the processes and outcomes are based on grassroots level needs, that the diffusion would occur in an evolutionary way, and people taking ownership of the new paradigm would drive the implementation (Daft, 1989). By an "institutional implementation model" (also called mechanistic model) the author means that processes and outcomes are developed through a broad top-down decree, and ownership of the new paradigm is not a high priority; staff are expected to do as instructed (Daft, 1989). More emphasis on the organic implementation model rather than the institutional implementation one was deemed to be appropriate when introducing the virtual class in a conventional tertiary educational institute because the paradigm of the virtual class was a new concept to conventional tertiary education. Understanding the possibilities of the virtual class and how it serves the needs of students and teachers is a gradual process which requires time to work through the implications of the differences between the virtual class and the traditional class. Academic staff needs to take ownership of the virtual class concepts and practices because they operate largely in an autonomous way when deciding how to deliver teaching. Nixon (1996:9) points to the important contribution of academic staff to the wider institutional actions: "university teachers bring important insights to bear on their own practice and these insights constitute an important perspective on the nature of learning and the institutional conditions necessary for learning to flourish”. The implementation of the virtual class in a conventional tertiary educational institute is furthermore a long-term strategic process and can be jeopardised if its implementation is decreed in a top down fashion to achieve short-term gains.

Any innovation, including networked education, faces the challenge of bridging a lack of knowledge and understanding of its the benefits and advantages. However, networked education poses an additional challenge: to balance the gradual promotion of information about the virtual class to tie in both with the cyclical and relatively slow pace of teaching and administrative cycles which occur in a more predictable and repetitive pattern within conventional tertiary education and with bringing and keeping all parties involved up to date with this rapidly developing field. This tension is a management challenge that needs to be addressed in the promotional strategy of implementing the virtual class infrastructure.

A pilot project was used to good effect at Wellington Polytechnic to introduce the virtual class infrastructure. A pilot project facilitates experimentation in a new field, testing of concepts and processes, the formulation of guidelines and principles, the establishing of credibility, promotion of the innovation as well as analysing how an organisation responds to a new paradigm or innovation. Selecting the right pilot project can provide an early response by the organisation that can then be used to formulate appropriate implementation strategies for the full implementation of an innovation. Goldenfarb (1995) similarly reports that the CWIS project used pilot/trial projects, and also that a pilot project was again used when the University of Melbourne implemented their first networked course:

(i) After a three month pilot, that trialed the various hardware and software options for both clients and servers, the central project implementation group established a set of guidelines for using CWIS in this institution, compatible with other systems and the University network.

(i) Many other departments reported success in obtaining commitment from the leader, when clear benefits were demonstrated in trial/pilot projects.

(i) In the next semester, the University will be delivering its first online multimedia based course in science to high achieving students in selected high schools. If the project is successful, this program could expand to other disciplines and other markets.

Using a pilot project or a few pilot projects therefore seems to be an appropriate strategy for introducing an innovation like the virtual class in a conventional tertiary educational institute.

In Cycle 1, the first course to be used in networked education was selected by the President based on general marketability. Thorough market research was not done to inform this critical decision and this proved to be a setback for the project in the long run as illustrated in the research cycles that followed.

In terms of a change model to provide overall structure for managing the implementation of the virtual class infrastructure in a conventional tertiary educational institute, the Lewin and Schein model for organizational change (Stair, 1992) can be helpful. The HYDI project engaged in each of these stages in Cycle 1, but instead of treating them as consecutive stages, treated them rather as dimensions of a dynamic process. The stages are listed with a description of how each step was applied in Cycle 1 of the project:

(i) *Scouting*: Identify potential areas or systems that may need change: educational planning, development and delivery

(ii) *Entry*: Stating the problems and the goals: included and described in the initial proposal document

(iii) *Diagnosis*: Gathering data and determining resources required: described in the initial proposal document and further developed during the pilot project

(iv) *Planning*: Examining alternatives and making decisions: some early decisions were contained in the initial proposal document, for example, that the WWW was to be used as key delivery medium; others were made by using the pilot draft where a large degree of exploration, discovery and experimentation was allowed for in all areas: educational, technical and design (to be developed further in the following cycles).

(v) *Action*: Implementing the decisions: decisions were followed through in a consistent manner in the pilot project

(vi) *Evaluation*: Determining whether the changes satisfied the initial objectives and solved the problems identified: this was done through internal team discussions, through open sessions where colleagues from all management levels were present, and through the distribution of hard copies of on-line materials

(vii) *Termination*: Transferring the ownership of the new/changed system to the users and ensuring efficient operation: at the end of cycle 1 the Website was probably still seen as something belonging to the HYDI project.

It is important that management identifies and tests the perceived critical success factors for the institute to progress towards the virtual class at an early stage in order to prevent allocating valuable resources to non-critical activities. Some factors will prove to be critical while others might be found to be of little or no significance as was the case at Wellington Polytechnic. At the University of Melbourne, Australia, the same approach as at Wellington Polytechnic was followed (Goldenfarb, 1995) by identifying and testing the critical success factors in diffusing a campus-wide information system (CWIS) by which most academic departments were striving to reach potential students in Australia and overseas:

> A research project that looked closely at the first ten departments adopting the use of CWIS, set out to test if Critical Success Factors in diffusing innovations, identified in the literature and at other universities played key roles in diffusing the CWIS in this University. It also set out to identify Critical Success Factors that were unique to this institution.

Another management issue in the implementation of the virtual class infrastructure in conventional tertiary education is the use of motivational tools appropriate for encouraging those involved in the creation of networked education. Conventional tertiary education in New Zealand is government sponsored and is thus limited in the available monetary resources. Motivation through financial reward might therefore not be possible, as was the case at Wellington Polytechnic, which makes the "non-hygiene factors" (the “motivators”) in Herzberg’s theory (1960) the more probable of the motivational tools. These include factors like a sense of achievement, recognition of achievement, how interesting the work is, responsibilities for decision-making, opportunities to develop and to learn new skills. A dynamic new development such as implementing the virtual class infrastructure in conventional tertiary education lends itself to using these non-hygiene factors to motivate staff. These factors were used by the author to add to the motivation of HYDI team members at Wellington Polytechnic during cycle 1 - special meals as recognition for achievements were held, the work was of an interesting nature to those involved and opportunities to develop and to learn new skills abounded.

Attending relevant conferences was a valuable strategy for establishing contacts and learning from others (as described). The limited financial resources made it impossible to use external consultants - learning from others at conferences proved to be a cost-effective alternative.

Making resources available proved to be a critical success factor (Appendix 1). It is necessary to deliberately state the requirement for adequate resources, as conventional tertiary education can be unrealistic in its expectations of the resourcing required for staff to achieve what is beyond their normal call of duty. Time allocation for those involved in the HYDI project was seen to be critical as the project moved beyond enthusiastic voluntary participation to the next cycle. At the University of Melbourne, Goldenfarb (1995) also found resource availability critical for the campus-wide diffusion of technology:

> An institution that values innovation and wants to encourage creativity, has to provide the resources to support innovative projects. Although, all heads of departments supported the CWIS project in principle, very few made funds available for additional staff. The central CWIS implementation group have taken on CWIS in addition to a very busy schedule of other responsibilities, having to work on the project in their own time. To encourage innovation an organisation must allow some slack resources or be willing to take some risks and allocate resources to new ideas at an early stage. Espoused support that is not backed up by allocation of resources is not enough incentive to adopt, except for those that are most enthusiastic or those who tend to gain major benefits.

The nature of the media and the characteristics of the implementation of the virtual class infrastructure in conventional tertiary education, point to the use of a prototyping systems development methodology for developing courses for the virtual class (Stair, 1992; Burch, 1992; Uys, 1997a June). On-line materials are in a “living” format, that is hypermedia, which is a very flexible medium to which changes can be made with ease, and publishing on-line materials is normally a continuous and uncomplicated process through using File Transfer Protocol (FTP). WWW based content has only one source copy that needs to be updated and that can then be re-published for the Internet audience. Media like CD-ROM and print require a more rigid and structured approach with changes having to be made through errata notices or republication. Hypermedia therefore lends itself to the use of a prototyping approach when developing on-line content.

4.3.1.2 <u>Roles and skills of individuals</u>

The growing awareness of networked education among tertiary education institutes globally as discussed above emphasises the need for academic staff, administrative managers and allied staff to become well informed about the possibilities of and issues pertaining to networked education.

The composition of the HYDI team proved to work well in this pilot project, but an additional role of educational director was identified for developing the first networked course in cycle 2. This role is crucial when designing and developing educational hypermedia materials because educational principles need to guide the development of networked education and these educational principles have a higher priority than graphic design features and the capabilities of ICT or administrative concerns. However, the centrality of ICT in developing on-line materials pointed to the important role of the computer specialist(s) in the development team. The titles of these roles changed slightly during Cycle 1 from the original titles in the draft proposal (Appendix 1). The external contact adviser and the academic adviser were specifically included as gatekeepers. The computer specialist, graphic designer, educational director and specifically the content director acted as gatekeepers. The proposed roles for a hypermedia team are:

- sponsor : supports the progress of the project
- external contacts adviser : advises on external relations and implications
- academic adviser : advises on all academic matters
- project manager : manages the project
- content director : organises and ensures the quality and currency of the content (rotating role for each course)
- creative director / graphic designer : responsible for all visual aspects including the production of graphical elements
- computer specialist : advises and supports all relevant software, hardware and networks; integrates text and graphical elements into appropriate computer formats eg HTML, Shockwave graphics
- educational director : ensures sound educational processes.

4.3.1.3 <u>Organizational structure</u>

A multi-disciplinary project team comprising design, education, computing, marketing, management and specific content specialists was used to develop the Polytechnic's Website. The team approach seemed to be a good model with which to continue in future cycles for developing networked education because of the effectiveness of this approach in developing the Website in cycle 1.

The author believed that the benefits of networked education was institute-wide and that localising the implementation of the virtual class infrastructure to a specific academic department or grouping would hinder its effective diffusion and adoption. Although localised initiatives can eventually diffuse to influence the wider institute, it seemed that an institution-wide approach from the outset would be most effective in promoting the innovation. The author presumed that the HYDI project was established in this way because it was under direct control of the President and the author provided input at senior management meetings. Later feedback, however, suggested that this was not the case as the HYDI project was often associated with the President or the author instead of the institute as a whole. Effective gatekeeping could have provided this critical information early in the project. At the University of Melbourne, Goldenfarb (1995) reports a better start to their CWIS project based on wide representation:

(i) The CWIS project started by setting up a Steering Committee with representatives from four of the twelve academic faculties in the University, the Library and Information Technology staff. Those invited to participate were mainly lead users, who had already some relevant expertise, or were recognised as stakeholders who could benefit largely from the use of the new technology.

(i) After a three month pilot, that trialed the various hardware and software options for both clients and servers, the central project implementation group established a set of guidelines for using CWIS in this institution, compatible with other systems and the University network.

(i) The project group recommended a distributed model, in which each department was encouraged to set up their own server and take full responsibility for its continuos maintenance and update.

The concerns raised by the computer services group during cycle 1 (as mentioned above) furthermore demonstrate the importance of ensuring that all wider stakeholders with regards to the implementation of the virtual class infrastructure are consulted and that the existing organisational structures are respected.

Even though there are many similarities between conventional tertiary education in New Zealand and also internationally, each organisation will have its own unique features or culture because of its particular history and staff composition. The HYDI project, for instance, did not run from within an academic unit, but directly under the auspices of the President's office and was funded through the President's development budget (even though one of the heads of schools controlled the budget at this stage). Although the project gained an early momentum from this reporting structure and funding, it actually turned out to be a barrier in the acceptance of the project by some academic managers. This resistance could have been avoided through a greater emphasis on diffusion strategies, especially discussions on a one-to-one basis to widen the acceptance and ownership of this project if the author had a better understanding of the organisational culture within Wellington Polytechnic. It therefore seems important when introducing the virtual class into a conventional tertiary educational institute to take the internal political patterns and dynamics that form part of the culture of an organisation into serious consideration. Paul (1990:28), however, points out that there is a strong and well-documented basis of the inherent conflict between the "client-oriented norms of the professional and the universalistic dimensions of a bureaucratic organization" and that "a professional orientation emphasizes authority of person, and a strong personal client orientation which will frequently justify the breaking or bending of rules to suit the perceived needs of individual clients".

4.3.1.4 <u>Technology</u>

The rapid changes associated with the ICT used for creating on-line materials (which is to be expected in such a new and developing field), in terms of not only newer versions but new *types* of ICT, for example, Hyper Reality, needs to be considered when selecting software and hardware. This points to the need for flexibility in an institute's approach to acquiring and discarding ICT, and the need for caution when technologies seem to lock an institute into rigid processes and approaches and do not allow for the speed of changes in on-line publishing technologies.

At this stage in the implementation of the virtual class infrastructure at Wellington Polytechnic, an integrated or hybrid CD-ROM and WWW delivery model for networked education was planned until such time as the Internet could accommodate rich media content more efficiently (and hence a second pilot project to develop a CD-ROM with the "Web home page" information for the Wellington Polytechnic by July 1996 was planned). This hybrid model seemed to have possibilities for managing the limited Internet bandwidth in linking rich media content to the dynamic capabilities and ease of distribution of the WWW.

A basic technological requirement for a conventional tertiary educational institute that aims to implement the virtual class infrastructure is to establish and manage links with an Internet Service Provider for hosting the on-line materials or, alternatively, an internal web server of the institution’s own. It is essential for on-line materials to be hosted on a Web server attached to the Internet in order to facilitate national and international access to the on-line materials.

The conventional strategy regarding recruitment of international students often entails recruiting international students to study at the physical location of the institute. The ease of international delivery of on-line materials pointed to a new strategy for conventional tertiary education, which is to use ICT to deliver courses to where the students are. The wide expectation of ICT in this regards is described as follows: “Leaders both inside and outside the higher education establishment have high hopes that technology can provide the means through which education can be delivered effectively to students who live in remote areas” (National Center for Higher Education Management Systems, 1995:2). In some projects like the Western Australian network these hopes were realised "the network quickly showed it was possible to overcome distance and to provide equity and access to rural and remote students" (WA Telecentres, 1995:1). Physical locality is an important factor to consider in creating and managing the technological virtual class infrastructure. This was illustrated in considering the physical locality of international users, thereby creating a Wellington Polytechnic Website mirror outside New Zealand to offer more rapid access to international users. Unless access to networked courses is facilitated from the specific geographical location of the student (normally via an Internet service provider or educational institute), networked education will not be able to bring education to the student. This is specifically the case in networked education because it needs to *transcend* geographical location through the use of ICT. The notion therefore that physical locality can be disregarded in the context of *designing* the virtual class infrastructure is not valid. An appropriate information and communication technological architecture for networked education that explicitly considers and addresses physical locality (and time zones) will be able to transcend both time and space constraints.

4.3.2 Managing the operations of the virtual class

The research findings in this section support the second research question (*How does one manage the operations of the virtual class?*). This section relates to the “Management Processes” element within the MIT90 schema (*see* Figure 1.3).

The international dimension of managing the operations of the virtual class was highlighted at this early stage through the pilot project of developing the Wellington Polytechnic Website as the Internet plays a pivotal role in both the virtual class and deployment of Websites. The Website immediately made the Wellington Polytechnic accessible internationally because of the global nature of the Internet. Instead of sending a large number of brochures to a few targeted countries, the single source of this “electronic brochure” was available to the whole world. It seems therefore that networked education naturally brings a conventional tertiary educational institute to the international stage where educational management needs to occur in a global context. This will impact on many of the sub-systems of an institute through changes in their vision, mission and long term objectives.

The virtual class presents an opportunity for conventional tertiary education in New Zealand to find its own niches in the international distance education market. This opportunity at the same time poses a threat for conventional tertiary education since "competition" is no longer limited to institutes in the geographical proximity only but opens the local educational market to all tertiary education institutes using networked education. Any institute using networked education can offer its courses internationally to students who might have traditionally attended local institutes. Each conventional tertiary educational institute needs to find strategies to address this threat and build these into its long-term objectives. They could participate in networked education themselves, or provide personalised attention through smaller groups, increase social interaction possibilities on campus, rigorously address the needs of the local work-market, address the specifics of the local culture, or increase the quality of its education and build a reputation for excellence in target areas.

Bridging the gap of English as second language (ESL) to penetrate the Asian market was initially identified as a critical success factor (Appendix 1). The Wellington Polytechnic already had courses in teaching English as second language. It was, however, not certain at this stage whether the Asian countries would be specifically targeted for networked education studies of Wellington Polytechnic. Entering international educational markets through networked education where English is not the first language, is a management challenge to be addressed.

Establishing contacts with others in the field proved to be extremely valuable for the author in managing this new endeavour at Wellington Polytechnic. It strengthened the vision of networked education through an increased appreciation of the possibilities, dynamics and issues of the virtual class. It provided encouragement to further research the implementation of the virtual class infrastructure and to continue with the hypermedia project. The growth in networked education internationally suggests that it is an essential practice for a conventional tertiary educational institute that wishes to progress along this path to learn and collaborate with others in this field. Electronic communications increase the feasibility of international exchanges. Collaboration and exchange with others in the field nationally and internationally do, however, require resources for attending conferences, obtaining applicable literature, encouraging exchange agreements and providing synchronous and asynchronous means of electronic communication.

Controlling access on the WWW to the Wellington Polytechnic's on-line educational materials was a critical success factor (Appendix 1) that was confirmed during cycle 1. Materials on-line on the WWW are accessible by anybody with an Internet connection. The management issues of ensuring security (Graham, 1995 September) and addressing copyright issues (McCullagh, 1995 September) featured as key topics at the "New Media and On-line Commerce" conference in Brisbane, Australia. Organisations can participate at low cost and with ease in offering their services via the Internet, but there are complexities surrounding copyright of digital information that need to be addressed (McCullagh, 1995 September). Graham (1995 September) points out that the open nature of the Internet poses risks which are very different to the risks contained on the closed networks managed by banks and other financial network agencies. These can be partially addressed through the use of information technology by means of the implementation of security software and the use of user identification and password controls. These controls can be instituted in conjunction with operational policies such as signed undertakings by students to use materials for their personal studies only.

These mechanisms can assist to protect an institute's investment in networked course materials.

Managing the dynamic nature of on-line materials is a new aspect of management in the virtual class as reflected in a proposed change process for the Website (Appendix 4): "It is important to keep the Home Page alive by updating materials regularly. This can be done much more quickly than waiting for the next print run of brochures or for print advertising deadlines." In paper-based teaching, once the materials are provided to the student (or published), these cannot be changed except by errata notices or a total re-issue, be it via distance education or handouts in class. On-line materials, however, can be changed continuously and immediately - as experienced during the initial development of the Wellington Polytechnic Website - and this new approach needs to be communicated to all relevant parties. Managing the dynamic nature of on-line materials thus requires tight change control systems while simultaneously capitalising on the flexibility of the materials.

The flexible and continuous publishing possibilities of on-line materials as well as the continuous changes in the ICT underlying on-line publishing point to the need for flexibility within the software and hardware for developing on-line materials.

The flexibility and keen interest that team members had in networked education, assisted the author substantially in coordinating the project. The project team operated as a virtual team since the members were physically located throughout the campus and had other full-time roles that made physical meetings extremely difficult. The team, however, had to find ways to work together and communicate effectively on this project. Asynchronous on-line communication in the form of electronic mail was used extensively. For synchronous communication, telephone conversations and some face-to-face physical meetings were held as these were necessary in getting to know each other and create a measure of group spirit. The team thus essentially experienced the virtual class model of education where teachers and learners are removed in time and space (Myburgh, 1995). Through this experience the author gained confidence, even though the operation of this virtual team faced some operational problems, that the learning environment within the virtual class would be able to be managed effectively. It also highlighted the need for future teachers in networked education to gain a solid grasp of the dynamics of a virtual team to conduct networked education.

It became clear that ICT plays a central role in on-line publishing and needs to be managed as essential, critical elements of networked education and not as an optional extras. During Cycle 1 the central role of ICT in on-line applications was illustrated in many ways (as described above). ICT was therefore identified as being central to the operations of the virtual class, which has a strong on-line dimension as expressed in networked education. The role of ICT within networked education can be seen as analogous to paper and physical structures (like buildings and roads) within conventional tertiary education that have to be available and functional for education to occur.

The critical and fundamental role that ICT plays in on-line applications highlighted the need for computer literacy of future students in networked education. It followed that planning for and providing appropriate training in the use of ICT for students was essential.

4.4 Conclusion

The implementation of the virtual class infrastructure at Wellington Polytechnic was in embryonic form at the end of Cycle 1. The research findings of Cycle 1 are documented in 4.3.1 and 4.3.2 above.

The implementation process highlighted a number of preliminary heuristics in managing the implementation of the virtual class infrastructure as well as some characteristics of managing the operations of the virtual class. These findings are of a tentative nature as only the first cycle, which analysed the pilot project of creating the Wellington

Polytechnic Website, had been completed. Managing the implementation of the virtual class infrastructure to this point indicated some significant management differences between conventional education and networked education (as discussed in 4.3.1 and 4.3.2 above).

The overall objective for this action research cycle was to manage the implementation of the virtual class infrastructure so that the feasibility of the concept of networked education at Wellington Polytechnic could be tested. This objective was pursued through the following strategies:

4.4.1. the vision of the virtual class at Wellington Polytechnic was defined in the initial proposal (Appendix 1)

4.4.2 the vision was communicated to different management levels and other staff in a variety of ways using different platforms - this needed to be extended in the next cycle

4.4.3 the vision was implemented:

- 4.4.3.1 resources for the initial introduction of the virtual class were secured and detailed resources and skills requirements for the next phase of implementing the virtual class infrastructure at Wellington Polytechnic were identified
- 4.4.3.2 the first steps in creating the technological architecture for the virtual class at Wellington Polytechnic was completed, but ownership had to be extended in the next cycle
- 4.4.3.3 the organisation's positive response, based on the pilot, to the new paradigm of the virtual class needed to be tested in the next cycle when the on-line campus and the first networked course would be created

4.4.4 closer links with institutions, organisations and individuals already conducting research and those involved in networked education and commercial activities on the Internet proved valuable and needed to continue in the next cycle.

The conclusion after cycle 1 was that it was feasible to progress with the implementation of networked education at Wellington Polytechnic and that more of virtual class management would be learned when developing a first networked course. This concluded the first of the four action research cycles.

As indicated in Chapter one, in order to address each of the research questions, the action research had to progress to the point of fee-paying students enrolling and participating in networked courses at Wellington Polytechnic. This was not possible at this stage when the Wellington Polytechnic Website was only implemented as a pilot.

In the second cycle, which occurred from January to December 1996, the plan was to progress with the implementation of the virtual class infrastructure at Wellington Polytechnic from a pilot project stage, to having a networked course. The plan also included implementing the virtual class infrastructure more comprehensively through the creation of the Wellington Polytechnic On-line Campus and a first networked course. These actions would highlight more heuristics for managing the implementation of the virtual class infrastructure in conventional tertiary education and assist in identifying the characteristics of virtual class management.

CHAPTER 5

CYCLE 2 – FIRST NETWORKED COURSE

In cycle 1 of the research, the Wellington Polytechnic Website was developed as a pilot towards implementing the virtual class infrastructure.

Cycle 2 is geared towards further answering the research questions of how to manage the implementation of the virtual class infrastructure in conventional tertiary education, and also how to manage the operations of the virtual class. The further implementation of the virtual class infrastructure is intended to test the findings of cycle 1 (described in Chapter 4.3.1 and 4.3.2 above).

In cycle 2 the implementation of the virtual class was to have moved away from a limited pilot stage to a more comprehensive implementation of the virtual class infrastructure through the creation of the Wellington Polytechnic On-line Campus (1998, June) as well as the creation of the first networked course.

The Wellington Polytechnic On-line Campus with the first networked course is central to the infrastructure for networked education. This is the infrastructure necessary for teacher, learner, problem and knowledge to interact through Internet or intranet technologies for the purpose of learning (as defined in Chapter 1).

In cycle 2 the HYDI project would be established as an institute-wide project, although essentially experimental. The first networked course was a free sampler course, and no full-time staff was allocated to the project. The vision for networked education was limited; for example, the author obtained a 30% reduction in teaching load to manage the project while some other staff who participated in the project formally received a small time allocation towards the project.

External to the HYDI team, staff of Wellington Polytechnic perceived the Wellington Polytechnic On-line Campus as an interesting add-on to conventional education. The HYDI team saw networked education at this stage mainly as a tool for delivering distance education. The HYDI project was carried out as a tiny part of the overall operations of Wellington Polytechnic.

This Chapter, like the previous chapter, has been structured according to the typical phases in action research that is:

5.1. plan

5.2. act and observe

5.3. reflection.

The duration of this action research cycle was from January 1996 to December 1996.

The action research log for cycle 2 comprises 1314 electronic mail messages of which the key messages are included in Appendix 11.

5.1 Plan

The overall objective for this action research cycle was to manage the implementation of the virtual class infrastructure at Wellington Polytechnic from the preliminary pilot stage to the infrastructure required by the institute to offer networked education. The emphasis in cycle 2 was on creating a stable infrastructure for building the first commercial networked courses in a further research cycle.

The plan was not to extend the implementation of the virtual class infrastructure widely into different academic areas but to retain the focus on courses within the degrees in education. In cycle 2, using Rogers' diffusion model (Rogers and Scott, 1997), the outreach activities should be concentrated on getting the use of the innovation to the point of critical mass. These efforts should be focused on the early adopters, the 13.5 percent of the individuals in the system to adopt an innovation after the innovators have introduced the new idea into the system. Early adopters are often opinion leaders, and serve as role models for many other members of the social system. Early adopters are instrumental in getting an innovation to the point of critical mass, and hence, in the successful diffusion of an innovation.

The plan also included further advancing the visibility of the HYDI project and promoting the ownership of the vision of networked education at Wellington Polytechnic specifically among senior and middle managers.

Some perceived operational actions for this period are described in a progress report in September 1995 (Appendix 3) that highlights the assumption of the author that networked education needs all the supporting sub-systems which the conventional class requires, but based on ICT.

Seven strategies were formulated as the *modus operandi* for cycle two to ensure that the overall objective above would be met:

5.1.1. concentrate promotional activities on the "early adopters" by developing the first networked course

5.1.2 advance the visibility and ownership of virtual class concepts among senior and middle managers

5.1.2 implement a stable technological architecture for the virtual class

5.1.2 identify and implement effective administrative services
establish a marketing strategy

5.1.2 identify and implement appropriate organisational structures

5.1.2 further extend and forge new links with institutions, organisations and individuals already implementing the virtual class.

5.2 Act and Observe

This section contains a discussion of how the strategies above were carried out.

5.2.1 Concentrate promotional activities on the "early adopters" by developing the first networked course

Continued support by the President for the HYDI project was evident through the financial sponsorship in cycle 2. He also supported the idea of a free sampler networked course to be developed in cycle 2.

As mentioned in Chapter four, there was a specific course offered by the Educational Development Department that the President had in mind for development as the first networked course. After discussion at a SMG meeting, it was decided that the "Teaching techniques for adult learning" course would be developed as the sample networked course (Wellington Polytechnic, 1998 April). However, this critical decision was made without carrying out a thorough market research.

The Educational Development Department (EDD) had some experience in distance education and was also planning to start delivery in 1998 of a Master of Education that would have a strong distance delivery component. The Educational Development Department therefore saw networked education as an important and relevant development and was keen to be involved in the HYDI project. The teaching philosophy within the Educational Development Department was to give pre-eminence to the student who carried through into the development of the sampler course.

The Educational Development Department qualified well to be the primary "early adopters" as the department was well-respected and established within the Wellington Polytechnic. Rogers and Scott (1997) indicate that the early adopters need to be a more integrated part of the local system than the innovators, have opinion leadership in many systems, need to be not too far ahead of the average individual in innovativeness and needs to be respected by their peers. The Educational Development Department was also represented on the HYDI team, but this did not negatively impact their role as early adopters.

The team approach to the development of the sampler networked course was extended when in early February the "Bachelor of Education (B.Ed) Hypermedia Team" was formed. It consisted of the core HYDI team (project manager, creative director / graphic designer, computer specialist, educational director) plus the content providers from within the Educational Development Department.

An training opportunity for the academic staff in the extended team arose through staff development when the author organized an open Hypermedia Seminar (Lobodzinski, 1996). Further bottom-up promotion was also intended through this seminar which was well attended by Wellington Polytechnic staff from a wide range of departments. This indicated an increase in interest in networked education. The Educational Development Department in particular was well represented.

Using the names of the workshop delegates as a base, an internal e-mail group of “interested staff” was created and periodic messages about progress of the HYDI project was distributed to this group as a way to internally promote networked education (Appendix 11: 8). This group was also invited to assist in the development of the first networked course in any way they felt possible, and some assistance was offered by them.

A team workshop in a group decision-making mode was held at the start of the year to plan the development of the sampler networked course. This workshop was specifically designed to incorporate the “early adopters” in the innovation of implementing the virtual class infrastructure.

In the first cycle the computer specialist, with the help of others, was also responsible for integrating text and graphical elements into appropriate computer formats in creating the on-line materials. However, when the development of the sampler course was planned and some of the team members who helped in this area in cycle one were no longer available, it became clear that a distinct role within the hypermedia team of a media developer was needed. No provision had initially been made for funding of this role and therefore it was decided to use second-year multi-media students of the Department of Computer Studies for creating the basic HTML code. This was defined as a project within their course and was structured as a group assignment (later in cycle 2 a staff member was added to the HYDI team in this role). The work of one of the groups of students was selected as a basis for further development (Appendix 11: 18).

At this workshop the development process for a module (called a "chunk" by the team) of the first networked course was defined. The content providers would provide the content in electronic format to the project manager via the head of the Educational Development Department. The project manager would be the link with the computer specialist, the creative director (graphic designer) and the lecturer (who convened the course in which the students acted as on-line media developers). A flexible and dynamic process was created whereby direct links between the content providers and the computer specialist as well as the creative director were established for testing purposes and for alterations. This process was followed over the next five months in which the sampler networked course was developed (the long period of development was due to the very limited staff allocation to the HYDI project).

The systems development methodology of prototyping (Stair, 1992; Burch, 1992) was discussed at the workshop and was used with good effect during the next few months as the sampler networked course was developed. The process that was followed is depicted in Figure 5.1.

For whole course:

Then for every module relating to content, visual design and technical computer aspects:

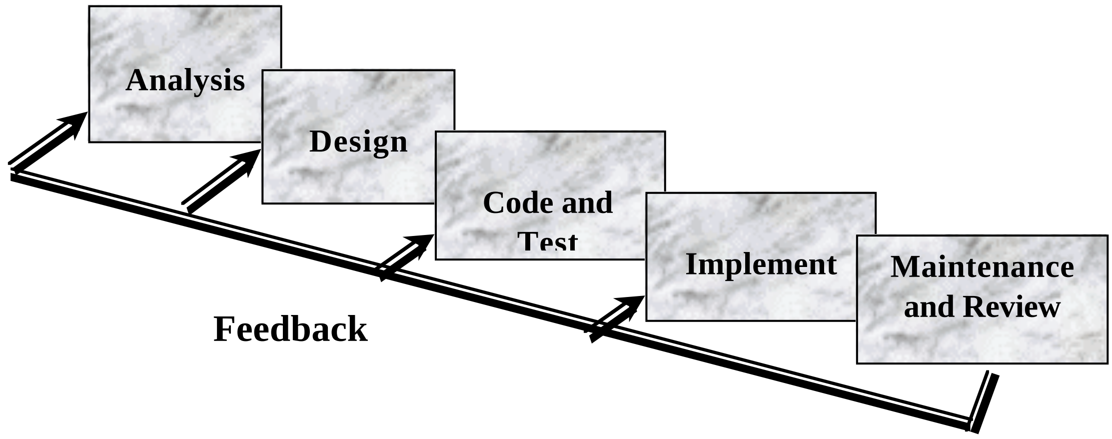

Figure 5.1 Prototyping Development methodology as used in this study (Adapted from Stair, 1992:406)

At certain stages during the development process, joint evaluation meetings were held to evaluate certain aspects of the course, and also to build more of a team spirit and keep the "early adopters" group informed (Appendix 11: 18).

During the iterative development process, it became clear that the additional role of an editor was required. The editor needed to be an objective person who could scrutinise all the materials and point out any inconsistencies, spelling mistakes and typing and language errors. A staff member in the Educational Development Department offered to act in this role. In the sampler course the editor scrutinised the content of the sampler course and contributed significantly to the quality of the content.

To evaluate the instructional design of this first networked course, a session was held at the completion of the sampler course, asking a group of on-campus students to browse through the sampler and provide feedback on the course via an on-line response form (Appendix 11: 14 - 17). They were asked to comment on factors like interactivity, the use of graphics, off-campus access, navigation and how it compared to printed materials. They made valuable comments that were fed back to the HYDI team for consideration.

The HYDI team found that on-line materials could be continuously re-published with ease because of having a single source to update. This dynamic nature of change to on-line materials therefore needed to be managed both in the development and delivery of networked education. Changing the content of a networked course while students are working through a networked course can cause confusion for them. A revision page was therefore created in the sampler course to inform students of changes.

A known problem of traditional distance education courses is the isolation that these students often experience; however, certain strategies can reduce this problem (Henri and Kaye, 1993:29-31; Stacey, 1997 June). It is possible that these students don't know their fellow students or who their lecturers are (as the author experienced when studying for an Honours degree at a distance education university). This is an area which on-line communications can impact significantly (Mason, 1996 June). The HYDI team's attempt to facilitate and manage the communications in the sampler course was to have a standard hyperlink to an "Ideas Exchange" at the bottom of each Web page in the course. Here students can post public messages for other students on a dedicated message board, publish materials on-line, post public messages for the lecturer on a dedicated message board, send private messages to the lecturer via e-mail.

The issue of privacy of information was analysed and the option was provided to students to specify their e-mail address on the message boards if they wanted to receive personal responses to their postings.

These boards can be used to bridge the boundaries of space and time when using it asynchronously (participants are not together in time). The boards, however, can also be used for synchronous (participants need to be together in time) communications to create a quicker feedback cycle. Current boards are designed for asynchronous use and a proper CHAT facility would need to be investigated in further cycles.

Networked education did enable the development team to consider the individuality of every student by catering for different ways of navigating a course and for different learning styles. This also left the students more in control of the management of their own learning. The navigational preferences of sequential and random navigation were addressed in the sampler course. The WWW and intranets cater very naturally through hyperlinks for the random learner. The HYDI team saw the management of navigation through the materials as an integral part of instructional design. No strict sequence was built into the sampler course, although suggestions for sequential progression are made to the students. The learner can thus take any route through the content and activities; the only fixed requirement is that the assessments need to be completed before any credit can be obtained.

For the sequential learner, special measures needed to be taken in the design of the first networked course. In the sampler course a clickable navigational "course map" was used as an anchor, which is a graphical presentation of the proposed sequence of the main sections in a course, and is presented at the start of the course. One of the standard hyperlinks at the bottom of each page within the course links to this "map" to help students orient themselves. From the page that contains the "course map", students can also access an "Index" page which contains an extensive list of most of the hyperlinks within the course. The inherent capability of Web browsers to change the colour of all followed links is used on this "Index" page. A student can access this page and see which elements of a course have been visited and which elements still need to be done. This, however, is a crude method as Web browsers reset these colours after a user specified period and furthermore does not indicate to the student that the work on the page has actually been completed but merely that the page has been visited.

Certain facilities were included in the sampler-networked course to support specific learning styles. Learning styles refer to the preferred way that a person processes information and describe the typical mode of thinking or problem-solving of individuals (Kearsley, 1994). Mind maps were used extensively to provide a visual overview of areas within the course.

Kolb's description of learning styles (1984) was used by the Educational Development Department content providers to cater for the individuality of students and to allow the student to manage their own learning. Kolb (1984) postulates that learning styles may be seen along a continuum running from concrete experiences (CE), reflective observation (RO), abstract conceptualisation (AC), to active experimentation (AE). Using these preferences, Kolb postulates four types of learners namely divergers, assimilators, convergers, and accommodators.

For those who prefer active experimentation, that is to say those who learn best by actively engaging in a practical application of the theory, a "Gymnasium" section was created (which has a hyperlink at the bottom of each Web page within the sampler course) where students are provided with exercises of both a practical and a theoretical nature

The "Gymnasium" section in the sampler course also assists those learners who prefer concrete experiences, that is to say those who learn best when they are involved in new experiences. The WWW also naturally lends itself to "discoveries" through hyperlinks to other course materials or to external sources. Students can also have new experiences in their learning through random navigation, a high level of inter-activity through e-mail, message boards, on-line feedback on assignments as well as the use of multi-media that is graphics, colours, sounds and movement.

For students who prefer learning by reflective observation, that is to say learn through watching others or by developing observations about their own experience, a

"Reflection" section (which is hyperlinked to form the bottom of each Web page within the sampler course) was created to provide students with "thinking" exercises - often more advanced questions or points to ponder on. The "Gymnasium" section also assists this learning preference. Asynchronous on-line communication in networked courses on the WWW also assists this learning preference since the student has the opportunity to reflect before responding to students, lecturers, the content or to assessments.

Students that learn best through abstract conceptualization, in other words by creating theories to explain their observations, are catered for through the extensive narrative within the sampler course.

The content providers and educational director from the Educational Development Department gave pre-eminence to the learner by also looking to incorporate constructivism in the sampler course. The central tenet of the constructivist approach is that "…the world is *constructed* by the individual" (Boyle, 1996 June:751). Constructivism is a philosophical educational approach by which it is argued that since knowledge is socially and culturally constructed (Brookfield, 1985), it is the learners who need to construct knowledge for themselves. It argues that no two people have exactly the same personal constructs of knowledge (Zepke, 1998). Hypermedia systems can facilitate this approach very well as hypermedia technology is seen as enabling rather than directive in that learners browse hypertext documents in constructing their own knowledge according to associations in their own cognitive structures (Landow, 1992).

The implications of educational media instructional design are well summarised by Boyle (1996), who suggests that such instructional design should focus on construction of knowledge rather than instruction, developing of contextually authentic rather than artificial learning tasks, setting collaborative tasks within clearly defined social contexts, giving students voice and ownership within the learning process, enabling students to construct knowledge from their own life experiences and awakening students to their part in the knowledge construction process. There should also be an expectation on the part of the lecturer to receive valid but different expressions of meaning in assessments.

The importance of networking with others engaged in similar projects to verify ideas and learn from them was illustrated when the author attended an overseas conference and visited tertiary education institutes. The author formulated the lessons learned as recommendations (Appendix 8). Specific aspects relating to the networked courseware included the possibility of having an area on the screen where a student can make personal study notes (annotations) that are saved on their own computers. Also that students can develop valuable hypermedia "text books" as part of their course assignments that can be used by future students (Bos, Kikstra and Morgan, 1996 June); the same would be true of examples of student assignments in general that can be used as a learning resource for future students. This illustrated another way that networked education can connect or network students to other students by bridging the barrier of time and essentially connecting past and present.

Another aspect that came to the fore was that of taking cultural differences and preferences into account in the design of courseware (Chyou and Esiley, 1996 June). Target markets will have to be well researched to establish any specific cultural preferences and then to investigate possibilities of incorporating these.

The HYDI team was still responsible for maintaining the Website too. An attempt was made to formalise the Website change process (updated in February 1996; Appendix 4). A discussion was held with the senior manager of the Management Information System (MIS) group in which it was decided that MIS would take over the maintenance of the Website. This signified a positive development in the wider diffusion of the vision for networked education at Wellington Polytechnic as the Website was increasingly seen as an important marketing tool for the Polytechnic. The Management Information Systems

(MIS) group also wanted to engineer it to become part of the mainstream activities at Wellington Polytechnic (Appendix 11: 12 and 20).

The HYDI team had face-to-face meetings from time to time to discuss issues arising from the tasks that were being completed and to build team coherence. Most of the intra-team communications, however, were via electronic mail as this multi-disciplinary team were physically located in different parts of the Polytechnic, and therefore still operated for most of the time as a virtual team.

5.2.2 Advance the visibility and ownership of virtual class concepts among senior and middle managers

The continued support of the President as sponsor of this project was a source of encouragement for the HYDI team throughout cycle 2 (Appendix 11: 11 and 12).

The importance of senior management support was again demonstrated in cycle 2 when the President requested that the author become a member of the Computing Advisory Committee. This committee discusses and makes proposals to senior management on operational computer issues (Appendix 11: 6). This contributed to linking the HYDI project to the recognised structure of the institute.

A report was presented to senior management on the author's overseas visit in cycle 2, containing the observation based on the conference workshops and presentations (Appendix 8) that "distance education via hypermedia delivery has been validated as an important delivery medium."

At the invitation of the President, the author provided input on a monthly basis at the meetings of the Senior Management Group (SMG) and periodically also progress reports (Appendix 9 and N). This invitation was an indication of the President's continued support for the project and his desire for a successful outcome and wider implementation. For instance, the name of the virtual campus, “Wellington Polytechnic On-line Campus” was decided on by the SMG with input from the HYDI team. These sessions in retrospect could have been used much more effectively to gain support from within the SMG. The assumption of the author, however, was that everyone in the SMG fully supported and felt a sense of ownership of the HYDI project. It was later learned that the support base was much smaller than assumed, which pointed to the difficulty of implementing an innovation in conventional tertiary education and to the need for understanding the culture of an organisation.

The author suggested to the President that the first networked course as well as the Wellington Polytechnic On-line Campus be launched at an open session to be followed by a small celebration (Appendix 11: 1) to which some senior managers were invited. This was designed to be a motivational instrument for the HYDI team members, for showing public recognition for the team and the vision for networked education, and as further internal promotion of the possibilities of networked education.

A positive view of HYDI was reflected in a memo in December 1996 by the head of Educational Development Department to the writer (Appendix 23) after discussions with the President, Vice President and other staff. The memo stated that "it was agreed that HYDI and the development of ‘new media’ involving computer mediated learning is very important for the polytechnic” and "it was agreed that the work of coordinating ‘new media’ developments would grow to a full-time load from 1998 and that the polytechnic would commit itself to funding such a full-time position from 1998.”

5.2.3 Implement a stable technological architecture for the virtual class

The plan was to conduct a second pilot project aimed at developing a CD-ROM with the "Website" information for the Wellington Polytechnic. CD-ROM technology was seen as an important complementary medium to the Internet with which the HYDI team wanted to experiment in order to create hybrid systems because of the bandwidth limitations of the Internet. The directorate, however, decided that HYDI should not pursue this planned second pilot project because of the resources required.

What in fact came to be created were the technological architecture to support the first networked course (Wellington Polytechnic, 1998 April) as well as the Wellington Polytechnic On-line Campus (1998, June). This virtual campus, which was called the "Wellington Polytechnic On-line Campus", was created as the entry point for students in networked education at Wellington Polytechnic. It was made accessible from the Website for marketing purposes and includes links to all networked courses:

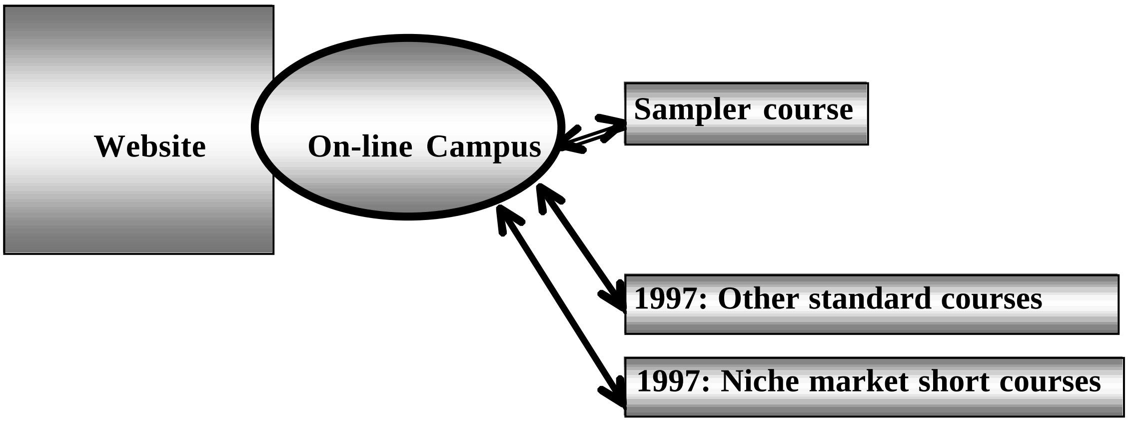

Figure 5.2 Wellington Polytechnic On-line Campus positioning

The On-line Campus includes hyperlinks back to the Wellington Polytechnic Website (Wellington Polytechnic, 1998 July), which describes the activities, support and other courses at Wellington Polytechnic and provides contextual information for the student in networked education.

To minimise Internet access costs for the student, the instructional design included an option for the student to download a compressed version of the whole course, enabling them to study off-line. Students thereafter need to come on-line only to participate in on-line communication.

In the On-line Campus a “Help” section was included to assist students in a variety of areas. A hyperlink to this “Help” section is included at the bottom of each Web page of the On-line Campus for easy access. Various technical computer issues are covered including more information on down loading the zipped course files, setting up the Web browser to send e-mail, down loading applicable plug-ins for the Web browser and the minimum computer configuration required. The following general information was included in the On-line Campus: How to enrol for networked courses; how to communicate on-line with lecturers and other students; how to navigate through courses; how on-line note-taking may be conducted.

The need for ICT literacy and expertise within the wider institute was recognised and the author suggested to colleagues in the Computer Studies department that they develop and present a course in Java (a cross-platform programming language especially useful for Web applications) in order to build up expertise in this field within the institute. This was not pursued further because some databases allowed the development in a fourth generation language to be exported as Java applets (Appendix 11:7).

Managing the relationship with the Internet Service Provider (ISP) continued as the on-line campus and sampler courses were also hosted at the same ISP. A program (script) was down-loaded from the WWW and placed on the Web server for use with the on-line message boards. The delays in communication between the ISP and the HYDI team during experiments with asynchronous communications indicated that having an internal Web server would be the preferred option. The technological architecture within the HYDI team comprised the PC and MAC multi-media computers, multi-media authoring packages, graphic design software, Web browsers, software to convert word processing documents to HTML, a scanner, as well as access to the Internet, the World Wide Web and access to a Web server.

The report on the author's overseas visit in cycle 2 contained recommendations and observations about technological architecture (Appendix 8), and it proposed that HYDI acquire a multi-media object-oriented database in 1997/1998 for more appropriate management of the courseware data (Lobodzinski and Williams, 1996 June; Lennon and Maurer, 1996 June; Schultheis, and Sumner, 1989). HYDI also had to employ someone with database management skills on the project to carry out this function.

A workshop in adaptive educational hypermedia at an ED-MEDIA conference (Brusilovsky, 1996) led the author to believe that, although complex to achieve, adaptive educational hypermedia should be a key design goal in hypermedia development at Wellington Polytechnic from 1997 onwards. This means that educational material is presented in an individualised and possibly unique way to students on the basis of mapping systems that are created for each individual student. This highlighted the centrality of the student in networked education which allows the students to navigate the materials and have the material presented to them in a way that suits them. This is one of the basic advantages of networked education over the traditional classroom method. A skilled programmer in some scripting language or another, eg JAVA or PERL would be required.

Virtual reality could possibly also be explored to enhance the learning experience of students because it has the potential to encourage more active participation and increased accuracy in illustrating features and processes. Although Chambers *et al.* (1996, June) indicate that VR in education is in its infancy, they are positive about the potential of VR in education as computing power increases and cost decreases.

Although the technological architecture for the on-line campus was developed as part of the implementation of the virtual class at Wellington Polytechnic, no (on-campus) student Internet access policy was yet in place (Appendix 11: 21). This indicates the need for also addressing wider policy issues when implementing a technological innovation.

5.2.4 Identify and implement effective administrative services

At this stage the enrolment procedure for networked courses was designed and tested since it was envisaged that students could enrol for the free sampler course if they desired to obtain credits for it. An on-line form was designed for students to indicate when they were planning to start studying, their highest educational level and some biographical and contact details. The Educational Development Department, as content providers of the first networked course, would receive this application and follow it up by sending out a comprehensive printed application form.

Students who wanted to gain credit for this course would have to enrol and payment could be made by faxing credit card information through to the Educational Development Department or by using a bank order. If demand for the Wellington Polytechnic's courses was high in a specific country, possibly creating a local deposit account for student fees was envisaged.

As the sampler was a free course available to the public, security measures like access to the course via user identification and password were not used (as would be the case in the following cycle for commercial courses). The course files were, however, technically protected through the security measures of the ISP so that only designated members of the HYDI team could update the on-line materials.

In terms of assessment, the plan was that students who enrolled for the sampler course would send their assignments to the course convenor by traditional mail or as an attachment to electronic mail.

5.2.5 Establish a marketing strategy

The specific marketing strategy that was decided on was to develop a free sampler networked course. This procedure was based on a similar very effective strategy that was used to market the popular Web browser Netscape (1996).

No market research was done before selecting the first networked course. The Educational Development Department had been active in distance education and one of the courses that they offered was selected. It was also believed that the specific course selected as the Sampler course could have a more general application. At the extended HYDI team workshop in February to plan the development of the sampler networked course, the target market for the sampler course was identified as being part-time New Zealand students interested in learning to teach adults - this included supervisors and people in the workplace.

The international possibilities of networked education were becoming more apparent and early in 1996 a meeting was held with the directorate member responsible for external liaison and international affairs. It was decided that the contact information of the International Student Office and the Course Information Centre would be prominently placed on the Website to assist national and international students to make on-line contact. The importance of marketing networked courses internationally using conventional means that included international educational fairs, as well as the possibilities of adapting a networked course for students in different geographical areas were discussed. The author saw a new role for the International Office in promoting networked education internationally.

The report on the author's overseas visit in cycle 2 (Appendix 8) contained a marketing recommendation that short courses for niche markets based on thorough market research be selected for development in the next cycle and that these be developed in parallel to the core formal courses in the next cycle. It was clear that all the resources of the HYDI project could be fully tied up for the foreseeable future in the networked education development of the Bachelor of Education, leaving no resources to move the innovation wider. It was therefore considered desirable for short courses to be developed and that they should have an emphasis on the international market, since the Bachelor of Education (B.Ed) was primarily focused on the New Zealand market.

5.2.6 Identify and implement appropriate organisational structures

Obtaining adequate staff resources was difficult as this initiative was funded solely from the President's development budget. The HYDI project still operated as a virtual team with members from different departments from various parts of the campus. Involvement in the HYDI project for all team members was secondary to other permanent duties. The project manager, for instance, had a 30% time allocation towards the HYDI project in cycle 2. The computer specialist also received a time allocation towards the project and duties within HYDI were included in this person’s annual performance objectives.

Information was obtained from the University of Auckland in New Zealand and University of Southern Queensland in Australia on how their hypermedia developments were structured (Appendix 11: 3 and 4). This correlated well with the HYDI team’s composition of sponsor, project manager, content director, creative director/graphic designer, computer specialist, educational director, editor and an on-line media developer. It seemed as if the HYDI team had the kind of composition that would facilitate wide implementation of the new virtual class infrastructure.

Recommendations concerning the organizational structure were included in the report on the author’s overseas visit in cycle 2 (Appendix 8). One such recommendation was that the hypermedia project should be placed on a firmer footing from 1997 in order to achieve the goals of this venture as specified by the President. It was felt that the structure at the time did not provide adequate focus and potential for the achievement of these goals. The conviction grew that the initiatives concerning the virtual class should not be localised in a specific school or department within a school because the implications and possibilities of the virtual class were seen to be institute-wide. It was also felt that continuity would be provided to the HYDI project if the project in 1997 were to be located closer to where it might reside eventually. This concern arose through the impending retirement of the President (and sponsor) at the end of 1997. In addition, relocation of the project would move the reporting structure of the project and budget to a department like the Educational Development Department, which was closely involved in the vision of networked education at Wellington Polytechnic.

A unit could be formed, perhaps to be called “The New Media Unit”, that would serve all the schools in the Polytechnic and as such would be a general support unit like the Library and the Educational Development department with a mission to research and implement appropriate new information technology in appropriate curricula at the Wellington Polytechnic. This unit would combine and balance the principles of education and of information technology to achieve its goals. Therefore it was felt that such a unit could reside within the Educational Development Department (second preference), or on its own (first preference) due to its general support function, or linked in some way or another with the computer development group (with the Academic Registrar). The name of such a new unit was discussed within the HYDI team and centered around the concept of “new media” (Appendix 11: 13). As a member of the Computers in Teaching Advisory Group (CTAG), the author therefore proposed the formation of a New Media Group at the end of 1997 (Appendix 11: 5 and Appendix 12) as a formalisation of the HYDI project and also to widen the diffusion of this innovation. The proposed mission was "enabling technology-based educational improvement and innovation for open and flexible learning” with promotion (and marketing), training, development, research and support as its the main functions.

Organizational culture and project dynamics did not seem to harmonise well as personal politics and institutional politics interacted. The dual reporting lines of the author to the President and to the operational adviser, who was also the author's head of school at that stage, proved to be problematic. Based on all the factors above, the project manager proposed to the President that the HYDI project be moved to the Educational Development Department - the “early adopters” group (Appendix 11: 2). At directorate level it was decided that it was in the best interest of all parties and that project HYDI be located in the Educational Development Department. The HYDI project thus became the HYDI Educational New Media Centre in the Educational Development Department at the start of 1997.

5.2.7 Further extend and forge new links with institutions, organisations and individuals already implementing the virtual class

Networking with others and maintaining these contacts was essential for the author to be able to evaluate the implementation of networked education at Wellington Polytechnic within a national and international context through feedback and advice. Links with other researchers in this field also enabled the author, for instance, to obtain information from the University of Auckland in New Zealand and University of Southern Queensland in Australia on how their hypermedia developments were structured (as mentioned above).

Contact with Prof Suave Lobodzinski who ignited the vision of networked education at Wellington Polytechnic through his hypermedia workshop (1995, 1996) was maintained and led to a seminar that he conducted in Wellington. This workshop further promoted this innovation among other departments. He also provided information on possible conferences that could be attended (Appendix 11: 7) for further networking and learning from others.

Similarly, the contact with Prof. Colin Latchem, Head: Teaching and Learning Group at Curtin University of Technology in Perth was maintained (Appendix 11:10) to be able to learn from developments at their institute.

The author and the head of the Educational Development Department attended the ED-MEDIA World Conference on Educational Multimedia, Hypermedia and Telecommunications in June 1996 to assess what other institutes are doing in networked education. The networking at the conference renewed the vision for networked education at Wellington Polytechnic, and inspired the head of the Educational Development Department to actively explore networked education. The author also visited the New Media Lab and Academic Computing Services Department of the Massachusetts Institute of Technology as well as the New Media Centre of California State University at Long Beach. Many of the recommendations and conclusions of the report on this overseas visit that are referred to above (Appendix 8) were implemented over the research period. A specific recommendation was that collaboration should be sought with other institutions in New Zealand.

5.3 Reflection

5.3.1 Managing the implementation of the virtual class infrastructure

These findings address the following elements of the MIT90 schema (see Figure 1.3):

5.3.1.1.strategy

5.3.1.2.roles and skills of individuals

5.3.1.3.organizational structure

5.3.1.4.technology.

5.3.1.1 <u>Strategy</u>

Exploring the possibility to publish student results on an intranet or the Internet accentuated this serious management issue and challenge to ensure the privacy of student information (Dearden, 1995). Underwood (1995) points to the increase in the risks to personal privacy because of ICT advances in general and the Internet in particular. Underwood lists unauthorised access, insecure storage of data, incorrectly recorded information and intrusion through ICT products and services as sources of this increased risk. In networked education most information about a student and also the teacher could reside in digital form on computers. Ensuring appropriate access to this information is both essential and complex, as digital information does not diminish when shared and is difficult to contain.

Developing a free sampler networked course based on the "Netscape" (1996) marketing strategy for on-line promotion was effective in that it did generate interest nationally and internationally in the HYDI project. The “free give-away of the first version” marketing strategy for on-line promotion can thus be followed when promoting courses within the virtual class. In this strategy a selection of courses, or parts of courses, can be made available free of charge in order to entice the student to enrol for other courses or the entire course.

In some conventional tertiary educational institutes decentralised organisational structures whereby central services and responsibilities are devolved to departments are becoming popular (Yetton, 1993; Randle and Brady, 1997; Hart, 1999 July). This devolution includes budgetary aspects that might leave central services with little funding for institute-wide innovations and projects requiring funds. The President’s development fund at Wellington Polytechnic however, provided the central funding necessary to start and maintain this initiative in cycle 2. Unless adequate central funding is available for innovations like the virtual class, these developments can easily occur in isolation and without wider impact.

The prototyping development methodology that was proposed in the previous cycle and described above was used to develop on-line materials and worked satisfactory. The reason for this was that the development of the first networked course displayed the features that point to using the prototyping approach, namely a low degree of certainty about input and outcomes, low user experience, immediate results are normally desired, a high degree of risk, a large number of alternatives (although the degree of complexity is average owing to the ease of WWW publishing and the availability of Web servers and technologies through Internet Service Providers) (Burch, 1992; Stair, 1992). The HYDI team also experienced that the virtual class technologies have a large degree of intrinsic flexibility and therefore facilitate prototyping. For instance, HTML is very pliable and on-line message boards can be updated and changed rapidly. On-line materials can be termed as being in a “living” format, that is to say hypermedia, as most flexible, can be changed easily and publishing on-line materials is a continuous and simple process. As each module within the sampler course was developed, it was tested and reworked in a series of iterative cycles until the content provider was satisfied.

The HYDI team found that an effective method of introducing change is using a pilot project (similar to the development of the first networked course during Cycle 2). The first networked course was essentially another pilot project (after the development of the Wellington Polytechnic Website as the first pilot in the first research cycle) since it was not a commercial networked course, but a free sampler. This pilot facilitated experimentation in this new field, testing of concepts and processes, the formulation of guidelines and principles, the establishing of credibility, promotion of the innovation as well as analysing how an organisation responds to the new paradigm of networked education.

The Lewin and Schein model for organizational change (Stair, 1992:396) is used to describe the stages that occurred in this second cycle of the project:

(i) *Scouting*: Identify potential areas or systems that may need change: educational planning, development and delivery

(ii) *Entry*: Stating the problems and the goals: these were identified through team discussions and focused on creating the first networked course as well as the Wellington Polytechnic On-line Campus

(iii) *Diagnosis*: Gathering data and determining resources required: included in the budget request to the president for cycle 2

(iv) *Planning*: Examining alternatives and making decisions: a large degree of exploration, discovery and experimentation was allowed for in cycle 2 in all areas: educational, technical and design (to be developed further in the following cycle).

(v) *Action*: Implementing the decisions: decisions were followed through in a consistent manner and the first networked course as well as Wellington Polytechnic On-line Campus was created and launched in August 1996

(vi) *Evaluation*: Determining whether the changes satisfied the initial objectives and solved the problems identified: this was done through team testing, testing by internal students and through feedback to the content providers

(vii) *Termination*: Transferring the ownership of the new / changed system to the users and ensuring efficient operation: at the end of cycle 2 full ownership of the first networked course was taken by the Educational Development Department who provided the content and ensured that educational principles guided the course development process.

Our experience of involving students as part of a teaching programme in a critical role of networked course development was not successful. Although some of the student groups produced good modules for the sampler course, it proved very difficult to couple the deadlines of this commercial project of developing networked education with the academic learning outcomes of the course. There was no academic justification to link project deadlines to the assessment criteria of the course, which lead to difficulty in having students produce the work on time (Appendix 11: 19). The author's conclusion was that the development of networked education is to be managed as a commercial project in which professionals fill the required roles and where deadlines are set and treated seriously.

The motivational tools that were available to the author in cycle 2 were again the "non-hygiene factors" (the "motivators") in Herzberg's theory (1960), to encourage those involved in the creation of the virtual class. These included a feeling of achievement, recognition of achievement, how interesting the work was, responsibilities for decision-making, opportunities to develop and to learn new skills. Wellington Polytechnic could not offer any financial incentives to HYDI team members.

Collaboration and exchanges with others in the field have proved to be invaluable in cycle 2. The importance for a conventional tertiary educational institute that aims to progress along this path to link up with others working in this field in order to learn from them and to collaborate with them, was underlined in this action research cycle.

The cost of distribution of materials shifts considerably from the institute to the student, as the students have to pay their ISP for studying on-line. This is a management issue that needs to be addressed, especially considering that the student in the virtual class additionally also requires ICT to access courses.

5.3.1.2 Roles and skills of individuals

It became clear that there was a serious need for student training in basic IT skills as well as having access to the Internet when learning in the virtual class. The teaching of computer skills could ideally be integrated as part of the learning process of each academic department, not only in the department that teaches IT courses. This can be achieved by pursuing a strategic organisation-wide goal to enable students to increasingly engage in the learning process by using the ICT of the emerging information society.

Although the sampler course was not intended to have any students who actually enrolled, a lecturer within the Educational Development Department was nominated to respond to e-mails and also to monitor the message boards. This pointed to new processes of communication whereby students can reach a lecturer by electronic mail and whereby the lecturer needs to respond to electronic discussions on on-line message boards, and raised the management issue of a how to construct an appropriate workload formulae for teachers in networked education. Barnard (1997:32) highlights the concern this is causing some academic staff: "…others may be concerned over additional work loads and how their position will be affected once their expertise is readily available as a packaged course over the Internet". "Contact time" - the time a lecturer spends in front of a class - is often used as an important yardstick and component of a lecturer's workload in conventional on-campus tertiary education. In conventional distance education, again, a certain amount of "office time" might be required. How relevant is "contact time" or "office time" when no or very little face-to-face contact is occurring? The networked education teacher also finds that, because the virtual class is unbound in space and time (except when synchronous meetings are held), a new flexibility is required in academic activities like communicating with students. This can amount to a significant number of "invisible" or "virtual" hours. Changes in the working lives of six academics who moved from teaching a Master's degree in a traditional face-to-face tutorial format to one in which they also taught the same program in a distance mode were explored by Johnston and Challis (1994). They found that the move to distance teaching required the academics to adopt more flexible working hours which included evening and weekend work. The invisibility of these "abnormal" working hours meant that the university might not recognise or value this work, which confirmed the author’s concerns.

In cycle one a project team composed of the sponsor, external contacts adviser, academic adviser, project manager, content director, creative director/graphic designer, computer specialist and educational director was proposed. In cycle 2 the author realized that two more roles are required, namely that of an editor and an on-line media developer while students evaluated the course. These roles incorporate the "five actor categories" that Paquettee, Ricciardi-Rigault, Paquin, Liegeois and Bleicher (1996, June) distinguish in the construction of a virtual campus namely learner, trainer, content-expert, manager and designer. The gatekeeping did not work well because the external contacts adviser and the academic adviser had high workloads and were thus passive in the role of gatekeeping. The computer specialist, graphic designer, educational director and specifically the content director acted as predominantly internal gatekeepers while the author acted in a boundary spanning gatekeeping role.

5.3.1.3 Organizational structure

Taylor, Lopez and Quadrelli (1996) (who investigated the relationships between diversification in modes of delivery, use of ICT, academics' teaching practices, and the context in which those practices are employed in two of the three large universities in Brisbane namely Griffith University and the Queensland University of Technology) strongly recommend that teams should be used when developing more flexible modes of delivery. This was also the experience at Wellington Polytechnic and reinforces the idea that in the design and development of networked education a multi-disciplinary team is required because diverse disciplines like education, graphical elements and ICT are involved. This is in contrast to the general practice of instructional design in conventional tertiary education, which is often a solo activity of an individual lecturer. Spender (1996a, September) bases the multi-disciplinary nature of instructional design and development of networked education on the progression towards the information age and the corresponding blurring of the lines between learning and work, and education and the media. In the education industry, Spender foresees infinite possibilities across the board for creative people, including writers, artists, sound technicians, film makers, media researchers, graphics geniuses, animators and computer professionals. In fact, Spender sees this as a new development for the education enterprise to amass a vast array of talent.

It seemed important to ensure that the implementation of the virtual class infrastructure was not localised in a specific school or department within a school because the author saw the implications and possibilities of the virtual class as operating institute-wide. A central unit instead of a localised project seemed a better basis for providing sustainable training, support, research and development. A separate unit to house this initiative was proposed as the first preference, and as second preference, to locate it within the Educational Development Department (which serves the whole institute).

The implementation of the virtual class infrastructure calls for appropriate policies to be developed, for example access of on-campus students to the Internet, publishing on-line and on-line communication protocols. Policies can blend the requirements of an innovation with the institutional capabilities and culture and are therefore necessary for wide implementation. This top-down aspect was neglected in this action research and could have been used to obtain positive support from administration.

5.3.1.4 Technology

The focus in terms of the technological architecture at this stage was still on implementing front-end technologies, that is to say those technologies that support the user-computer interface. This allowed a rapid start with networked education at

Wellington Polytechnic without having to set up a complicated and costly technological architecture. Acquiring back-end technologies such as database generation of HTML pages had to be postponed owing to limited staff resources in managing and maintaining these technologies. However, the technologies in the virtual class generally are most flexible, for example HTML, which allows for the back-end technologies to be introduced at a later stage. Focusing on the implementation of front-end technologies at this stage, therefore, appeared to be a good initial strategy to rapidly implement networked education. The need for a relational or object-oriented multi-media database was, however, identified during cycle 2 for managing the elements of a networked course.

5.3.2 Managing the operations of the virtual class

The research findings in this section support the second research question (*How does one manage the operations of the virtual class?*) and describes the "Management Processes" element within the MIT90 schema (see Figure 1.3).

In cycle 2 the author started investigating appropriate administrative processes for networked education in preparation for commercial networked education planned in the next cycle. Enrolments in conventional education (where physical structures are used) enforce a strict regime where students and administrative staff need to be at certain times and specific places - the virtual class removes these barriers and allows flexible enrolment. This may cause difficulties for conventional administrative procedures, related computer systems and academic work processes. Anywhere/anytime enrolment might be technically possible within the virtual class, but it might not be feasible to implement it in a totally open way because of the complexities it creates. However, the potential openness in the enrolment processes and procedures that the virtual class allows needs to be exploited. Some courses, where group work is not essential, could be offered on a continual, flexible basis.

On-line applications and enrolments that use the asynchronous possibilities of the virtual class can remove the typical bottlenecks that occur during enrolment time at most conventional tertiary education institutes. Students can provide the necessary details in a secure on-line environment and have it electronically verified for completeness and correctness. A single page that constitutes the contractual arrangement between the institute and the student and that carries the student's signature, could be faxed or posted to the institute.

Boone (1985:130) indicates that instructional design "…involves translating the identified and analysed learning needs of target publics into meaningful and cogent designs and developing effective teaching-learning strategies for their implementation". Although instructional design deals with "…how to make instruction work as well as possible with the tools at hand" (Mager, 1988:1), the reality in conventional tertiary education is that instructional design often does not deal with graphic design or ICT design. In networked education, however, instructional design in practice generally also includes graphic design as well as ICT design. Therefore the scope of instructional design in practice in the virtual class is wider and hence different from conventional education practice.

The virtual class brings a new flexibility to learning through its asynchronous components that include the use of the WWW or intranets, electronic mail and message boards. Students can study at their own choice of pace, place and time but also have the advantage of synchronous communication activities when required.

The virtual class environment enables students to be in charge of managing their own learning. In networked education the student may have the materials on-line, have hyperlinks to Websites for further research, can communicate with other students in the course as well as communicate on-line with students and lecturers in other locations - be it nationally or internationally. Correlating to this greater autonomy of the student, is a change in the role of the teacher in networked education from being an instructor to being more of a facilitator (Mason, 1999). Thompson (1997:2) challenges teachers to expand their intellectual and professional horizons in the virtual class environment:

> Professional development, particularly those activities intended to introduce instructors to distance teaching, should not only train participants in the use of educational technology, but also encourage participants to reflectively view distance education as part of a larger educational vision. In the current educational environment this vision must include a commitment to the process of non-traditional instruction, sensitivity to the unique needs and challenges of a variety of distance learner populations, and readiness to expand one's intellectual and professional horizons beyond past practices and individual institutions.

One of the significant differences between conventional education (whether it is distance or on-campus education) and networked education seems to be the *connectivity* that networked education facilitates by bridging the boundaries of both space and time. The HYDI team initially used the term distributed on-line education to capture this characteristic of virtual class education; the author later started to use the term *networked education* to highlight this aspect even more. It connects or networks student and student, teacher and student, student and resource, teacher and resource, past and present independent of geographical position or time differentials. Managing this connectivity is an important difference between the management of the conventional class and the virtual class. Hawkridge (1995:8) contends that "the greatest difference, however, between the old and new media is their capacities to sustain two-way communication that aids learning”. On the class level, there is a new relationship between student and lecturer. In the conventional class, the teacher often has a one-to-many relationship with the students, which is based on the conventional teaching model as well as on convenience for the students. Students in a course will often relate with the academic community solely via the convenor of the course when seeking clarification, feedback, additional instruction or wish to challenge ideas. The on-line student, however, is "...no longer confined to our campus and its teachers and students and activities" (Tiffin, 1996a November:2). The student now has various teachers accessible by e-mail and they may be geographically located anywhere in the world. This was vividly illustrated when the author wanted to clarify an aspect of Roger's (1983) diffusion of innovation theory and was able to use electronic mail to contact Everett Rogers personally and received clarification within 24 hours through a reply electronic mail (Rogers, E. Re: Top-down approach Everett Rogers <erogers@unm.edu>, 10 July 1998). The student in the virtual class, through an extended group of teachers in networked education, may therefore be more challenging in discussions and also more knowledgeable than the conventional student. Furthermore, lecturers might have to deal with a new relationship with their students, which is not one-to-many but *one-of-many*.

Networked education enables the instructional designer to consider the individuality of every student by catering for different learning styles, ways of navigating a course as well as individualised presentation. This provision increases the possibilities for students to manage their own learning. Mediated individualised instruction is an appropriate educational goal (Romiszowski, 1984) and extends the provision for different learning styles and different ways of navigating through a course to true adaptive hypermedia systems where personalised presentation can occur (Brusilovsky, 1996). Carver, Howard and Lavelle (1996, June:121) provides an example of adaptive hypermedia based on learning styles:

> Students determine their learning style by answering a series of twenty-eight questions. Based on the student's responses, a Common Gateway Interface (CGI) executable calculates each student's individual learning style, stores this student profile as a file on a WWW server, and associates it with the user's login. When the student logs in to begin a lesson, the student is given the option of exploring the course material according to their learning style...

Using a constructivist approach also adds to the centrality of the learner in the virtual class. It gives pre-eminence to the learner since it is argued that as knowledge is socially and culturally constructed by the individual, it is the learners who need to construct knowledge for themselves. Landow (1992) asserts that hypermedia systems should be seen as learning rather than teaching systems since these systems strongly facilitate the use of a constructivist approach in instructional design.

5.4 Conclusion

The implementation of the virtual class infrastructure at Wellington Polytechnic moved closer to being able to offer networked education, but this innovation was still being primarily located within the Educational Development Department. Notwithstanding the support of the President, the lack of general ownership of the vision for networked education at Wellington Polytechnic among senior and middle management as well as the cultural and political complexities that this innovation experienced, contributed to this position.

The action research findings of cycle 2 are documented in 5.3.1 and 5.3.2 above.

The implementation process during cycle 2 highlighted and confirmed a number of heuristics for managing the implementation of the virtual class in conventional tertiary education and also pointed to more features of virtual class management (as described in 5.3.1 and 5.3.2 above).

The overall objective for this action research cycle was to manage the implementation of the virtual class infrastructure at Wellington Polytechnic from the preliminary pilot stage to the infrastructure required by the institute in order to offer networked education through the following strategies:

5.4.1 the promotional activities which focussed on the "early adopters", the Educational Development Department, by developing the first networked course was successful and full ownership of this course was achieved

5.4.1 the visibility and ownership of virtual class concepts among senior and middle managers was still very limited

5.4.1 a stable, albeit basic, technological architecture for the virtual class had been developed

5.4.4 only limited administrative services were implemented because the sampler course was a free course and not intended for student enrolment

5.4.5 a basic marketing strategy was established and implemented

5.4.5 appropriate organisational structures were explored and recommendations were made for the implementation thereof

5.4.7 new links with institutions, organisations and individuals already implementing t he virtual class were forged and established contacts were maintained.

It became evident that the implications for managing the operations of the virtual class in conventional tertiary education were extensive and pointed to significant differences between conventional management of tertiary education and management of networked education.

A second order question that emerged was whether conventional tertiary education could adapt its management approaches and processes to the extent that is required to effectively use networked education. This would be further explored in subsequent cycles.

This concluded the second of four cycles of this action research.

As indicated before, the action research had to progress to the point of fee-paying students enrolling and participating in networked courses at Wellington Polytechnic in order to address the two research questions. The sampler networked course was not intended to attract any fees and during cycle 2 no students participated in this course.

In the next action research cycle that occurred from January to December 1997, the plan was to develop and deliver the first commercial networked courses and to establish the HYDI project as an integral part of the organisational structure. Through these strategies it was envisaged that more would be learned about managing the implementation of the virtual class in conventional tertiary education, and that more features of virtual class management would be identified.

CHAPTER 6

CYCLE 3 - FIRST COMMERCIAL NETWORKED COURSES

In the first two cycles, two pilot projects were completed which provided the basic infrastructure at Wellington Polytechnic to offer networked education on a commercial basis. In the first research cycle the Wellington Polytechnic Website was implemented, and in the subsequent cycle a free sampler networked course was developed

In the third action research cycle which occurred from January to December 1997, the first commercial networked courses would be developed while the HYDI project would be established as a more integral part within the organisational structure as the HYDI Educational New Media Centre (Wellington Polytechnic, 1998 June). The roles and responsibilities in the centre also would become more formalised.

The virtual class infrastructure would be implemented at Wellington Polytechnic to the point that two commercial networked courses were made available for enrolment by students. A small number of students would participate in one of the commercial networked courses when it was offered as an alternative to the students who were enrolled in the on-campus version of the course.

The traditional class was still the dominant model for education at Wellington Polytechnic where most teaching was done face-to-face physically on the Wellington campus. At the start of cycle 3 the HYDI team and the Educational Development Department (the “early adopters”) were enthusiastic about the possibilities of networked education, but there was little evidence in any of the other departments in Wellington Polytechnic of making networked education a priority.

A Computers in Teaching Advising Group report (CTAG, 1997:3) indicated a growing and wide computer use by academic staff at Wellington Polytechnic; it also indicated that "both lecturers and students were united in their call for access to the Internet”. A real concern was the limited computer access of students mentioned in this report: "access for students seems to be the Achilles heel for the polytechnic. Students consistently called for wider access to swipe cards so that they can use computers outside normal working hours”.

In a further study done at the Wellington Polytechnic (O’Donovan, 1997:4) the impact of information technology on internal communication was explored and the findings indicated that computer usage and electronic mail among staff had become widespread since this research started: survey findings indicated a “… critical mass of respondents had adopted the technology, the majority of respondents rank themselves as either intermediate or expert computers users and on average spend 2.5-3.0 hours per day on their computers”.

The above findings indicated a positive internal trend in computer usage and computer literacy if compared to the situation in 1995 when many staff members of the Wellington Polytechnic preferred to have paper-based communications and many academic staff did not have access to computers (Appendix 7: 10).

This chapter has been structured, like the previous two chapters, according to the typical phases in action research that is:

6.1. plan

6.2. act and observe

6.3. reflection.

The action research log for cycle 3 comprises 864 electronic mail messages, some of which are included in Appendix 13.

6.1 Plan

The overall objective for this action research cycle was to manage the implementation of the virtual class infrastructure at Wellington Polytechnic to the stage where networked education could be offered commercially.

In the terminology of Rogers (1983), cycle 3 was an attempt to move closer to obtaining a critical mass within the Educational Development Department, that is to say an attempt to reach the point at which enough individuals have adopted the innovation so that the innovation's further rate of adoption becomes self-sustaining. It became clear that reaching a critical mass within the Wellington Polytechnic as a whole would need more resources, intensifying the promotion and a longer time span.

While the work comprised growing the user-base of networked education within the Educational Development Department, the plan also included extending the diffusion of the virtual class into new academic areas because, as Rogers and Scott (1997) indicated, early adopters are instrumental in achieving to the point of critical mass for an innovation and, hence, in its the successful diffusion. In terms of Rogers' diffusion model (Rogers, 1983) the goal of cycle 2 would also be to find more early adopters.

In preparation for student participation in networked education there was an intention to extend the technological virtual class infrastructure in the areas of synchronous on-line activities and back-end information technologies.

The *modus operandi* for cycle three was based on the following strategies to meet the overall objective:

0.0.0 grow the base within the Educational Development Department by developing and delivering the first commercial networked courses towards the Bachelor of Education qualification

0.0.0 further explore appropriate organisational structures supporting the delivery of networked education

0.0.0 extend the diffusion of the virtual class into new academic areas

0.0.0 strengthen the interest regarding the delivery of networked education among senior and middle managers

0.0.0 extend the technological virtual class infrastructure

0.0.0 liaise with institutions, organisations and individuals working in the field of the virtual class.

6.2 Act and Observe

This section contains a discussion of how the strategies listed above were carried out.

6.2.1 Grow the base within the Educational Development Department by developing and delivering the first commercial networked courses towards the Bachelor of Education qualification

As in the sampler course in the previous cycle, a prototyping approach was used to develop the on-line materials. The prototyping approach not only provided the ability to experiment, but also created a high level of interaction among the development team of whom the content provider was part of (Appendix 13: 5).

The design of the first commercial networked courses at Wellington Polytechnic provided students with an option to study either independently in a more flexible mode or as part of a group in a more structured manner. Networked education does facilitate this flexible learning approach, which seems to be valuable to people already in the workforce as illustrated by an electronic mail inquiry that the author received from Texas (Appendix 13: 6). If a student elects to study as part of a group, the time lines within a course will need to be more structured, and the lecturer in networked education can thus use group work and group assessment techniques.

If a student elects to study independently, start and finish times for a course are less important. Assessments then are to be structured for an individual approach and the student might or might not want to participate in on-line communication. On-line message boards, electronic mail and real-time CHAT (which the HYDI team started to experiment with in cycle 3) can play a significant part in breaking the isolation often experienced by a student studying alone (Barnard, 1997:30). Asynchronous communications like hypermail boards and newsgroups allow the student to observe the discussions that have occurred on course topics as well as to obtain the contact information of other students who have done or are taking the same course (Appendix 20). Stacey (1997, June:1) quotes some of their students who used computer mediated communication (CMC) in outback and urban Australia as saying:

> *"I think it gives us better contact with our fellow students and it takes away the isolation of distance education. "*
> *"....it just makes you realise you're not isolated in your pain. You're not the only one out there that doesn't understand it".*

The head of the Educational Development Department, Nick Zepke, became convinced that networked education could improve the quality of learning, and was the first networked education teacher at Wellington Polytechnic. The first full course to be deployed on-line was “Introduction to Educational Research” (Zepke, 1997a) as well as case studies provided in the “Curriculum Design and Development” course (Viskovic, 1997). These Bachelor of Education courses were available in August 1997 and their introduction was announced in the internal staff memo as well as through a press release (Appendix 13: 10). A few students who where enrolled in the campus version of the “Introduction to Educational Research” course explored the on-line version and some reported that they found it to be a valuable resource.

The head of Educational Development Department also developed a research interest in networked education and published "Narrative and Constructivism in Cyberspace:

Instructional Design for Distance Delivery using Hypertext on the Internet" (Zepke, 1997b) and "Virtual Classroom: Holy Grail or Tin Can?" (Zepke, 1997 October 28). The educational adviser within the HYDI Educational New Media Centre also researched networked education and presented a paper "Experimenting with the Internet: Developing New Patterns of Communication with Distance Learners" at the New Zealand Association of Research in Education (NZARE) Conference, Auckland (Viskovic, 1997 December).

These two content providers were influential in promoting networked education in the wider Educational Development Department and also as gatekeepers for providing educational, operational and cultural information (that is of the Educational Development Department) to the HYDI team. There were still ambivalent attitudes and concerns towards networked education as Viskovic (1997, December:11) points out:

> ( ) Some are enthusiastic, seeing the potential for more distance students to join in a wider variety of course experiences
>
> (ii) Others are involved about equity issues such as access to the Internet for distance students from lower socio-economic groups
>
> (iii) Others again see difficulties in the staff time commitment required, not only in developing materials and creating interesting interactive WWW pages, but also in maintaining on-going communication. While our classes are relatively small, this is less of a problem, but they ask whether we will still be able to interact with all the students individually when the numbers grow …

Educational principles were pre-eminent in the development of the first commercial networked courses at Wellington Polytechnic. Technological possibilities and administrative requirements were evaluated on the basis of how they contributed to student learning. Educators drove the design and implementation of the virtual class, and the networked courses thus had a strong educational base as illustrated at an evaluation team meeting at the end of cycle 3 (Appendix 16). It was felt that the good visual design, provision of various navigational paths, personal warmth through style as well as sound content based on educational principles and objectives should be maintained. In terms of the process, aspects like the enthusiasm within the team, continual inquiry and critique and an experimentation approach were experienced as being positive. Growth areas identified, included closer integration of design and narrative, more clarity on navigation plan, increased quality assurance, early and clear explanation and negotiation of the role and responsibilities of the facilitator, and more creative and effective promotional strategies.

The three year plan 1998 - 2000 of the Educational Development Department (Appendix 14) indicated that the Educational Development Department had embraced the virtual class as a significant component and strategy, and saw it as one of the competitive advantages of the department. Bottom-up and top-down - through the head of the department - initiatives within the Educational Development Department led to the further extension of the diffusion process within the Educational Development Department.

6.2.2 Further explore appropriate organisational structures supporting the delivery of networked education

The HYDI project was in a transitional stage between being an experimental project and becoming an established part of the organisational structure at Wellington Polytechnic. Its experimental nature is illustrated by the fact that it was still being funded from the President's development budget and that no staff worked full-time on this project. However, the HYDI project had become part of the Educational Development Department as the HYDI Educational New Media Centre (Appendix 23) for the reasons described in chapter 6. The role and planned operations of the centre are described in the three-year plan for 1997 to 1999 (Appendix 22) and indicated that an expanding role was projected for the centre. The HYDI Educational new Media Centre had a vision to spearhead and co-ordinate the use of new media in education at Wellington Polytechnic from an integrated management, educational and technical computer perspective to enable technology-based educational improvement and innovation for open and flexible learning. The author's position description was amended to include more markedly the responsibility to spearhead and co-ordinate the use of new media in education (Appendix 19).

Networked education was slowly being recognised as part of the established organisational processes at Wellington Polytechnic as is illustrated by the inclusion of HYDI responsibilities in the 1997 performance agreement (Appendix 15) of the HYDI educational consultant. A further illustration of this is the inclusion of the author's role to "...input into WP Inet standards and liaise re intended HYDI developments" in a document prepared by the academic registrar and director of the Management Information Systems (MIS) group to indicate wider "Inet" (that is both Internet and intranet) roles within Wellington Polytechnic.

During cycle 3 the author was invited to be a member of the newly formed Computers in Teaching Advisory Group (CTAG), who reported to the President. Participants in this group included academic staff of the School of Engineering and Construction as well as the School for Business and Information Systems. CTAG thus became a natural vehicle for further promoting the concepts of the virtual class at Wellington Polytechnic.

The multi-disciplinary team approach that was used in the previous two cycles was again utilised in the course development in cycle 3. This approach seemed to work well, and regular fortnightly meetings (Appendix 13: 9) and some social events (Appendix 13: 8) supported the electronic communications of the team. The roles within the HYDI Educational New Media Centre remained as before, except that a designated person did not fill the role of “editor”; the content providers filled this role through peer evaluation.

It seemed that policies could be used to blend the requirements of this innovation with institutional capabilities and culture. In an attempt to formalise the use of networked education at Wellington Polytechnic and to establish continuity and wider support in administration, the author started formulating guidelines and possible regulations for the use of networked education via the Internet or intranet. This was done in consultation with the MIS director and a first rough draft was created as the basis for further discussions (Appendix 18).

6.2.3 Extend the diffusion of the virtual class into new academic areas

HYDI was still maintaining the Wellington Polytechnic Website, which had been developed as a pilot project in research cycle one. However, a transition of the maintenance of the Wellington Polytechnic Website was achieved in July 1997 when a Web administrator was appointed within the Management Information Systems (MIS) group. Although MIS group is not an academic department, this transfer did support the diffusion of the virtual class infrastructure within the institute because the academic registrar immediately set out to establish formal ownership of the contents of the Wellington Polytechnic Website within all the Wellington Polytechnic departments.

A recommendation contained in the report on the author's overseas visit in the previous cycle (Appendix 8) was that short courses for niche markets were to be selected on the basis of thorough market research and that these were to be developed in parallel to the core formal courses in cycle 3. It was also stated that these short courses should ideally cater for the international market. A memo (Appendix 21) and general e-mail to all staff was therefore sent out in April 1997 (with a proposal form) to invite staff to "...join in the exciting venture of delivering courses via the World Wide Web to an international audience, by proposing a short course in your academic area which you believe will have a wide international audience and success (this will hopefully enable the Wellington Polytechnic to offer it at a modest fee) and be a short course not more than the equivalent of 4 or 5 credits (40 - 50 total learning hours)."

The reaction was limited and no developments occurred as a direct result of this effort - it seemed as if academic staff were just too busy to explore this further. Through personal networking a first networked education short course, "Virtual Teams: Meeting On-line" (Pauleen, 1997) in the School of Languages and Communication was, however, developed and piloted in November 1997 for national and international delivery. The HYDI team endeavoured to operate as far as possible within the regulations of the institute. In this instance the approval status of this course was defined as a seminar (Appendix 13: 1). The need for differentiation of international fees based on the local fees of students came to the fore (Appendix 13: 7). Charging a standard international fee made it difficult to market courses internationally while the exchange rate further made the fees unattractively high for certain international markets.

Through personal networking, which again emphasised the importance of the bottom-up component of innovation diffusion, the first teaching and learning resource of the On-line Campus was launched in November 1997 from within the Computer Studies

Department. It comprised a comprehensive set of evaluated and categorised links to statistical organisations, resources and statisticians across the world (Lovrich, 1997). Another bottom-up activity was that the author presented two papers to academic and allied staff from various departments "The Wellington On-line Campus: Quo Vadis?" (Uys, 1997b October) and "Trends in Cyberspace Education: What's Happening?" (Uys, 1997 September) at the Winter lecture series at the Wellington Polytechnic.

At the end of that year, a proposal to CTAG (Appendix 13: 2) was accepted to create a subgroup of CTAG to conceptualise and enable the further development of networked education. This subgroup would be called the "Forum for Enabling Networked Education". This bottom-up activity was part of the plan to extend the diffusion of the virtual class into new academic areas and also to start addressing more of the strategic and operational issues related to networked education.

A study at Wellington Polytechnic (O'Donovan, 1997:3) indicated the need for training in general and basic computer skills among both academic and administrative staff in particular in order for networked education to diffuse further:

> … the majority of respondents (70.5%) rank themselves as an intermediate or expert computer user. While this is a positive outcome, it should be noted that 20 lecturers (40%) classify themselves as either novice or beginner. This suggests that computer based communication systems are likely to be less effective among this group of employees. Training may be needed to ensure that these respondents are able to communicate using the available technology.

6.2.4 Strengthen the interest regarding the delivery of networked education among senior and middle managers

In the Wellington Polytechnic's "STATEMENT OF CORPORATE OBJECTIVES 1998 - 2000" (Wellington Polytechnic, 1997) no mention was made of any aspect relating to the virtual class or the Internet. The references to the internationalisation of education were stated in terms of the conventional practices of increasing the international linkages with two more collaborative agreements, and recruiting international students to attend courses physically on campus eg “Orientation and ongoing social and learning support to be provided for international students” and “Increase international student numbers to …% of total EFTS”. The SMG also requested that the monthly spoken input that the author had been providing at SMG meetings be replaced with written input; the President obliged by consenting to the request of the SMG group.

In June 1997 CTAG made a presentation to the President in which the author identified the perceived advantages of using the Internet in education and specifically included benefits relating to management (Appendix 6). The author hoped that this document would be used to create more support among directorate members for the implementation of networked education at Wellington Polytechnic.

The directorate still supported the implementation of the virtual class at Wellington Polytechnic, as is reflected in September 1997 in a comment by the Vice-President at a public staff meeting t the effect that the directorate perceived HYDI as potentially significant in the strategic direction of the Wellington Polytechnic.

6.2.5 Extend the technological virtual class infrastructure

The importance of proper database support for networked education was illustrated when a small database application was developed to monitor the navigation of individual students through networked courses. This application analysed the raw data obtained from the Internet Service Provider (ISP) on “hits” statistics (the number of times pages are accessed) on the networked courses. This information could contribute to understanding how the students’ actual use of the on-line materials correlated to the instructional design.

Most of the necessary technological architecture for offering networked education had been obtained and implemented. This included access to the Internet and a Web server, HTML editors, a scanner and cross-platform computers. The news in August 1997 that Apple and Microsoft had reached a broad product and technology development agreement was welcomed with the hope that cross-platform differences like the rendering of colours and HTML files would be eliminated (Appendix 13: 11). In cycle 3 the HYDI team started experimenting with video-cams and related software for synchronous on-line communications within networked courses. The author felt that synchronous communications could contribute to a sense of accountability by students, communicate to students that there was a real interest in them and also to add aspects of non-verbal communication through on-line video-conferencing. The experiments proved to be difficult to conduct (Appendix 13: 4) without an internal Webserver to experiment and test these newer technologies and applications.

6.2.6 Liaise with institutions, organisations and individuals working in the field of the virtual class

Networking with colleagues involved in similar projects was essential for the author to evaluate the implementation of networked education at Wellington Polytechnic within a national and international context. As an open system, the Wellington Polytechnic also had to remain aware of changes in the external environment.

In New Zealand the author attended the "Virtual Technologies in Tertiary Education: A Vision for New Zealand?" conference and highlighted some of the central trends and developments in networked education (Uys, 1997a October). The author created an international e-mail discussion list on networked education, OnLinedu, and promoted its use at this conference. This growing list had around 100 national and international members subscribed at the end of 1997 and illustrated the growing interest in networked education. The growth of interest in networked education among tertiary education institutes in New Zealand was also illustrated at this conference where more than a third of the universities and polytechnics in New Zealand were represented.

The author attended the 18th World ICDE (International Council for Distance Education) Conference" in Pennsylvania, USA (June 1997), presented two papers (Uys, 1997a June; Uys, 1997b June) and participated in two panels that dealt with “An Infrastructure to Support the Use of Educational Technology for Sustainable Development” and “Moving Course materials from Paper-Base to Screen-Base”, respectively. In the process valuable feedback was obtained on the HYDI team’s efforts and the author also learnt more about management issues in the virtual class from other presenters of papers (as referred to in this Chapter and others).

6.3 Reflection

6.3.1 Managing the implementation of the virtual class infrastructure

These findings address the following elements of the MIT90 schema (see Figure 1.3):

6.3.1.1.strategy

6.3.1.2.roles and skills of individuals
6.3.1.3.organizational structure
6.3.1.4.technology.

6.3.1.1 Strategy

It seemed that in terms of instructional design in the virtual class, prototyping, which was used in cycle 3 to develop the first commercial networked courses and in each of the previous two cycles, again proved to be a useful and appropriate development methodology because of its flexibility (Stair, 1992; Burch, 1992). The assumption in the TIES change model of Szabo *et al.* (1997) supports experimentation, which is intrinsic to prototyping. Although no-one can predict the future, especially in the highly changing area of instructional technology, the best way to predict the future is to invent it through experimentation, retaining the good ideas and dropping any that do not work.

The presentation of papers and attendance of conferences by HYDI team members proved to be important strategies for establishing contacts with colleagues at other tertiary institutes working in the field of networked education as well as assisting in legitimising academic staff involvement in networked education.

In the virtual class the financial cost on the part of the student cannot be ignored and, besides strategies to provide affordable access to adequate ICT, the cost of Internet access while studying on-line needs to be considered as a management issue. A specific strategy that can be followed in this regard, and which was used at Wellington Polytechnic, is to have a networked course in a compressed state that the students can download as a single file, leaving the students to go on-line only for communications and perhaps on-line assessment. Clear instructions need to be provided for the students on the steps to follow for down loading the file, decompressing it and accessing the course. Some networked education software packages like WebCT and Lotus Learning Space require the student to stay on-line for networked education. The potential benefits to the institute (student tracking and database functionalities) need to be balanced by the cost to the student.

The interest from senior management in networked education was still limited to one or two individuals and, with the President as sponsor retiring at the end of 1997, the top-down support looked set to dwindle. The bottom swell of interest did extend slightly further than the Educational Development Department, but was still insignificant when compared to conventional teaching. Szabo, Anderson and Fuchs (1997) reported on the implementation of the virtual class at the University of Alberta, Canada and indicated their support for a simultaneous top-down and bottom-up approach to meet the two major intended goals of involved in a training, infrastructure and empowerment system. The first is for the chief academic officers to identify a vision for alternative delivery systems of instruction for the institution, publish that vision widely, and demonstrate their commitment to it in a clear and convincing fashion. Secondly, departments within the institution should create leadership task teams to interpret the vision for their unit and prepare colleagues to implement the shared vision.

In the HYDI team the Educational Development Department staff ensured the pre-eminence of educational principles rather than administrative desires or technical possibilities. It seems therefore appropriate that educators drive the implementation of the virtual class infrastructure. Szabo *et al.* (1997) made some assumptions in their TIES change model by stating that emphasis should be placed firstly on realistic goals for improving formal learning (such as increased achievement, decreased learning time, increased accessibility to instruction or cost control) and secondly on the use of the technology involved in alternative delivery systems (ADS). The move towards flexible approaches to teaching and learning in a medium-sized (2000 students) tertiary institute in England was examined over a period of three years by Willmot and McLean (1994:102-104). They found that academics were suspicious that flexible learning was being promoted for economic rather than educational reasons (1994:102) and that students and academics agreed that, if flexible approaches were to be successfully adopted, then "teachers need to take the responsibility for deciding on the appropriate level and type of guidance". Caladine (1993:9), who reviewed the literature on non-traditional modes of delivery in higher education using state-of-the-art technologies, supported this emphasis when noting “...that if the system is driven by technological determinists rather than educators, the learners may become the victims of the process rather than its beneficiaries”. David Noble (Appendix 13: 3) noted that "some sceptical faculty insist that what they do cannot possibly be automated, and they are right. But it will be automated anyway, whatever the loss in educational quality. Because education, again, is not what all this is about; it's about making money”. This highlights the importance of ensuring ownership by academic staff through using a bottom-up approach (which should occur in combination with top-down strategies) when implementing the virtual class infrastructure in conventional tertiary education (Rogers, 1983).

Another management strategy to enable the wide implementation of the virtual class infrastructure in conventional tertiary education is to ensure that this is a strategic objective and direction, and to tie reward systems to it (Munitz, 1997). This would be true for any strategic objective or direction, and also when an institute desires to move towards the virtual class. Its reward systems should encourage academic staff and students to become and remain involved in networked education if it desires to implement the virtual class infrastructure widely within the institute.

6.3.1.2 <u>Roles and skills of individuals</u>

In implementing the virtual class infrastructure in conventional tertiary education it is important that the perceptions of academic staff concerning networked education are addressed. The attitudes and ownership by academic staff are vital to the success of the implementation of educational innovations (Evans and Franz, 1998 April). At Wellington Polytechnic the two content providers of the first networked course from the Educational Development Department were positive about networked education and were influential in promoting networked education in the wider Educational Development Department - there remained, however, ambivalent attitudes to and concerns about networked education (Viskovic, 1997 December). The challenge that remained was to widen the positive perceptions in Educational Development Department to more academic departments at Wellington Polytechnic and to address the concerns about networked education within Educational Development Department. Taylor, Lopez and Quadrelli (1996) postulate that the adoption of technology within higher education faces three obstacles, namely attitudinal, technical and structural of which attitudinal issues are the most important. In their investigation, the relationship of attitudes and beliefs to change was fundamental. A negative perception of networked education is portrayed in an open electronic mail (Appendix 13: 3) by David Noble highlighting powerful barriers facing the adoption of networked education:

> Once faculty and courses go online, administrators gain much greater direct control over faculty performance and course content than ever before and the potential for administrative scrutiny, supervision, regimentation, discipline and even censorship increase dramatically. At the same time, the use of the technology entails an inevitable extension of working time and an intensification of work as faculty struggle at all hours of the day and night to stay on top of the technology and respond, via chat rooms, virtual office hours, and e-mail, to both students and administrators to whom they have now become instantly and continuously accessible. The technology also allows for much more careful administrative monitoring of faculty availability, activities, and responsiveness.

Wellington Polytechnic, as many other polytechnics in New Zealand, had more of a teaching than a research culture (see Chapter 2), which assisted in legitimising academic staff involvement and appreciation of the possibilities of networked education as a teaching mechanism. It seems necessary to ensure continued appreciation of the scholarship of teaching in an educational institute wishing to implement networked education. Barnard (1997:32) points out that "university faculty have traditionally been rewarded more for research and publication than for instructional innovation” . Unless this happens, academic staff might not be motivated to pursue networked education - unless it can be structured as a research project (as pointed out in Chapter 5). Taylor, Lopez and Quadrelli (1996), in referring to Boyer’s “taxonomy of scholarship", clearly identify the multiple roles/identities available to academic staff, for example the scholarship of discovery, the scholarship of integration, the scholarship of application, and the scholarship of teaching, and of the distinctions between these. The object is to advocate a recognition and valuing of the scholarship of teaching, which seems to be undervalued by comparison with the other forms of scholarship in the American system.

Nixon (1996:5) refers to this tension between the roles of academic staff as teachers and researchers when he argues that "the reconstruction of professional identity is a precondition of the restructuring of higher education". He points to the differential status (and employment opportunities and rewards) attached to these roles, with rewards going to those who are tenured and research-focused. Nixon (1996:13) identifies four pre-conditions in educational institutes for this problem to be resolved through proper development of academic staff:

( ) the importance of collegiality and the need for mutually supportive relationships with colleagues;

( ) the importance of having a clear sense of where their institution was going; a sense of its priorities and long-term commitments;

( ) the need for structures to support their development as teachers and writers; and

( ) the need to resolve tensions between their teaching responsibilities and research commitments.

6.3.1.3 Organizational structure

The HYDI project became the HYDI Educational New Media Centre within the Educational Development Department - a department that serves the whole institute. This created a firmer base for networked education and its wider diffusion at Wellington Polytechnic. This suggests that a central unit can be established to provide sustainable training, support, research and development of networked education in a conventional tertiary educational institute that aims to pursue networked education.

The HYDI Educational New Media Centre was established using the first of the three possible implementation approaches of "flexible delivery options" in higher education proposed by Taylor, Lopez and Quadrelli (1996). The integrated approach with a central unit managing the integration of teaching and learning with IT, emphasising support for professional development in educational and information technologies and linking it to university goals. The parallel approach, creating an IT-based teaching and learning unit, which operates separately and in parallel with existing staff development units. The distributed approach, which is more 'bottom up' and devolves responsibility for IT-based teaching and learning developments to local innovators across a range of faculties and units.

6.3.1.4 Technology

The use of video-cams and having to meet on external servers in experiments by the HYDI team confirmed the necessity of having a stable, dedicated internal Web server. Experimentation with and testing of new technologies also required quick access to, and a high level of control - an important function of management (Boone and Kurtz,1984; Van Dyk *et al.*, 1991; Newman, Warren and McGill, 1987; Schultheis and Sumner (1989) - regarding the relevant scripts and other ICT stored on a Web server.

6.3.2 Managing the operations of the virtual class

The research findings in this section support the second research question (*How does one manage the operations of the virtual class?*) and describe the "Management Processes" element within the MIT90 schema (see Figure 1.3).

The virtual class facilitates the use of the tools of the emerging information or knowledge society as educational tools. This can be particularly valuable in countries like New Zealand where there is a transition from an industrialised society to an information society. Tertiary education needs to prepare graduates for this society, and networked education can be the prime mechanism to accomplish this strategic goal.

Networked education makes it easier for students to select networked courses from different institutes of their choice in order to gain a qualification. This technical possibility could be explored at Wellington Polytechnic as more networked courses, specifically in adult education, become available. This again points to the new level of control that a student can exercise in the virtual class.

The growing list of locally and internationally offered networked courses (The University of Texas at Austin, 1998; TeleCampus Online Course Directory, 1999; Geteducated, 1999) provide the student with a greater choice and can simultaneously create a minefield for students in having to select from this increasing number and variety (in academic quality) of networked courses and virtual institutes (Global Virtual University, 1999; Butterfield, Chambers, Moseley, Prebble, Uys and Woodhouse, 1999 July). The value and standing of courses are factors the student naturally has to consider with care. The critical analysis skills of students will need to be sharpened as choices in tertiary education increases.

The design of the first commercial networked courses at Wellington Polytechnic gave students the option to study either independently in a more flexible mode or as part of a group in a more structured manner. Networked education facilitates this option which is often not available in conventional tertiary education where teaching occurs in a group mode or as individualised correspondence education. More autonomy for the student is thus possible in networked education.

On-campus students were increasingly considered to be part of the networked education student body. Viskovic (1997, December:4) describes this possibility as follows: "… can also enable local students to communicate between classes, or to access class resources or staff members at other than timetables class meetings". This convergence of learning modes which traditionally have been called "distance education" and "on-campus education" through networked education adds a new dimension to the management of student learning and the students management of their own learning.

Viskovic (1997, December:13) indicates concern among the Educational Development Department staff about the new possibilities of flexible enrolment at Wellington Polytechnic (Appendix 20): "what administrative practices may need modification if we want to use on-line learning as effectively as possible? Would variable start and finish times for courses offer distance students more flexibility, since they are not studying in classrooms? Or should on-line students be encouraged to progress 'in-step' so that they are all ready to discuss particular course topics at the same time?" At the ICDE conference in June 1997, Martin Valcke of the Open University of the Netherlands explained that after experimenting with a very flexible approach to enrolment and completion of courses, the university moved to a more structured approach of grouping and pacing students. They found that employers wanted students who have contemporary knowledge and skills, that government funding for prolonged periods of study was decreasing and that students enrolling, starting and finishing as and when they pleased required costly and complex administrative processes. An approach that emphasized grouping and pacing and required students to define their goal at enrolment seems a workable alternative. When engaged in studying to obtain a formal qualification, a more structured approach can be followed; but when studying for professional development only, a more flexible approach can be employed. Students might also enrol in a course that has been specifically designed in conjunction with a specific sector of industry, in which case the industry dictates the structure of the course. Student grouping can then be based on their purpose for studying and their progress monitored against their stated goal while following the related administrative processes. Networked education emphasises student-centered and flexible learning, but needs to be offset against effective administrative procedures. While the learner might need to be closer to the centre of the educational stage, any other necessary support to make underpinning the academic operations possible, for example effective administration, must be appreciated and taken into account when implementing networked education.

6.4 Conclusion

In cycle 2 the implementation of the virtual class infrastructure at Wellington Polytechnic had reached the stage where it was no longer experimental, but set to provide real education and earn real income. It was still largely based in the Educational Development Department with some other departments also starting to put materials on-line. The diffusion of this innovation had spread to more "early adopters" but was still a small project in the overall teaching regime at Wellington Polytechnic.

In the business plan of the HYDI Educational New Media Centre of August 1997 (Appendix 22) a number of weaknesses of the implementation of the virtual class infrastructure was listed as part of a "SWOT" (Strengths, Weaknesses, Opportunities and Threats) analysis including:

- ( ) The Internet and related technologies are developing at an exponential rate
- ( ) A research centre is new to Wellington Polytechnic (in fact to most Polytechnics in New Zealand and abroad) and fits more easily into a university environment
- ( ) The financial resources limit the research outcomes severely, especially in not being able to employ a computer technician for a substantial number of hours per week

( ) Most people involved in the centre have other stronger commitments in their working day

( ) The operational processes within this centre is often different than the processes within vertical departments and schools due to its nature as a growing research centre and its entrepreneurial focus

( ) Marketing and promotion of the services of the centre is not adequate

( ) Students desiring to do on-line courses might not have adequate computing facilities.

The research findings of cycle 3 are documented in 6.3.1 and 6.3.2 above.

The overall objective for this action research cycle was to manage the implementation of the virtual class infrastructure at Wellington Polytechnic through the following strategies to the stage where networked education could be offered commercially:

6.4.1 further extension of the base within the Educational Development Department by developing and delivering the first commercial networked courses in the Bachelor of Education

0.0.0 appropriate organizational structures for supporting the implementation of the virtual class were further explored with the most significant development being the establishment of the HYDI Educational New Media Centre as part of the Educational Development Department

6.4.3 the diffusion of the virtual class was extended into two new academic areas, which thus extended the number of "early adopters"

0.0.0 the interest regarding the implementation of the virtual class among senior and middle managers was not sufficiently strengthened

6.4.5 the technological virtual class infrastructure was extended through experimentation in the area of synchronous on-line activities, but lacked further acquisition of back-end information technologies, for example a proper database for storing all the course elements

0.0.0 liaison with institutions, organisations and individuals working in networked education occurred through the writer's attendance of the 1997 ICDE conference and Alison Viskovic's attendance at the New Zealand Association of Research in Education (NZARE) Conference.

As the implementation of the virtual class infrastructure progressed and approached closer to facilitating networked education in a commercial way, it became more evident that conventional management of tertiary education would need to be transformed to manage the operations of the virtual class. The conventional organisational structure and culture within Wellington Polytechnic made it very difficult for the institute to adapt – or consider adapting - its management approaches and processes to the extent that is required to effectively use networked education.

This concluded the third of four action research cycles.

As indicated in Chapter 1, the action research had to progress to the point of fee-paying students enrolling and participating in networked courses at Wellington Polytechnic. A few students did participate in one of the commercial networked courses in an experimental way when it was offered as an alternative to the on-campus version, but on-line course interactions were at an early stage as the courses were made available late in cycle three.

In the fourth action research cycle the plan was to extend the investigation of management issues particularly relating to teachers and students in networked education and also to investigate which administrative processes were required.

CHAPTER 7
CYCLE 4 – NETWORKED EDUCATION IN OPERATION

In the previous cycles, the virtual class infrastructure was implemented to the stage where commercial networked courses were available and students started to participate in these courses in an experimental way.

In this final action research cycle that occurred from January to December 1998, students would enrol and participate in networked courses, which took place especially through a growth in the use of on-line message boards in the Bachelor of Education (B.Ed) and Master of Education (M.Ed) courses.

The virtual class infrastructure was to be implemented at Wellington Polytechnic to the point where students enrolled for the commercial networked courses and on-line interaction among students and with lecturers occurred. The operations of the virtual class were still very much localised within the Educational Development Department.

This chapter has been structured, like the previous three chapters, according to the typical phases in action research that is:

7.1. plan
7.2. act and observe
7.3. reflection.

The action research log for cycle 4 comprises 227 electronic mail messages, some of which are included in Appendix 24.

7.1 Plan

In cycle 4 the overall objective was to assess the appropriateness of the virtual class infrastructure and to extend it where necessary to support commercial networked education.

The plan included further extending the diffusion of the virtual class to new academic areas and also to expand networked education into the Master of Education (M.Ed) courses within the Educational Development Department.

The intention was to specifically investigate the management issues related to teachers and students in networked education and the related administrative processes.

A list of planned operational actions for cycle 4 was included in the business plan of the HYDI Educational New Media Centre of August 1997 (Appendix 22), which highlighted the need for senior management support and for continued central funding.

The *modus operandi* for cycle four was based on the following strategies to meet the overall objective:

0.0.0 analyse the operations of networked education

0.0.0 extend the diffusion of the virtual class further in the Educational Development Department and into new academic areas

7.1.3 continue to liaise with institutions, organisations and individuals working in the field of the virtual class.

7.2 Act and Observe

This section contains a discussion of how the strategies above were carried out.

7.2.1 Analyse the operations of networked education

Most of the students and lecturers who participated in the two commercial networked courses had at that stage not worked on message boards (Viskovic, 1997 December) and the response to using these boards was minimal. There was also an intermittent technical problem with the boards, which did not receive priority treatment from the computer support group who had been requested to assist HYDI in this matter. This further discouraged student participation. However, electronic mail was used extensively between students and lecturers.

The HYDI team did more experiments with synchronous communication facilities over the Internet, but did not promote these for use in networked education because the team wanted to allow participants in the networked courses to first familiarise themselves with the asynchronous communication facilities. Using the synchronous communication facilities would also require a sharp increase in technical support, which could not be provided by either HYDI or CSG.

The ICT support for students in networked education was thus very limited and depended on the availability of one or two members of the HYDI Educational New Media Centre. A helpdesk using the 0800 was not available for students, and technical queries often ended up with the author.

When the networked course “Introduction to Educational Research” (Zepke, 1997a) was presented, a number of students requested printed copies of the course because of technical computer problems (mostly with down loading and decompressing the course) or lack of access to the Internet. Other students requested that the course materials be provided on floppy discs. This defeated many of the instructional design and communication principles and intentions, and highlighted the importance of designing networked courses with the least possible "footprint", which is the required technology on the student's side. This also underlined the need for consistent ICT support for students and staff in networked education.

An intranet was implemented at Wellington Polytechnic in 1998 by the Management Information Systems (MIS) group. This opened up new opportunities for offering networked education to on-campus students. A few lecturers in other departments started to experiment with this mode by putting some course resources on the intranet for their on-campus students. This made it possible to have on-campus and off-campus students participating seamlessly in the same course occurrence.

The administrative processes necessary for networked education were still largely print-based and designed for on-campus students. Library facilities were still catering largely for on-campus students, while some distance students expressed a need for accessing library resources electronically. On-line registration was discussed but the Management Information Systems (MIS) group was not yet able to support this possibility. Potential students, however, could still register their interest in networked courses on-line.

The global nature of networked education was illustrated when the HYDI team received the following e-mail from a trainer in the United States of America who had found the sampler networked course “Teaching Techniques for Adult Learning” on the WWW:

> We were having a difficult time paring down the rather involved and extensive 'Train the Trainer' training that is offered at Johnson Space Center (it's for professional trainers). What we needed was something direct and relatively simple to provide to crew training developers who, for the most part, are hardware, software, or science developers who also have to develop training demonstrations on how the equipment works. Your website provided exactly the information we needed and saved development $$$ for the space program.

There was interest from a number of international students to do the networked course “Introduction to Educational Research” (Zepke, 1997a), but even a significantly reduced international fee still cost more than what the potential students could afford - the exchange rate also aggravated this problem. The same occurred in the Virtual Teams course, but the fees – mainly because of the exchange rate – discouraged enrolment to the point that none of the students who had initially indicated an interest enrolled. The accepted view within Wellington Polytechnic at this stage was that standard international fees had to be paid by international students accessing courses from within their own countries (the cost of which was amplified by the exchange rate). This discouraged marketing of the networked courses as well as enrolments (as illustrated above). A proper marketing strategy had not yet been designed and needed serious consideration.

In the area of course development, the course elements were still being stored in flat directory structures. The HYDI Educational New Media Centre started work on a software package to better manage these elements by using a fully relational database. This software package would assist lecturers to develop on-line courses without any requirement for technical computer knowledge and would require limited technical input from the HYDI team. This software package was in an initial prototype stage at the end of cycle 4.

Quality assurance emerged as a management issue since students from other countries inquired about enrolling in the networked courses. Courses have prerequisites and the qualifications of students would have to be assessed for equivalence to New Zealand standards. This issue was also illustrated in the challenge to ensure authenticity in assessment and on-line communications. Quality assurance was becoming a significant issue in networked education, as was illustrated by the initiative of David Woodhouse, director of New Zealand Universities Academic Audit Unit (AAU), to invite the author onto a panel to investigate external quality assurance for the virtual institution (Butterfield, Chambers, Moseley, Prebble, Uys and Woodhouse, 1999 July).

7.2.2 Extend the diffusion of the virtual class further in the Educational Development Department and into new academic areas

The interest in the virtual class within Educational Development Department was positive, and staff of the Educational Development Department were interested in extending the use of on-line message boards. On-line message boards for four Master of Education (M.Ed) courses were created. In the second semester of 1998 work also started on another Bachelor of Education (B.Ed) degree course, “Adult Learning”.

The prospective on-line educators within the Educational Development Department were invited to do a short networked course “Virtual Teams: Managing the on-line meeting” (Pauleen, 1997). As the operations with the virtual class were akin to the operations of a virtual team in which participants are removed in space and often time (Jarvenpaa and Leidner, 1998; Lipnack and Stamps, 1997), the participation level was low owing to other higher priorities of staff and the culture within the Educational Development Department, which did not respond well to the invitation being framed as a pre-requisite for networked education.

A number of bottom-up initiatives were taken to extend the diffusion of networked education beyond the Educational Development Department. A brochure to promote the services of the centre both internally and externally was designed by the HYDI graphic designer and distributed by the author and other team members. A document containing guidelines for the development of networked education was also created and provided to the small number of prospective teachers in networked education.

Alison Viskovic, an educational adviser within the HYDI Educational New Media Centre, participated in the Wellington Polytechnic Winter Lecture Series during which she discussed the possibilities of using hypermedia in networked education (Viskovic, 1998a).

The need to train more academic staff within the Wellington Polytechnic in computer mediated learning contributed to the development and presentation of a new course of “Computer Mediated Learning” for the Bachelor of Education qualification. Interest was reasonable and ten staff members from departments representing the areas of Engineering, Nursing, Fashion Design, Computer Studies, Communications and Music enrolled. Three workshops on “Finding Things on the Web Fast”, “Educational uses of Telecommunications and the Internet" and "Creating a Website" were held by the author to stimulate further interest in networked education. These workshops also contributed to increasing the computer literacy level necessary for networked education within Wellington Polytechnic. The interest in these workshops was extensive and the workshops were repeated on demand, but even then could not cater for everyone on the waiting lists. This pointed to the use of staff development as an important strategy to manage the implementation of networked education.

In the second semester of 1998 initial discussions for on-line short courses in the areas of Nursing and in Business Writing (within the Communications Department) were held. s However, owing to other priorities of the content providers, this did not materialize.

The author of the course on Virtual Teams (Pauleen, 1997) was included in the HYDI Educational New Media Centre for possible future consulting work; unfortunately, he resigned from the Wellington Polytechnic late in 1998. He expressed some personal concerns he had about his work in a letter to senior management. Their response made it impossible for him to continue in any capacity within the HYDI Educational New Media Centre and nullified the role he could have played in diffusing networked education in his department. This was a serious setback for the bottom-up diffusion of networked education at Wellington Polytechnic and indicated how important it is to understand and work within the culture of an organisation.

The author (content provider) of the on-line statistics resource (Lovrich, 1997), which went on-line during the previous cycle, also resigned from Wellington Polytechnic. This highlighted a management issue relating to the continuity of on-line materials. The networked course materials still remained on-line but it was extremely difficult to find anyone in the area of statistics to take ownership of this resource. In an effort to ensure continuity in future scenarios, a form was designed where the head of department and head of school had to give permission for a lecturer to put materials on-line. This would contribute to ensuring continuity of on-line materials by placing the responsibility to maintain the materials within the academic department and school.

A new "Forum for Enabling Networked Education " (a sub-committee of CTAG) was established late in cycle 4 and met once. Establishing this forum was part of the plan to extend the diffusion of the virtual class into new academic areas and also to start addressing more of the strategic and operational issues related to networked education. Staff members from various academic and administrative departments were invited. This invitation also included representatives from senior management.

It seemed that while the bottom-up interest in networked education was growing, the lack of top-down support and priority being given to these developments frequently discouraged interest when commitments of time and energy were required. This was illustrated when a lecturer in another department who had been keen to experiment with networked education, was discouraged by his head of department and asked to focus on the face-to-face courses he was currently teaching.

The importance of middle management (heads of department) support when implementing the virtual class infrastructure has been illustrated in a positive way through the support and participation of Nick Zepke, the head of the Educational Development Department. The implementation of networked education at Wellington Polytechnic would probably have stalled if it had not been for his continued support. Rogers (1983) emphasised the importance of a bottom-up approach in a response to a question by the author (E. Rogers, personal communication, 10 July 1998) on whether Rogers' diffusion model (1983) proposed a bottom-up approach only:

> I think that it greatly helps an innovation diffuse if it has top management support, especially for its rate of adoption to reach critical mass, after which further diffusion can be self-sustaining. But top management support may not be necessary if the innovation has sufficient relative advantage, compatibility, etc.

This research indicates that unless the bottom-up support is matched by top-down strategy (that included senior and middle management), diffusion of technological innovation in conventional tertiary education will be slow and cumbersome.

7.2.3 Continue to liaise with institutions, organisations and individuals working in the field of the virtual class

The growing interest in networked education in New Zealand was illustrated when a relatively small community polytechnic in the Wellington region contacted the HYDI Educational New Media Centre to request graphic design assistance for their virtual class project (Appendix 24: 3).

The importance of networking was illustrated when the author, through a visit by a staff member of a South African polytechnic to New Zealand, was invited to lead a project to extend networked education in that institute (Appendix 24: 1). This project did not materialize, but a consulting visit to this polytechnic was included in consulting opportunities in Southern Africa, which included three universities and five polytechnics. The visit to the University of Botswana was a direct result of networking with others in a similar field of study at an international conference (Appendix 24: 2).

The growing interest in networked education in New Zealand, Australia and further afield was evident in the growth of subscribers to the international e-mail discussion list, OnLinedu. This list had been created at the end of 1997, and had extended its membership to around 220 national and international members by the end of 1998. This list also became a useful mechanism to exchange views and information on networked education and to obtain feedback on the work of HYDI.

During a visit to the British Open University (April 1998), a staff member commented that the most significant loss students experienced from paper-based to networked education is the mobility of the study materials which now resided on computers. This naturally impacts on the mobility of the students.

7.3 Reflection

7.3.1 Managing the implementation of the virtual class infrastructure

These findings address the following elements of the MIT90's schema (see Figure 1.3):

7.3.1.1.strategy

7.3.1.2.roles and skills of individuals

7.3.1.3.organizational structure

7.3.1.4.technology.

7.3.1.1 <u>Strategy</u>

Although the ICT allowed for sophisticated use, the HYDI team realised that the students might not have the required access to appropriate computer technology. This highlighted the importance to design networked courses with the lowest possible "footprint", that is to say the minimum required technology on the student's side, as well as to consider the financial cost required from students for effective participation in networked education.

Contact with students in the networked courses highlighted the importance to manage the affective domain, which is the area of feelings and emotions in communications within the virtual class. Negroponte (1997, June) said that the role of emotions in communication must be taken seriously. Instead of viewing as "noise" any emotions in the communication process that negatively influence the "true message", it is a very important and natural part of human communications that should be included and facilitated in computer mediated communications. The challenge is for networked education, as a computer mediated education system, to accommodate, facilitate and communicate emotions (be it verbal, body language or otherwise) as an integral and vital part of the message. Networked education can deliver some support for this aspect through on-line audio and video conferencing, emoticons and well-designed graphics. Teachers need to be aware of, and able to manage, the new dynamics of communication in a virtual environment. Gundry and Metes (1997) draw attention to the fact that working online fosters the feeling of communicating with a computer and not with other human beings. In such instance, this man lead to a loss of “self-regulation”, manifested in angry or abusive online communication quite unlike the person’s face-to-face behaviour. How to manage the affective domain effectively in the virtual class points to a significant area for future research.

The management issue of ensuring privacy of personal information in networked education can be illustrated in on-line communication. Providing students with, for example, the ability to create their own password protected discussion groups and boards for private conversations contribute to the privacy of students’ conversations. The degree of access that students in future course occurrences should have, and benefits of public access to internal course communications and student work are issues facing the teacher in the virtual class.

The management issue of intellectual property and copyright in the academic environment has been problematic in conventional tertiary education, but is amplified in networked education where copying and replicating materials are alarmingly easy. Viskovic (1997, December) refer to Wellington Polytechnic’s copyright license which did not cover reproduction over computer networks as a factor in why course readings were still print-based. On the one hand, this issue relates to providing materials of others to students, as Barnard (1997:33) points out: "the primary roadblock to providing written material online is not the technology… The main hindrance is paying authors of copyrighted material”. On the other hand, the issue also relates to academic staff who put their work on-line, for Barnard (1997:32) points out that “…others may be concerned over additional work loads and how their position will be affected once their expertise is readily available as a packaged course over the Internet". David Noble (Appendix 13: 3) further elaborates:

> Once faculty put their course material online, moreover, the knowledge and course design skill embodied in that material is taken out of their possession, transferred to the machinery and placed in the hands of the administration. The administration is now in a position to hire less skilled, and hence cheaper, workers to deliver the technologically prepackaged course. It also allows the administration, which claims ownership of this commodity, to peddle the course elsewhere without the original designer's involvement or even knowledge, much less financial interest. The buyers of this packaged commodity, meanwhile, other academic institutions, are able thereby to contract out, and hence outsource, the work of their own employees and thus reduce their reliance upon their in-house teaching staff.

Johnston and Challis (1994) explored changes in the working lives of six academics who moved from teaching a Master's degree in a traditional face-to-face tutorial format to one in which they also taught the same program in a distance mode. These authors point out that one of the concerns of the academics related to the ambiguous status of the written materials prepared for the distance mode. The academics questioned: whether the materials would be recognised as original works of scholarship: who would own the copyright and would these academics be recognized for their research or teaching activity.

The issues regarding intellectual property and copyright are further complicated by the preference for instructional design teams in networked education, which stems from the requirements of integrated educational design, graphic design and ICT design in networked education. Different team members may also create different elements of a networked course. Ownership can increase quality as it is essential that knowledgeable, committed faculty members continue to have responsibility for course content and delivery. Therefore, intellectual property policies should allow for faculty ownership of online courseware (University of Illinois, 1999). A model of shared ownership of the networked course may be explored to include retention by the institute of the rights to use the materials if members of the course development team should leave the institute. Staff can have the right to use the materials developed in their new work environment or in further publications. It seems necessary that when a conventional tertiary educational institute embarks on networked education that the management issues of intellectual property and copyright be resolved at the outset.

The HYDI team learned through the lack of ICT support how important it is to ensure that solid technological expertise is consistently available in the planning, development and deployment of networked education. During cycle 4, the full-time teaching commitments of the computer specialist limited his participation in the work of the HYDI Educational New Media Centre. The Computers Services Group (CSG) still focussed on operational aspects of ICT at Wellington Polytechnic. These two factors caused a lack of technical computer skills, technical development and ICT support for students (documented in Appendix 17).

Quality assurance emerged as a significant management issue during cycle 4. Butterfield *et al.* (1999, July) believes that, in the context of the emergence of virtual institutes, attention to quality assurance (QA) is more necessary, but may be more difficult than in conventional tertiary education. More necessary, because radical change gives the opportunity for flaws to creep in, and more difficult because the well-known and proven methods of QA may no longer work. They believe that attention must come from the institutions themselves as well as from the external quality agencies (EQAs). Ensuring that educational principles are pre-eminent in on-line instructional design and that ownership remains with the academic staff (University of Illinois, 1999) can contribute to internal quality assurance. Quality assurance also relates to the complexities of national and international accreditation and certification. Some argue that the virtual class often lacks recognition from employers and institutions of higher education provided by accreditation and certification systems (National Center for Higher Education Management Systems, 1995). A solution might be to use outcome-based education, which focuses on assessing learning and learners instead of courses or other instructional units delivered by providers, and is based on specific, standardised, and widely accepted competencies (National Center for Higher Education Management Systems, 1995). An existing national model that illustrates a way of addressing national accreditation and certification is Open Learning Australia (OLA, 1995), which represents seven Australian Universities active in distance education. The institute through which the students complete a specified percentage of their studies awards the qualification. International collaboration is also emerging, which is likely to contribute towards addressing international accreditation and certification (*see* 7.3.2 *below*).

7.3.1.2 Roles and skills of individuals

The role of the teacher in networked education is changing. The Educational Development Department content providers followed a constructivist teaching approach and perceived themselves as facilitators of learning. Within this environment, Zepke (1998:179) states, "…the teacher's role is a limited one… the role includes - facilitating students learning by communicating and empathising with them; structuring knowledge and arranging a reasonable workload; helping students develop, change and critique their own learning structures". Earlier Leslie (1994) had already identified the as one consequence of the information explosion the fact that teachers can't know everything of value to their students; however, assisted by telecommunications, they often can guide students to the information they seek. A broad range of studies seem to confirm the educational value of telecomputing networks. O'Donnell (1996) contends that the real roles of the teacher in an information-rich world will be not to provide information but to guide and encourage students working through the extensive body of information available. A "facilitator" would follow a developmental rather than a dissemination approach (Hodgson, Mann and Snell, 1987; Mason, 1998), and would be spending more time on on-line communication than face-to-face communication, being less of a "guru" and more of a coach, being less of a "creator" of courses and more of a "user", especially of Web resources.

Clearly teachers will have to manage their own learning more efficiently in the highly accessible and visible international environment. They will need to be more observant of international developments in their academic fields; if not, they might find that the students themselves would be pointing out these developments through their use of the global networks. Collis (1998) points to the following imperative for the teacher in the virtual class: abandon self-encapsulated thinking. The dynamics of change mitigate against what Collis (1998) calls "intellectual parochialism", a phenomenon typified by “self-enclosed thinking and teaching” by constraints imposed by one’s own work and ideas. This type of approach will no longer be acceptable in the institutions of the future. The growing synergy between local and global, with the pervasiveness of telematics, will assume such proportions in society as a whole, in all aspects of commerce and culture, that the instructor cannot but abandon the notion of relying on archives of self-compiled notes, on a world circumscribed by individual research, for fear of becoming a total anachronism.

This changing role points to the extensive need for training of teachers in the virtual class to master the new ICT. Using the global networks will be necessary for their own research and for networking with other academics, as well as being able to facilitate networked learning, for example managing on-line meetings and pointing students to appropriate on-line resources.

It could be that on-line educators in a networked course find themselves in the role of either instructional designer or as facilitator. Laurillard (1993) assumes that there will be a distinction between the tasks of teaching and of instructional design. This is a model of design and development of teaching and learning resources implemented by the British Open University. In paper-based distance education this model is often used; it is highly probable that this might become the typical scenario in the virtual class where instructional designers focus on instructional design and development of networked courses as well as researching their academic fields, while teachers (facilitators) are contracted to facilitate learning in the virtual class. These facilitators can in the virtual class be contracted in from any geographical area since most of the facilitation will occur on-line.

The HYDI team noticed that although the ICT allowed for sophisticated use, the students often did not have the required skills to use these technologies effectively. They had problems in particular with downloading the compressed version of the networked courses and in using the on-line message boards. This emphasised the need to provide computer literacy training for students as part of the virtual class infrastructure.

As indicated above, there is also a need for staff training, support and motivation when implementing the virtual class infrastructure (Mason, 1999; Rajasingham, 1999). The study by O'Donovan (1997) highlights the need for staff training in general computer skills at Wellington Polytechnic. Staff training in general computer skills is a pre-requisite for effective participation in the virtual class. Caladine (1993:24) notes that "staff generally are amenable to changes in teaching strategies to accommodate new modes of delivery, where appropriate development and support are in place". Nguyen, Tan and Kezunovic (1996) argue for the creation of a strategic plan for training academic staff in new techniques. However, it should be noted that lecturers and tutors will still need to take on the role of advisers, helping students to get started, manage their time and cope with self-doubt (Rowntree, 1992). Workshops could be introduced to cover course writing and editing, instructional design and course development and the use of the computer as a management tool in distance education.

The interest by academic staff in the workshops on using the Internet in education conducted by the author further indicated that staff development could be used as an important strategy to advance the implementation of networked education among academic staff. This is also one of the strategies within the training, infrastructure and empowerment system (TIES) at the University of Alberta in Canada and correlates with proposals by Mason (1996, June) and Gabel and Feeg (1996, June).

Ensuring authenticity in a "digital world" (Collis, 1996) is a significant management issue to address in the virtual class. Ensuring originality of work is an issue in assessment when most of the contact between teacher and student is computer mediated. Electronic signatures can also be shared and students in networked education can obtain assistance from others because of the lack of face-to-face control in assessment. This problem in paper-based distance education is often addressed by having a substantial part of the assessment done in a controlled environment. Other strategies to manage this problem can be to use continuous assessment, sampling of some assignments and conducting random personal interviews on-line.

Another area where authenticity impacts the virtual class is in on-line communications. On-line communications often occurs in newsgroups, synchronous on-line meetings and asynchronous message boards in which participants can take on a different persona or an alias. This can create serious communication and virtual class management problems when messages are incorrectly interpreted, on-line groups are inappropriately constructed as well as the occurrence of incorrect on-line student tracking (for example, incorrect statistics of student participation on on-line message boards). It might be beneficial to obtain student photographs at enrolment with some form of official confirmation of identity. The photograph can then be used extensively in the whole educational process as in the case of chat groups, assessments and printed certificates. However, proper training and clear student guidelines and policies regarding this matter may be the most effective way to address this issue.

Some distance students in the networked courses indicated that the face-to-face interaction with other students and the lecturer added a dimension not present in communications over a distance. A Bachelor of Education student said after a teleconference “If only we had met in person first” (Viskovic, 1997 December:9). Looking at the social environment within the virtual class, Tiffin (1996b, November:6) states that: "our students have no difficulty learning in a virtual class, but they hunger for the social side of a conventional university”. Caladine (1993:24) noted "student acceptance of alternative modes of delivery appears to exhibit some proportionality to the level of interactivity and the degree of presence of a human face”. Tiffin (1996a, November:2) also noted that "subject associations which cater to the academics and grad students are springing up on the Internet. They are places of gossip about university practices in the subject area and a community that can help a despairing writer or someone lost in an assignment”. Not only students, but also academics may have similar needs. In a study by Taylor and White (1991:20) they investigated academic staff' experiences of face-to-face, distance and 'mixed mode' teaching and found that the respondents preferred face-to-face teaching as it provided "...extensive opportunities for interpersonal interaction". Academic staff members might have a negative reaction to increases in "transactional distance" (Moore, 1993) and might therefore resist the implementation of the virtual class infrastructure.

Addressing the social needs of both students and teachers in the virtual class is therefore important. Strategies such as using newsgroups, electronic mail discussion lists, synchronous on-line meetings, arranging some meetings in the physical realm with other students, designing courses with a high level of interactivity and using photographs and video clips of students and lecturers within a course can all be used to create a "personal" touch.

Losing the two content providers outside the Educational Development Department was a serious setback for the diffusion of networked education into other academic areas, and points to the vulnerability of using a bottom-up approach only. In this approach the energy of the diffusion is invested in individuals. The top-down approach can add to the continuity of the diffusion of innovations with the objectives of an innovation captured in longer-term strategic plans, annual plans, committee discussions and minutes, and operational policies.

7.7.1.3 <u>Organizational structure</u>

The virtual team expert became unavailable to the HYDI Educational New Media Centre presumably because of not appreciating the culture of Wellington Polytechnic. This highlighted the importance of addressing the internal political patterns and dynamics of an institute when managing the implementation of an innovation like the virtual class.

There was a lack of technical computer support for the students and staff involved in networked courses. The HYDI team already had limited time for the development of courses and the wider implementation activities (all team members were involved on a part-time basis only) and the computer support group (CSG) did not offer a help-desk to students (on- or off-campus). Students had to "hunt around" for someone with the skills and time to assist them if they ran into problems. Staff could liaise with CSG but experienced that their focus was on other operational matters. This pointed to the need for sustained information technology support for students and staff in networked education. Help facilities like context sensitive help buttons can be built into networked courses and an accessible help-desk for both students and staff can be implemented. It appears essential that an ICT Help Desk facility be established to support students and staff in networked education.

7.3.1.4 <u>Technology</u>

The needs of students and teachers in networked education impacts on the nature, management and services of the library. Students in networked education at Wellington Polytechnic used the WWW and the print-based readings as well as the Wellington Polytechnic library for obtaining books and journals. The main implication of networked education for the library appears to be to be able to provide most of its services electronically, including database searches, searching its holding database, ordering library materials and issuing. Barnard (1997:33) sets out this requirement: "being able to work on class material at any time, no matter where you live, can be compromised by the need to find a library that carries academic journals and books… seamless access to library resources is now a common goal of university libraries". Capital expenditure on physical extensions to libraries can be replaced by subscriptions to on-line databases and resources. There is a continuing increase in valuable resources being available on the Internet and specifically on the WWW. Tiffin (1996b, November:1) indicates that "today there is no way our university library can match the resources of the Web. Our university library has become supplementary to the Web". Odlyzko (1994), in describing the reasons for the demise of traditional paper-based scholarly journals notes that there is increasing pressure from libraries to cut back on subscriptions as journals become available electronically.

The lesser use of paper in networked education, however, constitutes a loss of mobility for students in conventional, paper-based distance education. Smaller hand-held palmtop computers are a positive step in re-creating the mobility for these students in networked education although cost would still be a serious deterrent to widespread use.

7.3.2 Managing the operations of the virtual class

The research findings in this section support the second research question (*How does one manage the operations of the virtual class?*) and describe the "Management Processes" element within the MIT90 schema (*see* Figure 1.3).

There was some international interest in the networked courses at Wellington Polytechnic, which points to the global reach of networked education. Tiffin (1996, February) explains that if a virtual class, like the information society, were going to be distance independent then it would be global rather than national. The global nature of the virtual class is possible because the new educational technologies facilitate and lead naturally to the globalisation of education since the central technology in networked education is the Internet. The minimum requirements to publish on the WWW are simply to have an Internet account and to transfer documents in HTML format to a Webserver. The global reach of the virtual class means that all institutes in tertiary education find themselves in a global educational market of providers and students. Pearce and Robinson (1988) clearly illustrate in their strategic management model how the external environments, in conjunction with the internal company profile and the vision, determine the mission of an organisation. The importance of considering the external environment is also highlighted in the MIT90 schema (*see* Figure 1.3). It is therefore necessary for each conventional tertiary educational institute - as mentioned in cycle 1 - besides considering participating in the virtual class themselves, to look at other strategies to counter the threat of the virtual class. These strategies should be built into the organisation's long-term objectives. Institutes participating in the virtual class might need to focus on establishing a specific niche in the international educational market.

In the virtual class with its global character the importance of culture as a significant determinant in how students desire to learn, how the content should be structured and how the learning experience should be facilitated must be appreciated. The HYDI team did not design networked education for use by students of different cultures, and realised that this needed to be addressed to cater for international students. Woodhouse (1999) points out that education is definitely not culturally neutral. This might be a significant reason why a singular "MacDonalds" type networked course in each academic area for global use will probably not be feasible. Students may choose to study close to home because of convenience or physical security factors, but culture may also contribute to this choice. Dealing with foreign cultures requires teachers to have a knowledge of cultural differences and sensitivities for these differences. This can easily be overlooked in networked education where communications often exclude clues (like pronunciation, expressed moral values, and physical appearance) as to the culture of the communicators. For example, Gundry and Metes (1997) argue that online communication can unite the organization, but it can also highlight fundamental cultural differences. Online communications can suddenly pitch a person into a different national culture in which taken-for-granted perceptions of communication, time, power and information are quite different. These authors consider that training in working cross-culturally has become a necessity, not an option since understanding each other's world view, biases, and preferences will be essential to building trust and shared perceptions, and maintaining the communication that drives work.

Offering courses globally has implications for the pricing of these courses since conventional tertiary education is often subsidised by government and therefore differentiates between fees for local students and those outside its geographical area. In the virtual class, however, the fee structure needs to take the local target market of the student into account in order to be competitive in that specific market.

The centrality of the learner in networked education leads to increased autonomy for the student. With the student's ability in the virtual class to access other students, lecturers and resources globally in a predominantly flexible environment of enrolment and assessment, the learners in the virtual class can be in control of their own learning in a real way. This emphasis supports and can be facilitated through the use of constructivist approaches in networked education as used in networked education at Wellington Polytechnic.

Networked education facilitates ease of publishing on-line. Students at Wellington Polytechnic participated in on-line discussions, while on-line journals were also available in the networked courses. This leads to the ability of students in networked education, in contrast to the conventional student, to be on-line providers and publishers themselves by using facilities like hypermail threaded discussion boards and newsgroups

(Uys, 1997b June). This ability increases student control of and participation in the learning process, which can lead to added motivation for the student.

Students that are used to paper-based distance education seem to experience a significant loss in mobility when studying by networked education. The affordability and weight of portable computers such as laptop computers and notebooks mitigates against these technologies being an adequate solution to provide this mobility. Smaller hand-held palmtop computers with infra red updating capabilities are a positive step in re-creating the mobility for distance students in networked education.

Management of the learning environment within the virtual class parallels the operations of a virtual team, that is a group of people working towards a common goal in a computer-enabled environment where they are removed in space (and often in time). Lipnack and Stamps (1997:7) define a virtual team as "a group of people who interact through interdependent tasks guided by common purpose" that "works across space, time, and organizational boundaries with links strengthened by webs of communication technologies" . Jarvenpaa and Leidner (1998) aptly define a global virtual team as a temporary, culturally diverse, geographically dispersed, electronically communicating work group. Therefore, understanding how a virtual team operates is important in managing the on-line learning of students. Zack and Serino (1996) explain that effective team leaders also act as process facilitators, thereby promoting team effectiveness by educating the team about how to work collaboratively. For Gundry and Metes (1997) existing communication and work skills, developed over years of face-to-face, collocated work, do not transfer to and sustain high performance online work. Time, effort and bandwidth involved in online conferences and forums often suffer because the organizers overlook basic principles of need and relevance, being unaware of the special techniques required to sustain online dialog. Gundry and Metes (1996) stress the fact that teaching in the virtual class also requires proficiency in knowledge management. Increasing use of electronic group collaboration tools in support of team work has sparked interest in how others can capture, store, and re-use the ways by which what goes on when people use those tools. Called 'knowledge management', this is important for enterprises whose principal currency is knowledge, rather than physical or financial resource. At the heart of knowledge management lies the issue of placing knowledge under management remit in order to derive value from it, that is to realize intellectual capital.

Elements of the virtual class like the vast resources on the World Wide Web, on-line databases, newsgroups, threaded message boards with evolving discussions, discussion lists (like Listservs), and increasing volumes of electronic mail can create real information overload and stress. Users of ICT in the past had to deal with *data* overload through computer output (characterised by irrelevant and redundant information), but students and teachers in networked education have to manage a real information overload: an overload of relevant and valid information. Gundry and Metes (1997) sums this up by pointing out that electronic communication fuels information overload, which is a major cause of stress in online workers. Developing critical analysis skills will become increasingly important as the information or knowledge society grows. Gundry and Metes furthermore suggest that communications protocols, along with filtering devices, are required in order to develop an appreciation of, for example, the consequences of overcirculating electronic mail. Simply by indicating message priority in the e-mail header helps people get to the most important communication first.

Viskovic (1997, December:9) reports that a Bachelor of Education student commented: “Less easy to set aside time for learning if there is no set meeting time for the group. Scheduled Internet time for a group would be valuable”. It seems that the requirements for self-discipline and continuity of motivation in tertiary students are amplified in networked education owing to its virtual and asynchronous nature when the traditional prompts such as physical materials on a desk, or scheduled class times are often absent. Strategies to address this issue include effective instructional design to use appropriate multi-media, effective monitoring of participation through computerised or manual tracking, as well as asynchronous and in particular synchronous communications. Synchronous on-line communication tools may assist in producing both a sense of belonging as well as accountability in the student in networked education.

Managers of the virtual class need to address the issues of dialogue across the response and psychological distance between teacher and learner. "Distance" in this environment is no longer defined in terms of physical proximity or remote but in response time (Negroponte, 1997 June). There is also another type of distance, which Moore (1993) and Caladine (1993) explain as transactional distance, which is the psychological distance between learner and teacher. Caladine posits that transactional distance in technology-delivered education is greatly impacted by the technology (the medium) itself. Evans and Nation (1992:9) seem to support this view when they point out that that virtual class practices do not eliminate problems of distance between teachers and learners, but on the contrary create their own. Synchronous on-line communications like voice over the Internet, on-line video-conferencing, on-line whiteboards, CHAT and shared applications can play an important role in bridging transactional space in the virtual class - but it needs to be managed properly.

The computer mediated dimension of virtual class management is illustrated as having an electronic record of on-line communications that can be saved for future reference by the students and teachers. Gundry and Metes (1996) explains the special significance computer conferencing has for knowledge management, namely that a team using computer conferencing to collaborate, is creating a permanent, shareable, record of what they write and send to each other,

The availability of an intranet at Wellington Polytechnic signalled the potential to offer networked education to on-campus students, which reflects a trend in the private sector to use intranets to access internal documents through a Web browser (Cher, 1995; Gundry and Metes, 1997). The potential of a new convergence of on-campus and off-campus students participating seamlessly in the same course emerged. This phenomenon arises from the greater ease and feasibility of simultaneously offering a networked course to on-campus students as well as to distance students. This possibility extends collaborative on-line learning from an activity that can be used effectively for distance students (Stacey, 1997 June) to one in which distance <u>and</u> on-campus students can jointly participate. The synergy that networked education brings is that both local and distance students can participate in the same course occurrence in a real and meaningful way through synchronous and asynchronous on-line communications. This convergence of learning modes, which traditionally have been called "distance education" and "on-campus education" is a new management challenge for both teacher and student. Learning control and responsibility are distributed as well as on-line learning and teaching materials to both local and distance students using the same interface (that is a Web browser). The use of networked education for on-campus students will increase the demand for access to on-campus ICT. The convergence of traditional on-campus education and distance education could therefore require a decrease in spending on lecture theatres and an increase in spending on extending computer facilities like computer laboratories and the availability of intranet access in public areas such as libraries.

As experienced by the HYDI team, the materials and teaching process in networked education seems to be in a state of continuity: once a course is on the WWW, it remains available and no special arrangements are needed to keep it continually available - special arrangements, however, have to be made to discontinue availability. In contrast, course materials are in a state of discontinuity in conventional tertiary education. Two factors contribute to this problematic situation. Firstly, the on-line materials are often registered with search engines and guides on the Internet. The Universal Resource Locator (URL) is then bookmarked within a web browser by users who often may share the URL with others in a network of contacts. Secondly, the on-line materials need to be kept up to date. Berners-Lee (1999b) noted that it would take up a great deal of time and effort to keep that web of material up to date, to the extent of giving the impression of requiring more effort than creating it in the first place. Lennon and Maurer (1996, June) emphasised the importance of managing the hyperlinks which are embedded in on-line materials. Effectively managing the discontinuity of on-line materials as a result of the discontinuity of human involvement is necessary to meet student expectations and provide ongoing support, and in so doing to avoid the institute from falling into disrepute. An example of discontinuity of on-line materials is a course in a specialized academic area in which the lecturer concerned discontinues his/her involvement (as happened with the “Virtual Teams” course and “Statistical learning resource” in cycle 4). The networked course materials still remain on-line and might become outdated or, when removed, cause frustration to on-line users when unsuccessfully attempting to locate it. In a paper-based distance education environment or a face-to-face physical teaching environment, the discontinuity of a lecturer can be addressed by the discontinuity of the mailings or the classes at an appropriate point. The virtual class thus needs special approaches to ensure a seamless discontinuity like de-registering the materials with the search engines and guides, replacing the course materials with clear notices to that effect and notifying parties that might have bookmarked the materials. Furthermore the hyperlinks in particular need to be managed effectively, which may require specialized software (Lennon and Maurer, 1996 June).

Ergonomics emerged during cycle 4 as a management issue for an institute using networked education. Networked education is per definition enabled through ICT (Chapter 1) and therefore leads to an increase in the use of ICT by students and staff. The instructional design of networked education should therefore take into account the computer-user interaction, which includes the ergonomics of the physical and technological equipment. It is necessary for both the teacher and the student in networked education to manage this aspect of the computer-user interaction in order to avoid the possibility of repetitive strain injuries (RSI) - also called operational overuse syndrome (OOS). The institute has a responsibility to create awareness and to provide the necessary knowledge and skills to both the teacher and the student in networked education to manage the computer-user interaction appropriately.

Another management issue for the operation of the virtual class is to provide large-scale student access to intranet(s) and the Internet at the lowest possible cost since these technologies provide the basis for the implementation of networked education. Networked education students at Wellington Polytechnic did not all have access to the Internet and requested hard and soft copies of courses. Networked courses need to be designed with the lowest possible "footprint", that is the required technology on the student's side. Addressing the cost to students includes designing networked education so that students can stay off-line for most of their study time, while they naturally have to be on-line for communications. This can be achieved through compressing a course into a single file for the student to download. In addition, the institute can endeavour to negotiate favourable contracts for Internet access and ICT on behalf of their students. For on-campus students participating in networked education via the intranet, "drop-in" computer labs can be provided and computers can be placed in public access areas such as the library.

At Wellington Polytechnic the course elements were still being stored in flat directory structures on account of limited staff and financial resources. Work on a database application has started. Many networked education software packages take the notion for granted that course elements ("course objects") are to be stored in flat directory structures. HTML files, media elements and scripts are stored on servers in an organised flat directory structure, which is reminiscent of how data was stored before the emergence of databases (Stair, 1992:141). This can be an effective initial strategy to rapidly engage in networked education, but does not constitute effective data management in the long run. Relational databases and object-oriented databases have emerged as effective, sound and popular ways of storing data in computer systems (Stair, 1992:144). It is therefore suggested that managing the data in networked education should occur through the use of proper database management systems.

Only adults participated in the networked courses at Wellington Polytechnic in this cycle because of the nature of the courses (being targeted to tertiary teachers), and the flexibility it offered to working students. This links up to one of the reasons why tertiary education institutes are considering moving towards the virtual class, namely to address the need for lifelong learning (Mason, 1999:77). Education is becoming more of a lifelong endeavour compared to the traditional few years stint after school, a development that stems from the fact that most careers require continued training to keep up with the growing body of relevant knowledge and also from the modern tendency to develop more than one career during a person's working life. Spender (1996b, September) claims that the whole of society is becoming the student body.

Networked education is attractive to those already in the work force because of its open and flexible nature. Class management within networked tertiary education will increasingly therefore have to take the principles of adult education into account. A priority then for conventional tertiary education and especially teachers in networked education will be to research and understand how adults learn.

Equity of access is an issue that was often raised within the Educational Development Department (Viskovic, 1997 December). Terms often used in this regard refer to those who are "information rich" and those who are "information poor" - which often leads to social and financial impoverishment (Hope, 1998). Not only can access to the virtual class be limited through inadequate access to ICT and Internet costs, but also through computer illiteracy. Spender (1996, August) argues that the borderless information environment is not open to all the peoples of the world because of access and equity issues. The ongoing changes in ICT have been creating a seemingly unending spiral of regular upgrades to software and hardware, which leave many students wanting when they desire to access networked education. There are initiatives to address these issues, like Cybercafes, Internet access in public spaces such as libraries, arranging adequate on-campus computer access, collaboration with other educational institutes to provide access to remote students, as well as Telecentres which are used in Australia (WA Telecentres, 1995) and Europe, and growing in number in Africa (Naidoo and Schutte, 1999:90).

Linking with others working in the field of networked education in cycle 4 again proved enormously helpful to verify concepts, learn from the experience of others, contemplate possible collaboration and consulting. Many universities and colleges are indeed positioning themselves for effective participation in distance and particularly networked education through collaborations at institutional level. Examples include Universitas 21 (1999) that comprises 21 universities in Europe, Australasia and north America and includes Auckland University in New Zealand, and has plans to develop and use multimedia technology in education. Another example is the European Consortium of Innovative Universities (ECIU, 1999), which is a co-operative of 10 European universities with a focus on the development of new forms of teaching, education and research.

7.4 Conclusion

The research findings of cycle 4 are documented in 7.3.1 and 7.3.2 above.

In this action research cycle the overall objective was to assess the appropriateness of the virtual class infrastructure and to extend it where necessary to support commercial networked education by carrying out the following strategies:

0.0.0 the virtual class was operational at Wellington Polytechnic, but it was clear that much could be done to make it more effective; it was still very much based on the Bachelor of Education (B.Ed) and Master of Education (M.Ed) degrees offered by the Educational Development Department; work on a database application started; effective administrative and educational support services were not in place, especially in the area of ICT support

7.4.2 networked education within the Educational Development Department did expand primarily through the use of on-line message boards both in the Master of Education (M.Ed) and Bachelor of Education (B.Ed) courses; after extending the diffusion of the virtual class to two new academic areas, the diffusion contracted again when the two content providers left the Wellington Polytechnic; staff development proved to be a successful bottom-up diffusion strategy; middle management support proved to be necessary for wider implementation of networked education

0.0.0 liaison with institutions, organisations and individuals working in the field of the virtual class continued through attendance at conferences, the electronic mail discussion list OnLinEdu and consulting.

During cycle 4 the goal that was formulated at the outset (see Chapter 1) was achieved, that is to progress with the action research to the point of fee-paying students enrolling and participating in networked courses at Wellington Polytechnic. The implementation of the virtual class infrastructure at Wellington Polytechnic was operational, albeit small.

Wellington Polytechnic took its first steps towards the information-based operations of the virtual class and experienced what Drucker (1998:100) had predicted: "… as soon as a company takes the first tentative steps from data to information, its decision processes, management structure, and even the way it gets its work done begin to be transformed". The research findings were pointing to the need for a new educational management paradigm for managing the operations of the virtual class.

At this stage it was not clear whether conventional tertiary education was able to adapt its management approaches and processes to the extent required for the effective and widespread use of networked education.

At the end of this final research cycle a set of heuristics can be formulated as a tentative model for managing the implementation of the virtual class infrastructure in conventional tertiary education. These heuristics are derived as much from the failures of implementing networked education at Wellington Polytechnic as from the successes of this project.

CHAPTER 8
MANAGING THE IMPLEMENTATION OF THE VIRTUAL CLASS INFRASTRUCTURE IN CONVENTIONAL TERTIARY EDUCATION

In Chapter 7 the last of the four research cycles was described which concluded the action research.

In Chapter 8 the findings of this research are presented as they relate to the first of the two research questions: "How does one manage the implementation of the virtual class infrastructure in conventional tertiary education?"

The discussion in Chapter 8 synthesises the reflections in Chapters 4, 5, 6 and 7 on managing the implementation of the virtual class infrastructure, and relates these to the theoretical underpinnings of this research.

As in each of the four cycles (4.3.1, 5.3.1, 6.3.1 and 7.3.1) these findings are presented as a set of heuristics addressing the following elements of the MIT90 schema (*see* Figure 1.3) that is

8.1. strategy
8.2. roles and skills of individuals
8.3. organizational structure
8.4. technology.

The heuristics that will be discussed in this chapter are listed below in Table 8.1.

Strategy (8.1)
1. Follow a simultaneous top-down and bottom-up approach
2. Address the management issues of intellectual property, copyright, privacy of personal information and security
3. Presenting papers and attending relevant conferences are strategies for establishing contacts and legitimising academic staff involvement
4. Consider the cost to students of Internet access while studying on-line as well as the cost of the technology
5. Address the affective domain of the students in on-line communications
6. Lewin and Schein's change model can provide a helpful overall structure for organizational change
7. Participate in networked education as early as possible
8. Use a pilot project or a few pilot projects
9. Ensure that solid technological expertise is consistently available in the planning, development and deployment of networked education
10. A "free give-away of the first version" marketing strategy for on-line promotion can be followed
11. Do thorough market research
12. In the promotional strategy balance the gradual sharing of information about the virtual class with the rapid developments in this field
13. Ensure ownership
14. Ensure that educators and educational principles drive the implementation of the virtual class infrastructure
15. Increase the general use of ICT as well as the computer and information literacy levels
16. Identify and test the perceived critical success factors at an early stage

17. Obtain adequate central funding for wide impact
18. Ensure that implementing networked education is a strategic objective and that the reward systems of the educational institute are tied to it
19. Highlight the benefits and advantages of the virtual class for the institute, teachers as well as students
20. The "non-hygiene factors" (the "motivators") in Herzberg's theory can be used as motivational tools
21. Treat the development of networked education as a commercial project
22. Use a prototyping systems development methodology for developing courses for the virtual class
23. Address quality assurance issues in networked education
Roles and skills of individuals (8.2)
1. Provide computer literacy training for students
2. Address the concerns, perceptions and changing role of academic staff
3. Provide training and support for academic staff
4. Ensure that the scholarship of teaching is recognised and appreciated
5. Design an appropriate workload formula for teachers in networked education
6. Address authenticity in assessment and on-line communications
7. Address the social needs in learning of both students and teachers
8. A development team composed of the following roles are proposed: sponsor, project manager, content director, creative director / graphic designer, computer specialist, educational director, editor, on-line media developer, gatekeeper and student representative
Organizational structure (8.3)
1. Ensure wide representation from the outset
2. Establish a central unit to provide sustainable training, support, research and development

3. Use a multi-disciplinary team for the development of networked education
4. Carefully consider the internal political patterns and dynamics that form part of the culture of the institute
5. Establish an ICT Help Desk facility to support students and staff in networked education
Technology (8.4)
1. There is a need for flexibility in acquiring information and communication technologies for networked education.
2. Physical locality and time zones of teacher, learner and materials need to be explicitly considered and facilitated in creating the technological virtual class infrastructure to effectively transcend geographical proximity and time constraints
3. The needs of students and teachers in networked education impacts on the nature, management and services of the library. The library is required to provide most of its services electronically.
4. A basic technical implication for a conventional tertiary educational institute that aims to implement the virtual class infrastructure is that a web server needs to be managed for hosting the on-line materials. An internal Web server seems to be the preferred option for managing courseware.
5. An effective initial strategy to rapidly start networked education in terms of the technological architecture would be to initially focus on developing the front-end technologies.

Table 8.1 Heuristics of managing the implementation of the virtual class infrastructure in conventional tertiary education

8.1 Strategy

The virtual class needs to be regarded at some point during its diffusion within the institute as an educationally sound and commercially viable educational paradigm and not as an educational experiment. Therefore an important strategy to adopt if the implementation of the virtual class infrastructure is going to be institute-wide is to manage the progression of the diffusion of the virtual class from experimental mode to being established as part of the organizational structure of the institute. It seems that the methods for promoting the virtual class internally to the relevant parties have to be regarded as a significant management issue when implementing the virtual class infrastructure in conventional tertiary education. A top-down approach to simultaneously augment a bottom-up approach is believed to be necessary, as put forward in Roger's (1983) diffusion of innovation theory (this aspect is discussed in 8.5 below).

The management issues of intellectual property (Johnston and Challis, 1994) and copyright (Barnard, 1997; McCullagh, 1995 September) in the academic environment in general have been problematic, but these issues are amplified in networked education where copying and replicating materials are alarmingly easy. This issue is further complicated by the notion of instructional design through teams (used by the HYDI team), which is proposed as the desired approach in networked education. A model of shared ownership can be explored where the institute retains the right to use the materials if members of the course development team should leave, and where staff have the right to use the materials developed by the team in their new environment. It is important when a conventional tertiary educational institute embarks on networked education that these management issues be resolved at the outset.

These issues also relate to ensuring privacy of personal information (Dearden, 1995 September; Underwood, 1995 September) and the required security (Graham, 1995 September) within the ICT systems underpinning networked education. In networked education at Wellington Polytechnic most of the information resides in digital form on computers. This includes the educational materials themselves, assignment work and results of student assignments, on-line communications (both synchronous and asynchronous) among students and with the lecturer and/or tutors, students' progress data through on-line tracking, as well as enrolment and payment information. Digitized education via the Internet faces the same challenge, which requires unprecedented levels of security in teaching and learning systems (Graham, 1995 September). These can be partially addressed through the use of security software as well as user identification and password controls that worked well at Wellington Polytechnic. Operational policies to cover procedures such as signed undertakings by students to use materials for their personal studies only might also be necessary.

This research analyses the implementation of the virtual class infrastructure within conventional tertiary education, in which research output in terms of papers at reputable conferences and publications in respected journals, are regarded as important criteria for academic performance. Presenting papers and attending relevant conferences proved to be important strategies for establishing contacts with colleagues at other tertiary institutes working in the field of networked education. Structuring networked education projects as research activities can legitimise the involvement of academic staff in networked education that otherwise can be difficult to justify. This strategy might be essential to secure academic staff involvement when the scholarship of teaching (discussed below) is not recognized to the same degree as the scholarship of research. Networking with others and maintaining these contacts can also lead to valuable national and international feedback and advice on local efforts to implement networked education.

In the virtual class the cost on the part of the student cannot be ignored and, besides strategies to provide affordable access to adequate ICT, the cost of Internet access while studying on-line needs to be considered. The cost of distribution of materials shifts considerably from the institute to the student, as the students have to pay their ISP for studying on-line. This management issue is highly relevant to the issue of equity of access (discussed in section 9.11 in Chapter 9). A specific strategy that can be followed in this regard is to have a networked course in a compressed state that students can download as a single file. Students would only have to link up to the Internet for on-line communications and possibly on-line assessment. The potential benefits to the institute, like student tracking and database functionalities, need to be balanced by the cost to the student. Networked education should also be designed with the smallest possible ICT "footprint" on the student side. Furthermore, courses can be designed so that hard copy or off-line soft copy can be provided with ease.

Addressing the affective domain of the students, that is the area of feelings and emotions, in the virtual class is a challenge that needs to be addressed to ensure a high level of meaningful learning and communicating in the virtual class (Negroponte, 1997 June). The challenge is for the virtual class, as a computer mediated education system, to accommodate, facilitate and communicate emotions (be it verbal, body language or otherwise) as an integral and vital part of the message. Networked education can deliver some support for this aspect through on-line audio and video conferencing, emoticons and well-designed graphics. Teachers need to be aware of, and able to manage the new dynamics of communication in a virtual environment (Gundry and Metes, 1997).

The Lewin and Schein model for organizational change (Stair, 1992:396) proved helpful as a change model to provide overall structure for implementing the virtual class infrastructure in a conventional tertiary educational institute. However, the various stages may be treated not as linear but as dynamic elements of an iterative process.

Participating in networked education as early as possible seems to be important to create a desired niche and build up desired experience in the international virtual educational market in which there is a huge interest (as discussed in Chapter 1). To have any impact in this growing area, early participation seems a better approach than not responding to the possibilities and threats of networked education. Kenichi Ohmae asserts that "to prevent competitors from getting there first, a company must launch in the key markets simultaneously. Globalisation will not wait" (Caulkin, 1990:29).

Using one or a few a pilot projects seems to be an effective strategy for introducing an innovation like the virtual class in a conventional tertiary educational institute. A pilot project facilitates experimentation in a new field (Goldenfarb, 1995), the testing of concepts and processes, the formulation of guidelines and principles, the establishing of credibility, the promotion of the innovation as well as an analysis of how an organisation responds to a new paradigm or innovation.

Since networked education is based on ICT, it is necessary for solid technological expertise to be consistently available in the planning, development and deployment of networked education in order to address the needs of staff and students.

A "free give-away of the first version" marketing strategy for on-line promotion can be followed in promoting networked courses. This strategy is commonly used for on-line marketing - Netscape (1996) very successfully used it.

Thorough market research is as important to inform the critical decision of which courses to offer first in a networked mode, as in the case of launching any new service or product in other "markets".

Any innovation, including networked education, faces the challenge of bridging a lack of knowledge and understanding of its benefits and advantages. It faces an additional challenge: to balance the gradual sharing of information about the virtual class so as to tie in with the cyclical and relatively slow pace of teaching and administrative cycles that occur in a more predictable and repetitive pattern within conventional tertiary education. At the same time, all parties involved need to be kept up to date with this rapidly developing field. This tension is a management challenge that needs to be addressed in the promotional strategy of implementing the virtual class infrastructure.

Ensuring ownership was found to be important in the diffusion of the virtual class at Wellington Polytechnic. Strategies such as one-to-one and small group discussions, demonstrations and explanation of the benefits can be used to ensure ownership of the implementation of the virtual class by senior and middle management (Goldenfarb, 1995). It is also important for continuity of networked courses to ensure ownership by the department that offers networked courses (Szabo *et al.*,1997). Ownership by the academic staff is pivotal, and therefore the concerns and perceptions of academic staff need to be addressed (see 8.2 below).

In order to ensure ownership by academic staff as well as sound educational quality in networked education, it was important at Wellington Polytechnic for educators and educational principles to drive the implementation of the virtual class infrastructure, which served to confirm similar views of Szabo *et al.* (1997), Willmot and McLean (1994) and Caladine (1993). It proved essential to involve academics intimately in the reform process as suggested by Tillema (1995).

An institute that uses networked education extensively will develop an ICT architecture that is ubiquitous in order to serve its students and its staff (both academic and administrative). It appears necessary, therefore, to increase the general level of computer and information literacy (Goldenfarb, 1995) within a conventional tertiary educational institute when implementing networked education. Information literacy can be defined as the ability "to find, evaluate and disseminate information using traditional, currently available, and evolving technologies for the purposes of investigation, education, and the solving of real world problems" (ILT21, 1999). One of the four components of information literacy as defined by the Pennsylvania State University Libraries (1998) emphasises "... a positive disposition towards the use of new and extant information sources and information technologies".

It is important for management to identify and test the perceived critical success factors for the institute in order to progress towards the virtual class at an early stage (Goldenfarb, 1995) as occurred at Wellington Polytechnic in order to prevent allocating valuable resources to non-critical activities. Some factors will prove to be critical and need sustained resourcing while others might be found to be of no or less significance

In some conventional tertiary educational institutes decentralized organizational structures providing for the devolution of central services and responsibilities to departments are becoming popular (Yetton, 1993; Randle and Brady, 1997; Hart, 1999 July). Unless adequate central funding is available for innovations like the virtual class, these developments can easily occur in isolation and without wider impact.

A management strategy to enable the wide implementation of the virtual class infrastructure in conventional tertiary education is to ensure that this is a strategic objective and direction, and to tie reward systems to its implementation (Marquardt, 1996 ; Munitz, 1997). At Wellington Polytechnic it was done in a very limited way and led to limited reform. The institutional reward systems should encourage academic staff and students to become and remain involved in networked education if it desires wide implementation of the virtual class infrastructure internally.

It seems necessary to highlight the benefits and advantages of the virtual class for the institute, teachers and students, in order to gain the positive interest of administrative managers and academic staff in the implementation of the virtual class infrastructure (Goldenfarb, 1995).

The major motivational tools for participation in the virtual class may not be of a financial nature. The "non-hygiene factors" (the "motivators") in Herzberg's theory (1960) can be used as motivational tools to encourage those involved in the creation of the virtual class; factors to take into account are, for example a feeling of achievement, recognition of achievement, how interesting the work is, responsibilities for decision-making, opportunities to develop and to learn new skills.

The development of networked education is to be managed as a commercial project in which professionals fill the required roles and deadlines are set and treated in earnest. The HYDI team experienced that involving students as part of a teaching programme in the development of networked education was not successful (*see* Chapter 5). Students, however, have an important role to play in quality assurance within networked education developments (*see* 8.2 *below*).

The flexible nature of the media and the characteristics of the implementation of the virtual class infrastructure in conventional tertiary education point to the use of a prototyping systems development methodology for developing courses for the virtual class (Burch, 1992; Stair, 1992; Szabo *et al.* (1997). These characteristics include a low degree of certainty about input and outcomes, low user experience, immediately desired results, a high degree of risk and a large number of alternatives.

Quality assurance in networked education has proved to be challenging as version control needs to address an increased dynamic in updating materials, which confirmed the view of Butterfield *et al.* (1999, July) that as virtual institutes emerge, the attention to quality assurance (QA) is more of a necessity, but may be more difficult. It might become necessary to work with new organizations like the Global Alliance for Transnational Education (GATE, 1999) that have been created to deal with accreditation and certification issues across national borders.

8.2 Roles and Skills of Individuals

The critical and fundamental role that ICT play in networked education points to the need for computer literacy of students in networked education, which needs to be addressed through appropriate training. Part of the rationale for engaging in networked education could be that it uses the tools of the emerging information or knowledge society as educational tools. In an information society there is widespread use of the new communication technologies. This is the society in which graduates should be able to effectively participate. Access to the virtual class is limited not only through inadequate access to ICT therefore, but also through computer illiteracy. The teaching of computer skills could be integrated as part of the learning process of each academic department and not only of the department that teaches IT courses. This can be achieved by pursuing a strategic organization-wide goal to enable students to engage in the learning process by using the ICT of the emerging information society.

In this research it was essential to address the concerns and perceptions of academic staff because of the need for changing their attitudes and ensuring ownership by academic staff (Evans and Franz, 1998 April; Taylor, Lopez and Quadrelli, 1996). Managing the fears and expectations of academic staff is an important part of implementing the virtual class infrastructure. Our experience confirmed that the role of the teacher in networked education is changing (Collis, 1998; Thompson, 1997 June; Zepke, 1998; Leslie, 1994). The teacher should be more of a facilitator than a provider of information (Hodgson, Mann and Snell, 1987; Mason, 1998:157; O'Donnell, 1996); in fact, the student has the materials on-line, has hyperlinks to Websites for further reading, can communicate with the other students in the course as well as communicate on-line with students and lecturers in other locations - be it nationally or internationally. It could be that on-line educators find themselves in a networked course in the role of either content provider or as facilitator. A model used by the Open University (UK) provides for the lecturer to do research and also to work as content provider with instructional designers, while teachers (facilitators or tutors) are contracted to facilitate the learning of the students (Laurillard, 1993). These facilitators can in the virtual class be contracted in from any geographical area since most of the facilitation will occur on-line. Furthermore, lecturers might have to deal with a new relationship with their students, which is not one-to-many but one-of-many. Clearly teachers will have to manage their own learning more efficiently in the highly accessible and visible international environment. They will need to be more observant of international developments in their academic fields, if not, they might find that the students themselves would be pointing out these developments through their use of the global networks.

This changing role as well as the centrality of ICT in the virtual class point to the tremendous need for the training and support of teachers in the virtual class (Caladine, 1993). They need to become familiar with and master the new ICT used in networked education. Knowing how to use the global networks will be necessary for their own research and networking with academics. They also have to be able to point students to appropriate on-line resources. Teachers need to be aware of and be able to manage the new dynamics of communication in a virtual environment, for example managing on-line meetings. Understanding how a virtual team operates is necessary in managing the on-line learning of students. Academic staff members also need to be proficient in knowledge management and in dealing with the stress of information overload. Gundry and Metes (1996) indicate that dealing with foreign cultures requires teachers to have knowledge about cultural diversity and sensitivities for cultural differences. Nguyen, Tan and Kezunovic (1996) argue for the creation of a strategic plan for training academic staff in educational reform. Acquiring these skills and dealing with the stress of change and information overload underline the imperative for proper training and support mechanisms for teachers. The extensive interest in the workshops conducted by the author regarding networked education further indicates that staff development can be used as an important strategy to advance the implementation of networked education among academic staff. This strategy correlates with proposals by Mason (1996, June), Szabo, Anderson and Fuchs (1997) and Gabel and Feeg (1996, June).

In the polytechnic environment, the scholarship of teaching is recognized and appreciated, which was important as this is where the impact of the virtual class is most noticeable (Nixon, 1996). Involvement in networked education can also be structured as research projects to encourage academic participation.

An appropriate workload formula for teachers in networked education is required to cater for a new definition of "contact time" or "office time" (Barnard, 1997; Johnston and Challis, 1994). Timetabled teaching periods are no longer helpful as a way to determine workload. Management could rather be constructed around outcomes and performance agreements.

Another important management issue in the area of assessment that is to be addressed in implementing networked education, is that of authenticity - ensuring originality of work when the only contact between teacher and student is computer mediated. This problem in paper-based distance education is often addressed by having a substantial part of the assessment done in a controlled environment. Other strategies to manage this problem, such as continuous assessment, sampling of some assignments and conducting random personal interviews on-line, can be used. Another area where authenticity impacts the virtual class is in on-line communications. It might be beneficial to obtain student photographs at enrolment with some form of official confirmation of identity. The photograph can then be used extensively in the whole educational process, for example in chat groups and assessments and can be printed on certificates. However, proper training and clear guidelines for students in addition to regulations regarding this matter may be the most effective way to address this issue.

Addressing the social needs of both students and teachers when it comes to teaching and learning in the virtual class is as important as it is on a physical campus (Caladine, 1993; Taylor and White, 1991; Tiffin, 1996b November). Strategies such as newsgroups, electronic mail discussion lists, synchronous on-line meetings, arranging some kind of meetings in the physical realm with other students, designing courses with a high level of interactivity and using photographs and video clips of students and lecturers within a course can all be used to support these needs. Academic staff may have a negative reaction to increases in transactional distance (Moore, 1993) and therefore might resist the implementation of the virtual class infrastructure.

A development team for networked education composed of the following roles is proposed: sponsor, project manager, content director, creative director / graphic designer, computer specialist, educational director, editor, on-line media developer, gatekeeper and student representative. These roles incorporate the "five actor categories" that Paquettee, Ricciardi-Rigault, Paquin, Liegeois and Bleicher (1996, June) distinguish in the construction of a virtual campus, namely the learner, trainer, content-expert, manager and designer. The centrality of ICT in developing on-line materials emphasizes the important role of the computer specialist in the development team. The central role of the student in networked education (*see* Chapter 9) points to the inclusion of students in order to contribute to quality assurance within the multi-disciplinary networked education development team. The student representative role provides essential feedback during the development process and contributes to the internal quality assurance process. Our experience confirmed the importance of a gatekeeping role as proposed by Katz and Tushman (1997).

8.3 Organizational structure

The effective diffusion of the virtual class in a conventional tertiary educational institute requires that the process is not localised in a specific academic department or grouping but occurs in such a way that it can serve the whole institute. Ensuring wide representation from the outset seems a necessary strategy when an institute-wide effect is desired (Goldenfarb, 1995). The concerns raised by the computer services group in this research also demonstrates the importance of ensuring that all wider stakeholders are consulted on the implementation of the virtual class infrastructure, and that the existing organizational structures are respected.

It is proposed that an institute wishing to implement networked education establish a central unit to provide sustainable training, support, research and development of networked education to staff and students. This strategy uses the first of the three possible implementation approaches of "flexible delivery options" in higher education proposed by Taylor, Lopez and Quadrelli (1996).

In the design and development of networked education a multi-disciplinary team is required because of the involvement of diverse disciplines such as education, graphical elements and ICT (Taylor, Lopez and Quadrelli, 1996; Spender, 1996a September; DEC working party, 1989). This is in contrast to the general practice of instructional design in conventional tertiary education, which is often a solo activity of an individual lecturer. Although instructional design deals with "… how to make instruction work as well as possible with the tools at hand" (Mager, 1988:1), the reality in conventional tertiary education is that instructional design often does not deal with graphic design and ICT design. In networked education, however, instructional design in practice generally also includes graphic design as well as ICT design. The scope of instructional design in practice in the virtual class is thus wider and different from the practice in conventional education.

It seems necessary when introducing the virtual class into a conventional tertiary educational institute to seriously consider the internal political patterns and dynamics that form part of the culture of the institute (Pettit and Hind, 1992). The implementation of the virtual class infrastructure calls for appropriate policies to be developed, for example policies governing access of on-campus students to the Internet and publishing on the WWW. Institutional policies blend the requirements of an innovation with the institutional capabilities and culture and are therefore necessary for wide implementation. This top-down aspect was neglected in this action research and could have been used to obtain positive support from administration.

In networked education both students and lecturers are required to assume a new level of sophistication in ICT use, which requires appropriate ICT support. Help facilities like context sensitive help buttons, details on technological requirements and troubleshooting help need to be included within networked courses. There are, however, aspects about using ICT or technical problems that require students or staff to interact with a knowledgeable person. It is therefore suggested that an ICT Help Desk facility be established to support students and staff in networked education. This ICT Help Desk should be available to staff and students by means of both electronic and conventional communications (such as a 0800 telephone number).

8.4 Technology

Both networked education and the supporting ICT and applications are relatively new and are changing rapidly (*see* 9.4 *in* Chapter 9). An institute's approach to acquiring and discarding ICT therefore needs to be flexible. Caution is required when acquiring technologies to avoid being locked into its particular processes and approaches.

Physical locality and time zones of teacher, learner and materials need to be explicitly considered and facilitated in *creating* the technological architecture of the virtual class in order to effectively transcend any geographical proximity and time constraints when *delivering* networked education (National Center for Higher Education Management Systems, 1995; WA Telecentres, 1995). Networked education can, however, impact negatively on the mobility of the course materials (Mason, 1999). The affordability and weight of portable computers such as Laptop computers and notebooks rule out these technologies from being an adequate solution to provide mobility. Smaller hand-held palmtop computers with infra red updating capabilities are a positive step in re-creating mobility for students in networked education. A development of significance in this regard is experiments by the New Media Lab at the Massachusetts Institute of Technology (Negroponte, 1997 June) and by commercial companies in the United States to program every minute part of the "paper". This paper has all the characteristics of wood-based paper except that it is made of specialized synthetic programmable materials. Pages in such a book could be loaded with information from the Web or other electronic sources and copied and pasted into other computer applications. Each page has a tremendous storage capacity and can be continuously updated and reloaded. This will be a breakthrough in providing students of the virtual class with both mobility and a new level of flexibility.

The needs of students and teachers in networked education also impacts on the management and nature of the services of the library. The library is required to provide most of its services electronically and to provide increased access to external electronic resources rather than local paper-based materials (Barnard, 1997; Odlyzko, 1994).

Capital expenditure on physical extensions to libraries can be replaced by subscriptions to on-line databases and resources. Another development of significance for libraries in this regard is the current experiments with programmable paper (discussed above). Libraries might in future be mainly responsible for managing copyright contracts and electronic databases with categorised information that is accessible on the WWW for down loading onto computers or possibly into electronic books. The library might also become an important access area to networked education for on-campus students by making available computers in the library.

A basic technical implication for a conventional tertiary educational institute that aims to implement the virtual class infrastructure is that a web server needs to be managed for hosting the on-line materials. This can be done using an Internet Service Provider - which requires an additional relationship in need of being managed - or an internal web server of the institution's own. A stable, dedicated internal Web server seems to be the preferred option. An internal Web server will allow for experimentation with and testing of new technologies which require quick access to, and a high level of control of the scripts, on-line databases and other ICT.

An effective initial strategy to rapidly start networked education in terms of the technological architecture is to initially focus on developing the front-end technologies, that is to say those technologies that support the user-computer interface. The technologies in the virtual class are usually flexible (for example HTML), which allow for the back-end technologies to be introduced at a later stage - technologies such as a suitable database and course-management software.

8.5 Augmenting Rogers' Diffusion Theory

Innovation diffusion theory (Rogers, 1983) provides a general explanation for the manner in which new entities and ideas like IT and networked education are disseminated through social systems (in this case conventional tertiary education) over time. Diffusion, when according to Rogers' theory the innovation emerges from outside senior management, essentially follows a bottom-up path from early adopters to widespread use. This bottom-up approach was found to be essential for the diffusion of networked education at Wellington Polytechnic. This action research found that if the implementation is only top-down, academic and allied (administrative) staff will not be aware of the possibilities of networked education and the impact it might have on them, while ownership could well be a problem.

Tillema (1995) analysed historical studies, largely based on experience in the schooling sector, and supports the bottom-up approach and warns that top-down attempts to achieve educational reform have failed. Tillema asserts that top-down attempts will continue to fail unless they deal with the cultural and pedagogical traditions and beliefs on which current practices and organizational arrangements are based.

This research suggests further that the Rogers' diffusion of innovation theory, when the innovation emerges from outside of senior management, needs to be augmented with a top-down component that includes both senior and middle management in order to accomplish effective diffusion of the virtual class in conventional tertiary education. This correlates with Drucker's (1985) assertion that a successful innovation should aim at leadership from the beginning in order to be innovative enough and capable of establishing itself.

If it is only bottom-up, senior managers might not support it and resources might be difficult to obtain. The prominence of the project at Wellington Polytechnic and the level of resources made available would not have been possible without senior management and middle management support. When political problems were encountered, the President was able to step in and direct matters. Middle management, that is heads of academic and administrative departments, played an important role in controlling resources; in some cases in a positive way and in other cases withholding support. (However, when the initiative for moving towards the virtual class comes from senior management this support is implicit.)

Goldenfarb (1995) describes the importance of senior and middle management support with reference to the CWIS project that started by setting up a Steering Committee with representatives from four of the twelve academic faculties in the University, the Library and Information Technology staff. Invited participants were mainly lead users, who had already some relevant expertise, or were recognized as stakeholders who stood to benefit largely from the use of the new technology.

The head of Information Technology demonstrated some early achievements to the Vice Chancellor and his deputies. Their awareness and interest in the project provided the top-down pressure on heads of departments to support the project. This gave the project the legitimacy and full acceptance into the everyday operation of the institution.

When departments were asked to identify what was critical to their adoption of CWIS, all ten departments nominated their product champion, who drove the project through all the critical steps of the implementation process. Seven of the ten departments identified the support of their leader as having played a major role.

This illustrates the central role that senior management plays in bringing about organizational change, and in this case, the introduction of the virtual class in a conventional tertiary educational institute. The backing from a group of senior managers accompanied by strong budgetary support seems to be necessary if the progression towards the virtual class is to be an institutional one. Berge and Schrum (1998:35) contend that the "key to success of campus initiatives in technology-enhanced learning and distance education is the support of campus leaders". Daniel (1998) argues that a technology strategy is necessary for campus universities like Wellington Polytechnic, which underlines the importance of a top-down component when implementing the virtual class in conventional tertiary education. Daniel (1998:143) also maintains that

> The application of technology without a concurrent transformation in the teaching/learning process will be an add-on that will only increase costs. Re-

> engineering the learning environment will not occur without the development of a technology infrastructure.

Losing the two content providers outside the Educational Development Department in cycle 4 was a serious setback for the diffusion of networked education into other academic areas. It points to the vulnerability of only using a bottom-up approach in which the energy of the diffusion is vested in individuals. The top-down approach can add to the continuity of the diffusion of innovations; this approach ensures that the objectives of an innovation are laid down in longer-term strategic plans, annual plans, committee discussions and minutes, and operational policies.

Goldenfarb (1995) found that a critical success factor in the diffusion of innovation was following both a top-down and bottom-up approach.

Szabo, Anderson and Fuchs (1997) report on the implementation of the virtual class at the University of Alberta, Canada and support a simultaneous top-down and bottom-up approach:

> There are two major intended goals of TIES [Training, Infrastructure and Empowerment System]. The first is that the chief academic officers identify a vision for alternative delivery systems of instruction for the university, publish that vision widely, and demonstrate their commitment to it in a clear and convincing fashion. Secondly, departments within the university create leadership task forces to interpret the vision for their unit and prepare colleagues to implement the shared vision.

Daft (1989:274) states that a bottom-up innovation process is typical for technological innovation (within an organic management structure) while administrative innovations typically follow a top-down direction of change (within a mechanistic management structure). However, the virtual class, as a technological innovation also requires changes in administrative processes to operate effectively, and hence needs both approaches.

Using a bottom-up and top-down process links up to the learning organization concept (Marquardt, 1996:218) in which "... it is possible for any member to be an awareness-enhancing agent or an advocate for new competence development. In this way, both top-down and bottom-up initiatives are made possible". Using both approaches simultaneously confirms Gunn's (1998:142) assertion that

> An effective technology strategy works in both directions. From the top down, it is articulated through institutional objectives, sensitive to existing culture, constraints, strengths and weaknesses, and presented as a coherent, achievable set of goals with appropriate incentives and rewards. It must also move from the bottom-up where knowledge of teaching strategies, learning contexts and disciplinary expertise can be translated into action plans geared to achievement of institutional strategic objectives and so creating a sense of ownership at all levels of the institution.

In following both approaches simultaneously, preference needs to be given to an organic implementation model rather than an institutional implementation model. In the organic model the processes and outcomes are based on grassroots level needs, the diffusion occurs in an evolutionary way, and the persons taking ownership of the new paradigm drive the implementation. This is in contrast to the institutional (or mechanistic) implementation model in which processes and outcomes are developed through a broad top-down decree, and ownership of the new paradigm is not a high priority; staff are expected to do as instructed. More emphasis needs to be placed on the organic implementation model because the paradigm of the virtual class is a new concept in conventional tertiary education, and understanding the possibilities of the virtual class and how it serves the needs of students and teachers is a gradual process which requires time. Holt and Thompson (1998:215) assert that "whatever the road to mainstreaming, it is a slow, difficult and time-consuming one to negotiate successfully". Academic staff members need to take ownership of the virtual class concepts and practices because they largely operate in an autonomous way when deciding how to deliver teaching. The implementation of the virtual class in a conventional tertiary educational institute is a long-term strategic process and can be jeopardised if its implementation is decreed in a top-down fashion to achieve short-term gains.

Everett Rogers commented as follows on a question set to him by the writer (E. Rogers, personal communication, 10 July 1998), on whether Rogers' diffusion model proposes a bottom-up approach only:

> I think that it greatly helps an innovation diffuse if it has top management support, especially for its rate of adoption to reach critical mass, after which further diffusion can be self-sustaining. But top management support may not be necessary if the innovation has sufficient relative advantage, compatibility, etc.

However, the findings in this research suggest that a simultaneous top-down and bottom-up component is necessary for an effective diffusion of the virtual class in conventional tertiary education. Bates (1995:47) contends that "... even more important than an environmental scan for managing change is the development of a long-term vision". Moving towards networked educational management requires visionary leadership which cannot be left to bottom-up initiatives but requires strategic planning by senior management in education and government.

CHAPTER 9
MANAGING THE OPERATIONS OF THE VIRTUAL CLASS: NETWORKED EDUCATIONAL MANAGEMENT

In Chapter 8 the findings relating to the first research question, "How does one manage the implementation of the virtual class infrastructure in conventional tertiary education?" were presented.

In Chapter 9 the findings related to the second research question "How does one manage the operations of the virtual class?" are reported. The research findings address the element “Management Processes” within the MIT90 schema (*see* Figure 1.3).

In Chapter 9 the author tentatively proposes a new educational management paradigm for managing the operations of virtual class: *networked educational management* (*see* Figure 9.1). The twelve dimensions of networked educational management can be seen as the essential characteristics for managing the operations of the virtual class.

These dimensions are a synthesis of the characteristics of managing the operations of the virtual class as reported in the four research cycles (4.3.2, 5.3.2, 6.3.2 and 7.3.2). The discussion in this Chapter relates these characteristics to the theoretical underpinnings of this research.

The term *networked educational management* is chosen since a central aspect of education in the virtual class and the management of such education seems to be the *connectivity* or *networking* that it facilitates across the boundaries of space and time. This term correlates with “network management” (Limerick and Cunningham:1993) and terms that authors like Tapscott (1996) ("internetworked organisation"), Beare and Slaughter (1993) (“network organisation”), ” Limerick and Cunningham (1993), (“network organisation”), and Tapscott and Caston (1993) ("open networked organisation") use when describing the organisational model for the emerging information age. The Alliance for Converging Technologies calls the new kind of organisation the "Internetworked Enterprise" (Tapscott, 1996:54). Drucker (1995:65-66) calls the society in which tertiary education currently operates the "networked society" because of the centrality of networking with other organisations through alliances, partnerships and outsourcing. The concept of a networked society also incorporates the notion that an increasing number of people network their abilities to different firms for longer or shorter periods.

Networked educational management is proposed as an integrated management system for the operations of the virtual class. The *networking* dimension is therefore central to networked educational management as it also functions to connect all the other dimensions (Figure 9.1). The integrated approach is based on the premise in systems theory that "a system is a whole that cannot be taken apart without loss of its essential characteristics, and hence must be studied as a whole" (Ackhoff, 1972:40). It also relates to Michael Porter's emphasis on integration in order to achieve competitive advantage in organisations (Pastore, 1995, October 1).

Twelve dimensions of networked educational management are described below:

0.0 Networking
0.0 Student focussed
0.0 Globalisation
0.0 Transitory
0.0 Adaptability
0.0 Transcending time
0.0 Market orientation
0.0 Computer mediation
0.0 Collaboration
9.10 Convergence
9.11 Boundary orientation
9.12 Information based.

Figure 9.1 Networked educational management

9.1 Networking

Networked educational management postulates that a distributed model of management is appropriate for networked education at both learning and institutional level. Networking is therefore regarded as the central premise of networked educational management. The distributed nature of networked educational management is based on the new connectivity within networked education, the distribution of learning and control, the distributed nature of the Internet and intranets, and the globalisation of education.

9.1.1 Networked management of learning

Managing the connectivity that networked education facilitates, is a key difference between managing the conventional class and managing the operations of the virtual class and hence calls for a *distributed* management in the virtual class. One of the most significant differences between conventional education (whether it is correspondence or on-campus) and networked education seems to be the *connectivity* that networked education facilitates. It bridges the boundaries of both space and time. It connects or networks student and student, teacher and student, student and resource, teacher and resource, past and present, independent of geographical or time differences.

This connectivity within networked education and its management links to Nipper's (1989:64) concept of "third generation distance education", in which the essence is "interactive communication facilities". Nipper contrasts this connectivity with low interaction among students and teachers in the first generation "correspondence teaching" (Holmberg, 1995:3) and second generation "multi-media distance teaching". Hawkridge (1995:8) contends that "the greatest difference… between the old and new media is their capacities to sustain two-way communication that aids learning".

On-line communications advance networking among students and teachers, which Hodgson, Mann and Snell (1987) refer to as “expert networking”. Networked courses can provide both synchronous and asynchronous on-line communication facilities. On-line video and voice conferencing, Internet Relay Chat (IRC), shared whiteboard facilities and other real-time interactive applications are being explored in education and commerce, while asynchronous facilities like electronic mail and hypermail threaded message boards are commonly used in networked education. Part of networked educational management is managing the new dynamics of communication in a virtual environment (Gundry and Metes, 1997).

Control of the learning and the actual on-line learning and teaching materials are distributed among both local and distance students, using the same interface (that is to say a Web browser) because of the convergence of learning modes that traditionally have been called “distance education” and “on-campus education” through networked education. This convergence is described below (*see* 9.10) and imply that the management of learning is no longer linked to physical locality (on-campus or off-campus), but distributed to study networks comprising local, distance, national and international students that operate as virtual teams (Jarvenpaa and Leidner, 1998; Lipnack and Stamps, 1997).

9.1.2 Networked management of the institute

The management model at institutional level in conventional tertiary education is one of tension between a centralised administrative approach and a decentralised academic approach in which the centralised, bureaucratic (Garrison, 1989; Paul, 1990) and hierarchical dimensions (Middlehurst, 1993) seem to be uppermost. Conventional tertiary education has been highly stagnant in its practice and perception of management and seems to be highly resistant to change in this domain (Patterson, 1997; Trow, 1996).

Conventional management of tertiary education struggles with the desperate need to reform its management because of the external environment, but is often ineffective in its endeavours because of this internal tension. Against this background, Cohen and March (1974) depict the modern university in the extreme as an organised anarchy.

Networked educational management proposes less centralised control in line with private enterprise, which has been transformed to greater decentralization and less bureaucratic management approaches (Drucker, 1998) in order to respond more effectively to change (Beare and Slaughter, 1993).

There is a real challenge to create a congruity between centralised and decentralised management aspirations in tertiary education (Bates, 2000; Paul, 1990). A similar tension within the organisation of information systems activities has been transcended by the use of distributed networks like intranets and the Internet. Organisations initially used (and, where appropriate, today still use) a centralised approach (based on mainframes) that focused on centralised control and economies of scale, but did not address the local needs of users and departments effectively (Schultheis and Sumner, 1989:565). Decentralised approaches (where appropriate, such as home users, still in use today) then followed (facilitated by personal computers) in which local control and processing were pre-eminent, but created inefficiencies and incompatibility with the central standards and philosophies (Schultheis and Sumner, 1989:568). The solution was *distributed processing* (through networks like intranets and the Internet), used "to distribute some data processing activities to users, but to maintain centralized control over other activities… (this) means that both computer power and the data can be distributed to local user sites... can also mean distributing responsibility for other computing activities to the user " (Gibson and Hughes, 1994:558; Schultheis and Sumner, 1989:569). The same applies to communication systems where the use of distributed networks like intranets and the Internet created a *distributed communications* model. In the oral traditions before Guttenberg's press of 1452, a centralised model of communication was most feasible. The text tradition, which followed the revolution that the printing press caused, brought with it the decentralisation of communication through paper distribution (Innis, 1972). The intranet and the Internet, however, facilitate communications from any locality and distributes the control of the communications throughout the network (for example, electronic mail can be sent by anybody to anybody else connected to the network within an institute or globally). The Internet creates a global distributed communications model while intranets create an institutionally distributed communications model.

Networked educational management emulates the distributed networked systems it is based on. The management style reflects the distributed nature of the systems in and through which it operates. Paul (1990) argues for this congruity when stating that an institution that is dedicated to the values and practice of open learning needs to have a management style that is open. Networked educational management will thus be based on a clear set of guiding principles which forms the basis for all decision making at all levels, while using and encouraging delegation widely to distribute power and authority (Paul, 1990).

Networked educational management further aligns itself with Luke's (1997:2) notion of 'net work" as "the new kind of intellectual and institutional labour needed to transform the existing national/ industrial/ traditional university into an informational operation with new transnational/ postindustrial/ innovative capabilities ".

The globalisation of education may furthermore necessitate collaboration and partnerships. These partnerships can exist to ensure the local support of distance students in networked education, to address accreditation and certification issues (*see* Chapter 8) or for more effective participation in networked education. Institutes might therefore find themselves physically or logically distributed through partnerships and collaboration with other national and international institutes. This calls for a distributed management system in education: networked educational management. Networked educational management is a response to the need identified by (Morrison, 1995) to interact on "learning highways" across all borders.

Networked educational management has its control, power and resources thus distributed throughout the organisation. The ICT base of networked educational management facilitates an organisational model that moves away from centralised control. The decentralisation of control aligns itself to the view of Bates (1984a), Garrison (1989) and Peters (1993) that new technologies offer the possibility of an alternative model to the large, centralised and specialised distance education system in the post-industrial society.

Networked educational management contends that a distributed model of management of conventional tertiary education is appropriate for networked education, which is based on the Internet or intranets. Networked educational management links with the distributed emphasis of “open management”, being energised by value-driven leadership, as proposed by Paul (1990) and with the distributed models both in information systems activities and communications. Networked educational management aligns itself to the newer forms of distance education that Rumble (1992) describes as a highly distributed system.

Networked educational management further conforms to two of the ten major transformations (or megatrends) in society identified by Naisbitt (1982), namely a transformation from centralisation to decentralisation (in effect distribution) and from hierarchies to networking. Networked educational management links through its distributed nature to the idea of the new organisation that empoweres individuals to manage their own networking towards a common objective (Limerick and Cunningham, 1993).

In contrast to a *mechanistic* control process, networked educational management has an *organic* control process (Burns and Stalker, 1961) in which “knowledge and control of tasks are located anywhere in the organization" (Daft, 1989:1). Networked educational management aligns with an organic control structure in which the employees contribute to the tasks of the department, tasks are altered and redefined through the interactions of employees and there is less hierarchy of authority and relevant control. In an organic control structure there are also few rules, while knowledge and control of tasks are distributed throughout the organization and communication is predominantly horizontal (Daft, 1989). Learning organisations (Marquardt, 1996:1) similarly "make greater organizational use of employees at all levels of the organisation". Networked educational management will ensure conformity to central principles and values and simultaneously encourage diversity. Active progression towards the virtual class opens an institute to the impact of the distributed nature of the new educational technologies (specifically the Internet and intranets). Networked educational management encourages the distribution of objectives, control, power and resources throughout the institute, and indeed among its students (*see* 9.2 *below)*.

Networked educational management being based on a distributed model, can therefore ensure conformity to central principles and standards while simultaneously encouraging diversity and thus transcends the tension between the centralised administrative management and decentralised academic management approaches. Instead of bureaucracy and anarchy, networked educational management may contribute in a philosophical way to harmony within tertiary education.

The organisational structure which could embody the notion of networking is one in which centralised and decentralised management need to be integrated (Bates, 2000). Networked educational management could find expression in an organisational model as described by Bates where a fairly large professional center work with small flexible units of technical support and generalist educational technology support within each faculty (or school).

Networked educational management can further enable tertiary education to use a "network structure" which is used in private enterprise to outsource some or part of its essential functions (Drucker, 1995; Robbins and Barnwell, 1998). Teaching can be outsourced in networked education to teachers who may be anywhere in the world. Administration can be outsourced to external organisations that process for instance on-line enrolments, assessments, student records and computer systems. Research aspects can be outsourced through international collaboration (*see* 9.9 *below*). The control of learning is essentially "outsourced" or distributed to the students in networked education due to their central role described below.

9.2 Student Focussed

The shift in networked education from a national to a global educational focus (see 9.3 below) has created a controlling position for the student in the virtual class. The global reach of networked education, the distributed nature of the Internet, the increase in private enterprise participation and the growth of transnational educational collaboration shift the focus of education away from the nation state. In this paradigmatic shift the focus and control transfers to the student who can select from various international offerings, access Websites and people across cultural, national and philosophical boundaries, while constructing their own learning and meaning through a constructivist educational approach (Mason, 1998:157).

The global nature of the virtual class gives students a new, extensive choice of locally and internationally offered courses. Networked education makes it technically possible for students to engage in networked courses from different institutes of their choice in order to gain a qualification. This calls for increased critical analysis skills of students to make the appropriate choice as well as for transnational accreditation and certification (*see* 9.11 *below*). The student now has various teachers accessible by e-mail and they may be geographically located anywhere in the world (Tiffin, 1996a November:2).

The learners in the virtual class have the ability to access other students, lecturers and resources globally (Tiffin, 1997 April). The virtual class through the use of educational technologies like the Internet, which is a global (Wizards, 1997) and expanding phenomena (Internet Software Consortium, 1999b), bridges national borders and occurs in a “space” which is accessible from anywhere in the world where access to the Internet is possible (Uys, 1998 April). This means that anybody in the world with a telephone connection can access the Internet (even though it might mean making an international call).

Networked educational management has to deal with the student in the controlling position since networked education is based on ICT which *per se* has the potential to provide more control to the student (Garrison, 1989; Bates, 1994). Peters (1993:43) points to an assumption of management in a post-industrial society in which control will occur through “employee self-control”, which he interprets as referring to the student. Peters (1993:52) postulates that learners could well “…insist on determining themselves what and how to learn” which is increasingly common in networked education.

Networked education further enables the instructional designer to consider the individuality of every student by catering for different learning styles, different ways of navigating a course and individualised presentation through adaptive hypermedia systems (Brusilovsky, 1996). The constructivist approach has been propagated as a fitting approach in networked education. The central tenet of the constructivist approach is that "…the world is *constructed* by the individual" (Boyle, 1996 June:751). Constructivism is a philosophical approach in which it is argued that since knowledge is socially and culturally constructed (Brookfield, 1985), it is the learners who need to construct knowledge for themselves. It argues that no two people have exactly the same personal constructs of knowledge (Zepke, 1998).

In networked education on-line publishing is extremely easy. Students in networked education, in contrast to the conventional student, can with ease be on-line providers and publishers themselves by using facilities like hypermail threaded discussion boards, on-line journals and newsgroups (Uys, 1997b June). The student in networked education can further study at their own choice of pace, place and time and may enrol on-line using "anywhere - any time" enrolment (as discussed above).

The central role of the student correlates with the new role of the teacher as facilitator in networked education (discussed in Chapter 8). Zepke (1998:179) states that "…the teacher's role is a limited one… the role includes - facilitating students learning by communicating and empathising with them; structuring knowledge and arranging a reasonable workload; helping students develop, change and critique their own learning structures". In networked educational management the student is in control.

In this regard networked educational management could be seen as linking to a "network structure" (Robbins and Barnwell, 1998) in which the control of learning is essentially "outsourced" or distributed to the student based on the principles and facilitated by the processes described above.

9.3 Globalisation

The global nature of the virtual class is possible because the new educational technologies, in particular the Internet, facilitate and lead naturally to the globalisation of education Tiffin (1996, February). Tiffin (1997, April) asserts that the virtual class carries a vision of knowledge that is international not national. Networked education further is accessible from anywhere in the world where access to the Internet is possible (Uys, 1998 April).

Networked education has an integral distance education component and links therefore to the globalisation possibilities in education, which distance education *per se* makes possible (Evans and Nation, 1993). The rationale for global courses could be for educational institutes to extend its market particularly into developing nations (Evans and Nation, 1993) or socio-political, technological and purely educational grounds (Mason, 1998). Globalisation is also seen as a generic feature of later modernity (Evans and Nation, 1993) which is occurring in many areas like the economy (Holland, 1987; Tapscott, 1999) and communications (Frederick, 1993).

Networked education has a strong global disposition also because it is information-based (Drucker, 1989). The global nature of the virtual class means that institutes in tertiary education can project themselves into a global educational market of providers and students which places new demands on management.

It is therefore important for each conventional tertiary educational institute, besides considering participating in networked education, to employ appropriate strategies to survive and prosper. Conventional tertiary education might provide personalised attention through smaller groups, excellent social interaction possibilities on campus, focusing on addressing the needs of the local work-market, addressing the specifics of the local culture, as well as increasing the quality of their education and building a reputation for excellence in target areas. These strategies could be built into the organisation's long term objectives. Institutes participating in the virtual class might further need to focus on establishing a specific niche in the international educational market.

Networked educational management through its global nature also addresses the management of relationships with collaboration and consortium partners (see 9.9 below). It also address the new competitive international educational market since competition can come from everywhere in the digital economy (Tapscott, 1996).

Networked educational management therefore also needs to authentically address cultural differences in an international educational market and arena (*see* 9.7 *below*).

9.4 Transitory

Control is an integral part of management (Newman, Warren, McGill, 1987) that is hugely impacted by the transitory nature of the operations of the virtual class. Networked educational management acknowledges a decrease in control, more uncertainty and therefore an increased in risk in the management of digitised education (Tapscott, 1996).

The central position of the student as described above (*under* 9.2) and the changing nature of the student body contributes to an uncontrollability of huge proportions, which challenges the essence of conventional educational management and have to be addressed in networked educational management. The virtual class is unbound in space and time - networked education allows the student to study any time and anywhere. Networked education provides students with the flexibility of studying at their own pace and also at their choice of place. Networked education further allows students to either study independently in a more flexible mode or as part of a group in a more structured manner.

The transitory nature of networked educational management is linked to both the transitory nature of the technological environment and that of the change process. The environment in which networked education in tertiary education occurs at the beginning of the new millennium has been described as exceptionally dynamic and volatile (Tapscott, 1996). The introduction of computers in education is seen in revolutionary terms by some (Drucker, 1989). Even the nature of the change process from conventional to networked education itself is not stable (Morrison, 1995).

The global dimension of networked educational management furthermore increases the boundaries of the institutes using networked education and exposes them to be impacted by more factors and influences from a turbulent international environment. The boundaries of the networked educational organisation (*see* 9.11 *below*) are also becoming wider and more fluid.

In the emerging information or knowledge society, education has to further contend with an exponential growth of the amount of new information available for use by organisations, governments, and businesses and people (Nugent, 1996). The growth in the Internet continues to be exponential (*see* Figure 1.1) while there are furthermore sustained, revolutionary changes in the ICT that undergird networked education (Bates, 1995:45; Szabo *et al.*, 1997). In the increasingly digitised environment of networked education, networked educational management needs to allow for less control and more risk-taking (Tapscott, 1996).

Networked educational management takes cognisance of the immediacy of information that is one of the themes of the new economy. Tapscott (1996) refers to information immediacy as a critical factor in establishing the transitory nature of the new enterprise as a real time enterprise. Networked educational management thus facilitates the operations of a real time tertiary educational institute.

Web-based materials are further especially fluid due to the ease of publication and the state of continuity of Web-based materials as demonstrated by Farrell (1999:2) "Due to the nature of the World Wide Web and the re-structuring of home pages by Web masters, the addresses might change by the time readers try to access the referenced sites". Lennon and Maurer (1996, June) emphasised the importance of managing the hyperlinks embedded in on-line materials and pointed to the use of specialised software to automate this process. In networked education the materials and teaching process is in a state of continuity in contrast to the state of discontinuity of materials in conventional tertiary education. Once a course is on the WWW, it remains available and no special arrangements are needed to keep it continually available - special arrangements however have to be made to discontinue its availability. Effectively managing the discontinuity of on-line materials is necessary to meet student expectations and provide ongoing support, and in so doing avoiding that the institute comes in disrepute. The virtual class thus needs special approaches to ensure a seamless discontinuity like de-registering the materials with the search engines and guides, replacing the course materials with clear notices to that effect or contacting those whom the institute know have bookmarked the materials.

The dynamic nature of on-line materials require tight change control systems in networked educational management while at the same time addressing the flexibility of on-line materials that can be changed continuously and immediately. This is different from using other publishing mediums like paper or CD-ROM. The distributed nature of networked educational management can address this tension (as described in 9.1 above).

9.5 Adaptability

The turbulent and dynamic internal and external environment described above calls for networked educational management to be highly adaptive. It connects to the concept of learning organisations (Marquardt, 1996) in which management needs to be highly adaptive. Networked educational management is organised along a flat hierarchy and is seamless and boundaryless like learning organisations (Marquardt, 1996). Esquer and Sheremetov (1999, July) further points to a consensus that successful universities of the future will be those that operate with high flexibility.

The team approach in course development in networked education (described in chapter 8) also leads to high level of flexibility in networked educational management regarding project management and collaborative approaches (Daniel, 1998).

There is also a strong requirement for flexibility within the software and hardware for developing on-line materials itself due to the inherent flexibility of web based materials (*see* 9.4 *above*). Management of networked education also needs to be flexible in the approach to acquiring and discarding ICT in order to grow with the continuing developments in the undergirding ICT.

An adaptive approach is also required in managing the learning environment through instructional design. Adaptive hypermedia systems achieve personalised presentation (Brusilovsky, 1996). This means that educational material is presented in an individualised and possibly unique way to students on the basis of mapping systems that are created for each individual student.

On-line enrolment and Web-based study makes "anywhere - any time" enrolment technologically possible, but it might not be feasible to implement it in a totally open way due to the complexities it create for administration (*see* Chapter 8). The potential openness in the enrolment processes and procedures that the virtual class allows need to be exploited.

JIT teaching (see 9.6 below), that is teaching that can change rapidly and immediately based on the needs of students and is available when students need it (Tiffin and Rajasingham, 1995; Marquard, 1996; Mason, 1998) calls for the management of teaching to be particularly adaptive.

The factors above point to a high level of adaptability that is required in networked educational management in relation to the administrative, academic and technological management of the virtual class. Peters (1988) believes that the modern business organisation needs to be far more decentralised and responsive due to the more unpredictable and competitive environment; this is also applicable to the management of an educational organisation that embraces networked education.

9.6 Transcending Time

This dimension of networked educational management deals with the immediacy of networked education, the impact of the adaptability of networked educational management (*see* 9.5) on time, and the ability of networked education to transcend time through the asynchronous components of networked education.

Networked educational management deals with an immediacy that Tapscott (1996) identifies as one of the themes of the new economy. This is also the case in networked education as Web based materials (be it on the Internet of intranet) can be updated continually and immediately. Just as immediacy within enterprises facilitates just-in-time (JIT) shipping and manufacturing (Tapscott, 1996:63), it leads in networked education to JIT teaching - teaching that can change rapidly and immediately based on the needs of students and is available when students need it (Tiffin and Rajasingham, 1995; Marquard, 1996; Mason, 1998). This can be managed manually or in conjunction with adaptive teaching systems (Brusilovsky, 1996 June; Carver, Howard and Lavelle, 1996 June)

Networked educational management addresses the immediacy of resources and people in networked education. A hyperlink to a source on the Internet or an intranet provides an immediacy that is not possible in conventional education. Hyperlinks provide seamless transfer to pages within the networked course as well as to global information sources on the Internet. The practice in networked education to provide links to electronic mail addresses or discussion groups across time zones leads to the sense of the immediacy of people. Adding to this immediacy are programs like ICQ (2000) and Yahoo Messenger (2000) which can indicate when other members of an on-line discussion group access the Internet.

Flexibility is prevalent in the virtual class also through the ability of students to study at their own choice of pace and time and also has the advantage of synchronous communication activities when required. The virtual class further facilitates the option for students to either study independently in a more flexible mode or as part of a group in a more time-constrained manner.

On-line enrolment and Web-based study makes "anywhere - any time" enrolment technologically possible (as discussed above) and in this way transcends the time factor in the enrolment process. This flexibility challenges the control emphasis of administrative systems. Efficient administrative management that caters for this flexibility might be achieved through using grouping and pacing. Students define their study goals at enrolment. When studying to obtain a formal qualification a more structured approach can be followed but when studying for professional development only, a more flexible approach can be employed. Students might also enrol in a course that has been specifically designed in conjunction with a specific sector of industry in which case the industry dictates the structure of the course. Students can then be grouped based on their purpose of study and their progress monitored against their stated goal, while following the related administrative processes. While the learner might need to be closer to the centre of the educational formula, the other necessary factors to make the formula work like effective administration, must be appreciated and taken into account when managing networked education.

9.7 Market Orientation

A market orientation in networked educational management is required because of dramatic changes in the competitive nature of the tertiary educational market, and also because of the changing nature of the student body. Networked education needs to match the needs of an information society (Tiffin, 1996).

Drucker (1985) asserts that innovation needs to be focused on the market and driven by the market. This also needs to be the case with the management of networked education as an educational innovation.

Entrepreneurship is no longer the domain of private enterprise but critical to ensure the validity of conventional tertiary education. Drucker (1985) maintains that the development of the modern university is a case study in entrepreneurship. Networked educational management therefore incorporates entrepreneurship.

Tapscott (1996) contends that in the digital environment, competition comes from everywhere. This seems also the case in tertiary education where any institute in the world using networked education becomes a potential competitor in the local educational market. The extent of collaboration as described (*see* Chapter 2) further points to the requirement in market orientation in educational management.

The virtual class further seems to be an enabling factor in the increasing proximity between industry, entertainment and education that impact on long term strategies of growth and survival of conventional tertiary education. Tapscott (1996) notes convergence as one of the themes of the new economy. He holds that new media is the dominant sector in the new economy, which are formed through the integration of computing, communications, and content industries such as tertiary education. This change could have extensive organizational, economic and cultural effects on post-compulsory education (Evans and Nation, 1993).

Corporate Universities are emerging (Drucker, 1989) for example Oracle University, Motorola University (Meister, 1998 June), McGraw-Hill Companies, Global Telecom Academy, Microsoft Online Institute, Jones Education Company and Global Learning of Deutsche Telekom (Mason, 1998). These institutes do not necessarily have the same academic philosophies or binding traditions of conventional tertiary education. Proprietary institutions focuses on profit through all its operations including education (Mason, 1998) and follows a market model of education, which is that inputs through an intermediate process deliver outputs which can be marketed and sold. This could become a serious threat to the values traditionally emphasised by conventional tertiary education like social responsibility, humanism, freedom of expression, liberal arts, political and moral values (Tapscott, 1996). New powerful consortia might rise to deliver the same quality of education, at the same cost or less, but in a more entertaining way, and will allow students to obtain a degree in a shorter time (Munitz, 1997). The changing educational market poses a real threat to conventional tertiary education and thus needs to be integrated into long term strategising.

Management within networked tertiary education will increasingly have to take the principles of adult education (andragogy) into account. Drucker (1989) identifies continuing education as a new requirement for education in the knowledge society (p. 243). Education is becoming more of a lifelong endeavour than a few years stint after school. Spender (1996b, September) asserts that the whole society is becoming the student body and many in this extended student body will be drawn to the open and flexible nature of networked education.

The market orientation of networked educational management implies that entering international educational markets where English is not the first language when networked courses are in English, needs to be addressed. Providing assistance to non-native English speakers - ideally on-line - needs to be integrated in networked education. If not, the translation of courses and presentation through adaptive hypermedia systems need to be considered.

Networked educational management is embedded within the (internal) culture of an educational organisation (Drucker, 1998). Networked education however exposes both teacher and student to inter-cultural exchanges in Internet based learning communities that could impact on the unity of an organization (Gundry and Metes, 1997).

Cultural sensitivity and alignment need to go beyond mere language translation. Woodhouse (1999) points out that education is not culturally neutral. In the virtual class with its global character, the importance of culture as a significant determinant in how students desire to learn, how the content should be structured and how the learning experience should be facilitated must be appreciated in the management of the virtual class. Students may choose to study close to home because of convenience or physical security factors, but culture may also contribute to this choice. Dealing with foreign cultures needs to be managed with care and requires teachers to have knowledge about cultural differences and sensitivities for these differences. This can be easily overlooked in networked education where communications often exclude clues to the culture of the communicators like pronunciation, moral values, and physical appearance.

Offering courses globally has implications for the pricing of these courses since conventional tertiary education is often subsidised by government and therefore differentiates between fees for local students and those outside its geographical area. In the virtual class the fee structure however needs to take the local target market of the student into account in order to be competitive in that specific market - networked education therefore calls for differential pricing.

Managing networked education therefore needs to be relevant to the market in which the trends, threats of competitors and the needs of students are paramount.

9.8 Computer Mediation

In embracing networked education, an organisation also embraces the ubiquitous use of ICT, as networked education is the expression of the virtual class when teacher, learner, problem and knowledge interact through Internet and intranet based technologies. Networked educational management therefore is highly computer mediated.

In a systems based approach, using the MIT90 schema (*see* figure 1.3), the computer-mediated nature of networked educational management impacts on strategy, roles and skills of individuals, management processes and organizational structure. In this environment the management in all its fractal dimensions will be largely computer enabled for instance through electronic communications, reporting, tasking and delegation, project management and class management. The reality in conventional tertiary education is that instructional design often excludes graphic design and ICT design. In networked education however, instructional design in practice generally also includes graphic design as well as ICT design. The scope of instructional design in practice therefore in the virtual class is wider and thus different from the practice in conventional education. The ubiquitous use of ICT in institutes which uses networked education extensively, thus requires higher levels of computer and information literacy of academic an administrative staff as well as their students.

Widespread participation by on-campus students in networked education could naturally increase the demand for access to on-campus ICT. The convergence of traditional on-campus education and distance education could therefore require a decrease in spending on lecture theatres and an increase in spending on extending computer facilities like computer laboratories and the availability of intranet access in more public areas like libraries

An extensive set of technologies, which have become transparent through their ubiquitous integration into every-day life and through our frequent use, constitutes the infrastructure of conventional on-campus or distance education. The technologies and systems necessary for instance for a typical conventional lecture include transport, media, electricity, air conditioning, buildings, ducting, clothing, food preparation, piping, waste systems and so forth. The virtual class also requires an extensive infrastructure that parallels that of the conventional class but are constructed digitally (Tiffin, 1997).

A specific management issue in the planning of the computer-user interaction is to take ergonomics of the physical interface and the equipment used to interact with the ICT into account. It is necessary for both the teacher and the student in networked education to manage this aspect of the computer-user interaction in order to avoid the possibility of repetitive strain injuries (RSI) - also called operational overuse syndrome (OOS). The institute has a responsibility to create awareness and to provide the necessary knowledge and skills to both the teacher and the student in networked education to manage the computer-user interaction appropriately.

Computer mediated collaboration in networked education has become widespread (Bates, 1993b). A new requirement for management in the information or knowledge society is managing the dynamics of communication in a virtual environment (Gundry and Metes, 1997). Tapscott (1996:55) highlights networking and collaboration as a vital modern management issue. Networked educational management therefore needs to include the particular challenges in the management of computer mediated collaboration such as dealing with anonymity, authenticity and the lack of traditional communication clues.

Networked educational management for technology managers incorporates the phenomena that some people when they don't have the skills to work effectively online, may blame the technology (Gundry and Metes, 1997). Technology managers need to be able to point to available training opportunities and support mechanisms for mastering the new ICT (as discussed in Chapter 8).

Networked education uses the tools of the emerging information or knowledge society as the educational tools. At this stage these tools are however not only in its infancy and undergoing revolutionary changes, but the full complement of what is required is not fully established. In the current phase of networked education, there are often realisations of totally new technologies needed (Tiffin, 1996) like automated hyperlink verification systems (Hyperwave, 1998) or significant changes required to existing technologies like Word-processing HTML documents.

Networked educational management therefore strategically manages ICT as essential, critical elements of networked education. Michael Porter (Pastore, 1995, October 1) points out that the best way to think about ICT is not as a separate entity, but as integral to what makes a company unique in all its activities.

9.9 Collaboration

Collaboration is central to many dimensions of networked educational management. Collaboration among institutes is due to the pressure of increased competition through the wider global reach of networked education. It is founded on the networking dimension and relates to its boundary orientation in that institutional and transnational boundaries are transcended through increased collaboration.

Tapscott (1996) points to collaboration and networking as central management issues also applicable in education. It is becoming common for conventional tertiary educational institutes that wish to progress along the path of networked education to link up with others working in this field and correlates with one of Fullan’s (1991) six themes of educational change namely to establish alliances. Many universities and colleges are indeed positioning themselves for effective participation in distance and particularly networked education through collaborations on institutional level as in *Universitas 21* (1999), ECIU (1999), NUDC (1999), CENIC (1999), ADEC (1999) and METEOR (Indramalar, 1999 April 23). This seems to confirm Michael Porter's emphasis on clustering within competitive industries (Caulkin, 1990).

The collaboration is however no longer exclusively that of educational institutes. It could include private enterprise, entertainment industry players and other (Evans and Nation, 1993). Networked educational management, being based on ICT, would have to contest with an openness of huge proportion (Garrison, 1989). This openness increases collaboration opportunities with other institutes and could lead to large learning systems that could well be a network of institutions (Forsythe, 1984).

Through collaboration, networked educational management links to the form of organisational design called a "network structure" in which outsourcing is used extensively (Robbins and Barnwell, 1998). Drucker (1995:68) identifies outsourcing as a central example of managing in what he calls the "networked society". Essential educational processes can be outsourced (as described above) through wide collaboration with other institutes facilitated by the Internet and other digital technologies.

The possibilities and ease of student collaboration are also enhanced through synchronous and asynchronous on-line communications that lead to increased connectivity. Electronic mail, CHAT, hypermail threaded message boards and the like provide opportunities for students to collaborate in cost-effective ways with each other and others external to the student body. Hodgson, Mann and Snell (1987) refer to student and teacher collaboration as "expert networking". Through the new technologies discoveries can be shared, as well as developments and reference materials.

Collaboration furthermore pertains to instructional design for networked education where a team orientation is prevalent in development. The research indicated that a multi-disciplinary team is required in the design and development of networked education because of the need for educational, graphic design and communication and information technology perspectives. This is in contrast to instructional design in conventional tertiary education that is often a solo activity of an individual lecturer (discussed in Chapter 8).

The team-concept is one that is proposed in a more generic sense in private enterprise by Peters (1988), Drucker (1998), Hayes and Watts (1986) and Tapscott (1996). The learning and development teams in networked education however display the characteristics of a virtual team; that is a group of people working towards a common goal in a computer-enabled environment where they are removed from each other in physical space (and often in time). Therefore understanding how a virtual team operates is necessary in managing the on-line learning of students and the development of networked education.

Collaboration and exchanges with others in the field nationally and internationally do however require strategic planning and management as well as resourcing for instance to acquire and install the ICT to be used for interacting with others, travelling and conference costs, obtaining applicable literature and facilitating exchange agreements.

9.10 Convergence

The convergence that networked educational management need to address finds expression on the institution level as well as the more detailed learning levels.

On institutional level this convergence is increasingly among educational institutions, enterprise, entertainment and the like (Evans and Nation, 1993).

The convergence that networked educational management needs to address is related to it being computer mediated. ICT is fundamental to the operations of networked education (as described in 9.8 above). Bates (1995) points to the convergence of telecommunications, television and computing as an important technology trend for the distance-teaching organisation (p. 45), while Tapscott (1996) highlights convergence of computing, communications, and content industries as one of the themes of the new economy. Networked educational management needs to manage a new integration or convergence of computing, communications, and educational content.

Networked educational management deals with a new convergence of on-campus and distance learning which has been made possible through networked education particularly with the advent of intranets and the Internet. Garrison (1989:117) notes that this convergence is "…blurring the boundaries between conventional and distance education". Bates (1984a) also suggests that many dual mode institutes will emerge as conventional education move into distance education This is due to an increase in the ease and feasibility of simultaneously offering a networked course to on-campus students as well as to distance students. With the same interface (that is a Web browser), networked education and teaching materials are available to both local and distance students. Students can evaluate each other's on-line published materials, do group assignments together and form informal study groups. The shape that this convergence might take can vary. Teaching and learning materials for instance can be placed on-line as well-designed networked courseware which include on-line communication facilities, different navigation paths, catering for different learning styles, access and pointers to other WWW resources and exercises. The local students may also have face-to-face tutorials to work through exercises and may sit tests and exams in a physical building. Distance students also have access to the on-line materials but have on-line real-time tutorials, may attend some workshops on the physical campus, and do their assignments on-line. Berge and Schrum (1998:31) contends that “it is important to recognize that on-campus programs and courses may often use the same resources and infrastructure as those delivered to students at a distance”..

The synergy that networked education brings is that both local and distance students can participate in the processes of the same course occurrence in a real and meaningful way through synchronous and asynchronous on-line communications (Bates, 1984a; Lundin, 1993). This convergence of learning modes which traditionally have been referred to as “distance education”, "extra-mural education", “on-campus education” or "face-to-face" education means that both learning control as well as on-line learning and teaching materials are distributed to both local and distance students using the same interface that is a Web browser. Dhanarajan (1998) and Lundin (1993) questions in the context of open and flexible learning whether it still make sense to draw a distinction between distance and conventional education. Networked educational management through its networking dimension addresses this convergence and makes the virtual class “mode-independent”. Networked education therefore creates the possibility for conventional tertiary education to realise the benefits of dual-mode institutions like flexibility and an extended range of courses (Evans and Nation, 1993).

The convergence on macro- and micro-level does not necessarily mean conformity. Networked educational management is based on a distributed or networked model (described in 9.1 above) and can therefore couple centralised (strengthening conformity) and decentralised (encouraging divergence) management approaches. Networked educational management can ensure conformity to central principles and standards as Evans and Nation (1993) contend, and simultaneously encourage diversity (Frederick, 1993; Negroponte, 1997 June).

9.11 Boundary Orientation

Networked education opens the boundaries of an organisation and make it more vulnerable to the external environment (Middlehurst, 1993). The external environment for conventional tertiary education includes its customers, its competitors and beneficiaries. Networked educational management therefore needs to address the expanded need for effective boundary management. An emphasis on boundary management correlates with the organization of the future proposed by Peters (1988a), Tapscott (1996) and Daft (1989). It also correlates with the importance to develop boundary roles as an essential element of effective network management (Limerick and Cunningham, 1993), as well as the notion that the learning organisation is boundaryless (Marquardt, 1996).

The extensive use of the Internet in networked education further leads to an extension of the boundaries of an organisation's academic and administrative systems. Networking now often transcends national boundaries (*see* 9.3 and 9.9 *above*) so that the Global Alliance for Transnational Education (GATE, 1999) describes the current educational environment as the "…new borderless educational arena".

A major boundary management issue in networked education is to provide adequate access to courses. Spender (1996, August) asserts that the borderless information environment is not open to all the peoples of the world because of access and equity issues. Terms often used in regard to equity of access are those who are "information rich" and those who are "information poor" - which often leads to social and financial impoverishment (Hope, 1998). Not only is access to the virtual class limited through inadequate access to appropriate ICT and Internet costs, but also through computer illiteracy which needs to be addressed through training and support systems (discussed in Chapter 8).

The ongoing changes in ICT have been creating a seemingly unending spiral of regular upgrades to software and hardware, which leaves many students wanting when they desire to access networked education. There are initiatives to address these issues like Cybercafes, Internet access in public spaces like libraries, arranging adequate on-campus computer access, collaboration with other educational institutes to provide access to remote student as well as Telecentres which are widely used in Australia (WA Telecentres, 1995) and Europe and growing in Africa (Naidoo and Schutte, 1999:90). "Drop-in" computer labs can be provided for on-campus students participating in networked education via the intranet and computers can be placed in public access areas like the library. The cost of access to networked education also needs to be addressed. The institute can endeavour to negotiate favourable contracts for Internet access and ICT on behalf of their students.

Networked courses further need to be designed with the lowest possible "footprint", which is the required technology on the student's side. This includes designing networked education so that students in networked education can stay off-line for most of their study time, while naturally have to be on-line for communications. This can be achieved through compressing a course into a single file for the student to download. Even with the smallest “footprint” on the students’ side, it might still be necessary to be able to provide a hardcopy or off-line softcopy of the course materials.

With increased access and extended boundaries comes an increase in the possibility of abuse, which highlights another boundary management issue: ensuring security of the ICT systems in networked education (discussed in Chapter 8). Addressing accreditation and certification across national and academic status barriers however, is a prominent issue in boundary management of the virtual class (described in Chapter 8).

The boundaries in administrative systems supporting networked education can also be transcended in networked educational management through on-line applications and on-line enrolments that use the asynchronous mechanisms of networked education like electronic mail and on-line forms. It can remove the typical bottlenecks and physical queuing that frequently occur during the application and enrolment periods in conventional tertiary education.

9.12 Information based

Information management in networked education is critical because the virtual class deals with the movement of bits of information rather than atoms (Negroponte, 1995). Tiffin (1997, April) asserts that the promise of the global information infrastructure is that teachers, students, knowledge and its applications can come together not as atoms but as bits of information. Networked educational management therefore deals with an education space rather than the education place - similar to the notion of a "marketspace" that is a virtual market place (Rayport and Sviokla, 1995).

The virtual class is further interconnected with the information or knowledge society as it can be seen as the educational response to the needs of the information society. Tiffin (1996b, November:1) describes the virtual class as "... a new educational paradigm that matches the needs of an information society " - a society organised around the utilisation of information. Rayport and Sviokla (1995:75) point to the central role that information play in the virtual class when they write about a virtual market place, which they characterise as being virtual because the value adding processes "...are performed through and with information".

Managing real information overload in the virtual class has become a serious challenge for both students and teachers (Gundry and Metes, 1997; Marquardt, 1996). This dimension of networked educational management is closely linked to Drucker's (1995) concept of the information-based organisation. The vast resources on the World Wide Web, on-line databases, newsgroups, threaded message boards with evolving discussions, discussion lists (like Listservs), and increasing volumes of electronic mail creates information overload and stress, if not managed properly. Developing critical analysis skills and increased information literacy (as discussed in Chapter 8) will become increasingly important as the information or knowledge society and networked education, as the corresponding educational paradigm grows. Victor (1999, July) further asserts that information overload can be addressed through the effective use of information architecture while Gundry and Metes (1997) points to the positive role that communication protocols and filtering devices can play.

Part of effective information architecture is the use of relational or object-oriented database approaches for data management in networked education (Gibson and Hughes, 1994; Lobodzinski and Williams, 1996 June; Lennon and Maurer, 1996 June; Schultheis, and Sumner, 1989) of which Hyperwave 1998) is an example. Many networked education software packages take the notion for granted that course elements ("course objects") are to be stored in flat directory structures as a series of files. HTML files as well as media elements and scripts are stored on servers in an organised flat directory structure which is reminiscent of how data was stored before the emergence of databases. Using a series of files can be an effective initial strategy to rapidly engage in networked education, but does not in the long run constitute effective data management. Relational databases and object-oriented databases have emerged as effective, sound and popular ways of storing data in computer systems (Schultheis, and Sumner, 1989; Stair, 1992). It reduces data redundancy (duplication), increases data sharing while improving data consistency, data independence (data are separate from its definition) and data administration and control (Schultheis, and Sumner, 1989:224).

The need for self-discipline and continuity of motivation of student is amplified in the virtual class due to its virtual nature, being information-based. The traditional prompts such as physical materials on a desk, or scheduled class times are often absent. Networked educational management includes effective instructional design using appropriate multi-media, effective monitoring of participation through computerised or manual tracking, asynchronous and in particular synchronous communications (Mason, 1999 July). These mechanisms can play a positive role in enabling the student to successfully address the virtuality of the information dimension in networked education.

Networked educational management as it relates to the library has to address the largely electronic information base of the new library. The fact that the library as physical device is not required in the virtual class has huge implications for conventional tertiary education regarding their mobility, flexibility, capital costs and competitiveness.

The information base of the virtual class also underlines the solemn management issues of ensuring privacy of personal information and security of ICT systems underlying the virtual class (as discussed in Chapter 8).

Networked education is based on information exchanges. Drucker (1998) describes the shift from the command-and-control organisation to the information-based organisation as the third major evolution in the concept and structure of organisations since modern business enterprise first arose. Networked educational management aligns itself to this evolution and exercises control through information and communication and not through bureaucracy (Garrison, 1989).

CHAPTER 10
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Chapters 8 and 9 constitute the thesis of this study. Chapter 8 presents a set of heuristics as a tentative model for managing the implementation of the virtual class infrastructure in conventional tertiary education. Chapter 9 proposes a new tentative educational management paradigm for the virtual class called networked educational management.

The writer offers these findings tentatively and with a cautionary note in the words of Fullan (1991:350) to "…employ this knowledge in a non-mechanical manner along with intuition, experience and assessment of the particular situation…"

Chapter 10 provides a summary as well as overall conclusions and recommendations.

This study set out to identify what the key management issues are when implementing the virtual class in conventional tertiary education. It endeavoured to do this by establishing how the implementation of the virtual class infrastructure in conventional tertiary education as well as the operations of the virtual class are to be managed.

An action research approach was followed over three and half years that studied the endeavours of Wellington Polytechnic, a conventional tertiary educational institute in New Zealand, to manage the implementation of the virtual class infrastructure and the operations of the virtual class. The implementation of the virtual class infrastructure at Wellington Polytechnic advanced over the research period from a pilot project in July 1995 to offering commercial networked courses by December 1998. Using the terminology of Rogers (1983) the diffusion of this innovation included early adopters but was far from reaching critical mass.

The experience of implementing the virtual class infrastructure at Wellington Polytechnic does not confirm the smooth contours of Roger's diffusion of innovation curve (*see* Figure 2.1). The various barriers that were encountered (both internal and external to the HYDI team), the uncontrollable events that negatively and positively impacted on the HYDI project, the mistakes made and fruitless experiments point to a ragged contour of the innovation "curve". This innovation at Wellington Polytechnic experienced many of the problems that Fullan (1991:27) refers to in political change like "… overload, unrealistic time-lines, uncoordinated demands, simplistic solutions, misdirected efforts, inconsistencies, and underestimation of what it takes to bring about reform". It was many times a case of a few steps forward and a number of steps backward.

More of a team approach could have been followed that could have added other significant insights. The action research methodology would have facilitated a team approach well. The writer acknowledges the subjectivity of this study and the impact this has had on both the process and outcomes of the research.

Further activities regarding the implementation of the virtual class infrastructure at Wellington Polytechnic would seek to move this innovation to reach a critical mass, which is Rogers' (1983) indication of that point at which a sufficient number of individuals have adopted an innovation so that its further rate of adoption becomes self-sustaining. Effective administrative and educational support services for networked education were not in place at this stage and would need serious attention in the further implementation of the virtual class infrastructure at Wellington Polytechnic. Details of the planned further implementation of the virtual class infrastructure at Wellington Polytechnic are contained in HYDI's three-year plan (Appendix 22).

Following the merger on 1 July 1999, Wellington Polytechnic became Massey University at Wellington after this research had been concluded. Massey University is a dual mode institute and is the major provider of university distance education in New

Zealand. This will most probably energise the implementation of the virtual class within Massey University at Wellington. However, It could also stifle the implementation of the virtual class, as networked education could be interpreted as just “another mode” of delivery and buried in traditional on-campus and distance education policies, practices and processes.

10.1 Managing the Implementation of the Virtual Class Infrastructure

This study concludes that the diffusion of innovation theory of Rogers (1983), which proposes a bottom-up approach when the innovation emerges from outside senior management, needs to be augmented with a top-down component for effective diffusion of the virtual class in conventional tertiary education. The top-down component needs to include both senior and middle management.

Lack of funding is often touted as a key stumbling block in the implementation of the virtual class in conventional tertiary education. This is indeed the case in the Pacific Rim, as Rajasingham (1999:170) points out: “New Zealand and the Pacific Islands are well aware of the need for a paradigm shift in education delivery, but are grappling with the world-wide problem of a lack of resources to provide equitable access to information technology”.

More important than lack of funds, might be the lack of vision and of creating a strategic implementation framework for the effective implementation of technological innovations like networked education. Berge and Schrum (1998:35) contends that “the most important function of institutional leadership may be to create a shared vision that includes widespread input and support from the faculty and administration, articulates a clear educational purpose, has validity for stakeholders, and reflects the broader mission of the institution”. Rajasingham (1999:166&170) also points to the imperative of addressing management infrastructure within tertiary education in New Zealand, and of addressing the lack of vision for the virtual class Naidoo and Schutte (1999:90) also point to this need in the African context: "If African countries cannot take advantage of the information revolution and surf this great wave of technological change, they may be crushed by it… Catching this wave will require visionary leadership in Africa". Bates (1995:47) contends that "…even more important than an environmental scan for managing change is the development of a long-term vision", the implication of which is stated explicitly when Bates (2000:42) asserts that "…the widespread use of new technologies in an organization does constitute a major cultural change. Furthermore, for such change to be successful, leadership of the highest quality is required".

The challenges to conventional tertiary education therefore require imaginative and bold leadership. Leadership Paul (1990:66) asserts in the context of employing what he terms "open management" that a value-driven leadership approach is required to transcend the traditional models of educational management. Limerick and Cunningham (1993:37) connect to value-driven leadership when proposing the use of transformational leadership as part of their "Fourth Blueprint" for the organisational life at the turn of the century. "Passive stewardship as a concept of management … is no longer a useful option when the continued viability of the institution over which stewardship is being executed is threatened ... [it] demands enlightened, innovative, and aggressive leadership" (Karol and Ginsburg, 1980:246). Tom Peters asserts that "my own hypothesis about tomorrow's survivors is that they will be fast, intuitive, opportunistic, hustling, caring, trusting, empathising, cheer-leading, emotional, mistake-making and action taking. It is about as close to a 180 degree flip-flop as could possibly be imagined" (Caulkin, 1990:79).

A strategic plan for the implementation of the virtual class infrastructure needs to incorporate the possibility of second level effects. It is also vital to ensure that proper feedback loops (*see* Chapter 1) are built into the implementation system. Senge (1990:60) points out that novel ideas tend to cause behaviour to grow better before it grows worse. Sproull and Kiesler's (1991) explain that second level (or second order) effects are more significant and longer lasting than first level (or first order) effects. They assert that second level effects occur because the technology transforms how people depend on and relate to others, and what they attend to. Hermann (1997, June) illustrated second order consequences of using the WWW for teaching in relation to access, changing concepts of teaching and learning and the changing nature of interpersonal communication. He states that “each in its own way provides anecdotal evidence for positive and negative unintended consequences of the use of this mode of teaching and learning in distance education.” Gundry and Metes (1997) note that second level effects have to do with changing the design of interaction, work process and social organization. Gundry and Metes warn that second level effects can indeed defeat the intended first level effect. They quote the example used by Neil Postman (1990) that Gutenberg, the inventor of printing, was a devoted Christian, and thought that the printing press through the wide distribution of the Bible would advance the cause of the Holy Roman See. In fact, it brought about a knowledge revolution that destroyed the monopoly of the Church.

The set of heuristics for managing the implementation of the virtual class infrastructure in conventional tertiary education provides a broad area for future investigation into its second level effects as it is mainly based on first level effects of efficiency and productivity.

Implementing networked education needs to be a strategic objective and direction of an institute and the reward systems need to be tied to the implementation of networked education. The institute’s reward systems should encourage academic staff and students to become and remain involved in networked education if it desires to implement the virtual class infrastructure widely within the institute. Structuring networked education projects as research activities can legitimise the involvement of academic staff and might be essential to secure academic staff involvement when the scholarship of teaching is not recognised to the same degree as for instance the scholarship of research.

Strategic management of the implementation of the virtual class infrastructure needs to address the interests and concerns of administration, academics and students. Willmot and McLean (199499) found in a case study of an Australian University that "…each group has its own interests and concerns, which, at times, overlap, but at others, diverge".

Particularly important is addressing the perceptions, fears and concerns of academic staff in order to change their attitudes and to ensure ownership. The extensive interest in the workshops that the writer conducted regarding networked education indicates that staff development can be used as an important strategy to advance the implementation of networked education among academic staff.

The critical and fundamental role that ICT play in networked education point to the need for a strategic training and support plan for academic staff and students in the educational reform that effective networked education induces. There is a need to increase the general level of computer and information literacy within an institute as a strategic goal when implementing networked education. Sustained ICT support and training is necessary due to the new skills, wider choices and distinct philosophies of the virtual class. The dramatic increases in the amount of information available that students and teachers in networked education has to contend with calls for increased critical analyses and knowledge management skills of both students and teachers. Acquiring these skills and dealing with the stress of change, extended choices and information overload underlines the imperative for proper training and support mechanism for teachers and students.

It follows from the central position of students in networked education that they could contribute significantly to the bottom-up swell of innovation diffusion in conventional tertiary education. Students need to be considered as agents of educational reform in concert with academics and managers. The diffusion of networked education will gain increased momentum in an institute when students petition for its widespread use.

The links and liaison with other institutions and individuals involved in implementing networked education proved to be a major source of encouragement, critique and inspiration. Networking at conferences led to continued exchanges and sharing of operational as well as research progress. Peers at national and international conferences where the writer presented some of the interim research findings as papers provided helpful feedback through their comments as well as through the papers they presented. Networking within the institute proved to be essential in diffusing networked education, obtaining support and ensuring ownership.

10.2 Managing the operations of the virtual class

This study was based on the hypothesis that a new kind of educational management is required in conventional tertiary education for managing the operations of the virtual class. Although the research intention was to be deductive rather than conclusive, that it would uncover and highlight rather than lead to closure, this research led to the identification and formulation of a new type of management required for the operations of the virtual class namely: *networked educational management*. In this regard it would seem in the words of Luke (1978) that the virtual class indeed is “new wine” that require the "new wineskin" of networked educational management.

An institute that uses networked education extensively will need to develop a ubiquitous ICT architecture to match the central role of ICT in networked education. Effectively managing ICT, which forms the base of networked education, may also assist in attracting external resources that can further fund this innovation. Yetton (1993), in his research of twelve universities' management of IT, uses the MIT90 schema (*see* Figure 1.3) to illustrate the important role of technology in an organisation's performance, and claims that the universities that succeed in getting IT right, will attract resources; those that get it wrong, will not.

Networked educational management is based on a distributed or networked model and has therefore an advantage above both centralised (strengthening conformity) and decentralised (encouraging divergence) management approaches. Conventional management of tertiary education have been described as having a peculiar model of centralisation in administration and decentralisation in academic endeavours which often lead to frustration and counter-productive outcomes which have been referred to as organised anarchy (Cohen and March, 1974). Networked educational management can ensure conformity to central principles and standards while it simultaneously encourages diversity and may contribute to the bridging of the traditional schism between the administrative and academic areas in tertiary education.

The enhanced effectiveness that networked educational management can bring to tertiary education is based not only on the premise that it is an appropriate management response to the new educational paradigm of the virtual class, but also through new synergies. Tapscott (1996:xiv) describes this possibility as follows:

> The Age of Networked Intelligence is an age of promise. It is not simply about the networking of technology but about the networking of humans through technology. It is not an age of smart machines but of humans who through networks can combine their intelligence, knowledge, and creativity for breakthroughs in the creation of wealth and social development… The network becomes the computer – infinitely more powerful than any single machine. And networked human intelligence is applied to research, thus creating a higher order of thinking, knowledge - and maybe even internetworked consciousness – among people. The same networking can be applied to business and almost every other aspect of human endeavor – learning, health care, work, entertainment.

This research through the notion of networked educational management offers a variety of further research opportunities. Bertalanffy (1968:18) points out that the "…earlier versions of a new paradigm are mostly crude, solve few problems, and solutions given for individual problems are far from perfect".

Further research could explore the effectiveness of networked educational management and the heuristics of implementing the virtual class infrastructure in other conventional tertiary educational institutes, non-conventional educational institutes for example distance educational institutes and dual-mode institutes, as well as in secondary and primary education. Networked educational management could further be examined in different organisational and national cultures.

The collaborative nature of networked educational management calls for further investigation of effective physical and virtual team processes and principles in tertiary education. Aspects of team motivation, decision-making, autonomy and accountability needs to be explored within the framework of the learning organisation.

It is a paradox that conventional tertiary education which has traditionally been the main providers of post-secondary learning in society seems to be enormously challenged to become a learning organization itself – adaptive, flexible, information based and responsive to its environment. Eric Hoffer stated that in a time of drastic change, it is the learners who survive; the 'learned' find themselves fully equipped to live in a world that no longer exists. Will conventional tertiary education be able to transform its management approaches and processes to the extent required when there is widespread use of networked education? Can it implement networked educational management to its fullest extent? In the context of the emerging digital information age, Tapscott (1996:37) asks the following questions: "Can the formal education system transform itself? …Will teachers and administrators be able to reinvent education?". This research has not provided positive responses to these questions.

Luke (1998) feels so strongly about the fundamental differences between conventional face-to-face and virtual universities that it prompts him to state that "virtually all the rules governing face-to-face universities make it difficult, if not impossible to run a virtual university; you just don't migrate into Cyberspace from a built environment". Taylor, Lopez and Quadrelli (1996) believe it to be improbable that conventional tertiary education can transform itself. With technology becoming more pervasive in all aspects of teaching and administration, academic as well as general staff roles are being transformed. Across all key areas new positions and skills are needed. From the diversity of staff development strategies and activities that universities are adopting, we identified three approaches to deal with this challenge. These approaches will need to support an accelerated shift from teaching to learning, delivered not by individual lecturers but by multi-functional teams. Universities are poorly equipped and under resourced to manage this strategic change.

The extensive management and wider implications for a conventional tertiary education institute when implementing the virtual class might further be pointing to the emergence of a new kind of educational institute. This study has shown that implementing the virtual class needs to have an extensive impact on the management processes within conventional tertiary education. It further confirmed the centrality of management processes in implementing technological innovation as depicted in the MIT90 schema (Figure 1.3). Networked educational management needs to occur on all levels and in all areas of an institute that seriously engages in networked education. It follows that the kind of institute that fully adopts the virtual class will display fundamentally different characteristics than that of a conventional tertiary educational institute. In terms of an overall organisational structure it seems possible therefore that *networked educational institutes* might emerge which will actualise networked education and use networked educational management to its fullest extent.

Finally, educational principles need to guide the implementation of the virtual class in tertiary education. Corporate universities and private enterprise are poised to supersede the current role of conventional tertiary educational institutes in higher education. Tertiary educational institutes need to respond to the requirements of the information society to ensure that educational principles govern future post-secondary education. Johnston (1997:120) aptly puts it: "there is no alternative but to face the inevitability of a profound impact of new technology on teaching and learning and to work to establish a rich educational environment within that framework…"

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APPENDICES

Appendix 1
Draft Project Proposal

Combining **hypermedia** on the **World Wide Web** (WWW) as a **distance learning** medium
with current educational strategies to
provide education to both **overseas** and **New Zealand students**.

Presented to Bob Bubendorfer and Head of the School for Business and Information Systems on 8 September 1995

Contents

1. Terms of reference

This report was compiled by Philip Uys, Senior Lecturer, Department of Computer Studies, School of Business and Information Systems, Wellington Polytechnic.

The aim of this report is to establishing the **initial feasibility of the vision** for the Wellington Polytechnic as described here.

This report is a "draft" proposal owing to :

* the strategic focus of this report,
* the early stages of conceptualising and
* the great number of variables and parameters of this project due to
  - -its wide scope and
  - -the speed of changes in the underlying computer technology.

A more complete investigation (incorporating more role players and lower levels of detail) will be required to establish the feasibility of this **project**.

2. Vision

Combining **hypermedia** on the **World Wide Web** (WWW) as a distance learning medium with current educational strategies to **provide education** to both **overseas** and **New Zealand students**.

In conjunction with strategies to draw students physically to Wellington, this strategy will deliver our products to students *where they are.* We will be able to offer a unique combination of :

* hypermedia presentations
* visits by lecturers to **major** centres/pockets of our hypermedia-students in overseas countries and to other centres in New Zealand on a periodical basis in order to :
  - conduct student group work
  - present key lectures and
  - address learning problems.

* attendance of students invited to attend annual/semester workshops locally at the Wellington Polytechnic.

The hypermedia presentations will clearly define the NZQA units on the framework that can be achieved within our courses and we will thus be able (where we have been accredited) to offer national qualifications to foreign students.

3. Background

At a workshop on hypermedia, by Prof. Suave Lobodzinski (of California State University and currently a Fulbright Visiting Scholar at the University of Auckland) at this Polytechnic, and sponsored by our Research Development Fund, he stated that universities in the US are turning to hypermedia in an attempt to attract more students through distance learning.

At the University of Auckland a language called Hyper-G has been very recently developed specifically to solve four major obstacles in using the WWW for distance learning:

* links to information could be "dead" i.e unavailable
* no security on the servers
* absence of access control
* lack of database support which made finding documents very difficult.

Hyper-G was offered free to this Polytechnic and the Computer Studies department has already communicated with Prof. Lobodzinski who will be sending it shortly (we have the correct infrastructure to be able to use it).

The cost of satellite connections and network usage is steadily decreasing. In the US the cost of unlimited access to the Internet via satellite (!) is US$15 per month and a joining fee of around US$500 !

In a conversation with Mr Higgins, Director of "The Networking Edge" and the driving force behind the "Wire Wellington" project (to link buildings and later residential properties with a fibre optic network which have the bandwidth needed for video presentations), he stated that the business opportunities via the Internet are a *strategic new option* to be researched.

Client-server technology, which is becoming a standard in the structure of resource sharing between computers, offer the possibility of sending large files to servers capable of managing it, with access by the students (and their personal computers as "clients") which can have very basic configurations.

Dr Mimi Recker (recently from the US and currently at Victoria University) whom I met at a recent conference and who has ten years of research experience in using information technology in education, is convince that the Internet is going to revolutionise education internationally because it:

* provides, through hypermedia, a very **natural** (by combining the media) and **truly interactive** means of communication

* is possible to facilitate *group interaction* among the students *and* with the lecturer by using groupware (which has only recently become available) in presentations.

  ties in with the opinion of Paul Strassman (previous CEO of Rank Xerox) who stated that "case studies show that most of the benefits derived from information technology are derived from improvements in intra group communications rather than from acceleration of an individual's work"

* has an exponential growth in public and business awareness and number of users in most countries in the world, with an estimated number of current users of 40 million people and around 400 WWW servers internationally.

Prof. Robert Spence (Professor of Information Technology at the Imperial College of London), in the keynote address and in a personal discussion at the recent NZCS conference, stated that according to industry experts in the United Kingdom, most of the current hardware limitations would be removed in the following two decades. At the

Imperial College they also are looking at using the Internet for educational purposes (currently interesting work is done in the field of microbiology).

According to Mr Robert Lau from Singapore, the secretary-general of SEACC and speaker at the NZCS Conference, the opportunities in South East Asian countries for New Zealand educational institutions has greater potential than before on account of:

√ the high regard for our educational standards
√ deregulation and liberalisation sweeping across South East Asia.

4. Objectives

4.1 Reach and retain more clients (students) in foreign countries as well as in the wider New Zealand in a unique way, to address issues such as:

* income and cash flow
* physical space restrictions in Wellington and
* the growing need of specialised computer labs

4.2 Build a reputation of

- technical innovation
- quality of products
- addressing the client's needs in
- an international market.

4.3 Increase the productivity of our staff by **adding** the concept and application of hypermedia to content and facilities, which already exists.

5. Strategies

5.1 Receive senior management support for this project

5.2 Forge closer links with institutions, organisations and individuals currently conducting research and already involved in "Education and the Internet" and conducting business over the Internet (business areas currently realising the potential are less than 10!)

5.3 Conduct our own research into this area via

√ the above contacts
√ the limited number of publications in this area
√ conferences

in order to determine :

* feasibility
* detail requirements

* detail of resources required.

5.4 Constructing a project group from within the polytechnic and utilising external parties (where necessary and appropriate). The internal Polytechnic staff who attended the Hypermedia Workshop represented the Departments of Computer Studies, Design, Electrical Engineering, Academic Staff development and Fashion and Food.

5.5 Forge closer links with SEACC for penetration of these markets

6. Resources

6.2.1 People

Four categories of people are required on hypermedia projects according to Prof. Lobodzinski, namely

- * producer : performing project management duties
- * content director : organising and ensuring the quality of the content
- * graphics/design artist : ensure quality presentations
- * software specialist : expertise in hypermedia and the related software, hardware and networks .

This project brings together, I believe, the following disciplines:

* education (including psychology and sociology in education)
* multi-media
* networks
* client-server architecture
* systems development
* graphical design.

0.0.0 Hardware

* Multi-media computers: additional required at work and in some cases at home
* Good network links : fibre optic to be considered and satellite connections in the long run; we already have satellite connections via WWW

0.0.0 Software

* A language like hyper-G : will be obtained without expenses
* A type of UNIX : we have Lynux in Computer Studies
* Multi-media authoring package : which we have in Computer Studies and Design

0.0.0 Procedures

* forming a project group and establishing procedures

0.0.0 Finances

* evolutionary allocation of resources as project develops since we will be breaking large areas of new ground in conjunction with other institutions

7. Critical success factors

7.1 Top management support
7.2 Ensuring confidentiality of the project
7.3 Speed of implementation (since global on-line commerce is now perceived in a ore serious light by more businesses internationally)
7.4 Controlling access on the WWW to our educational materials
7.5 Bridging the gap of ESL to penetrate the Asian market
7.6 Working with SEACC in making the Internet more acceptable in a large number of Asian countries by providing solutions to their concerns such as (barriers are freedom of speech, pornography, terrorist activities)
7.7 Linking to the "Wire Wellington" project in the near future (at a cost of about $10 000 per building)
7.8 Basing our material on the NZQA Framework
7.9 Making resources available (people, finances, procedures)
7.10 Thorough planning and management of the project

8. Glossary

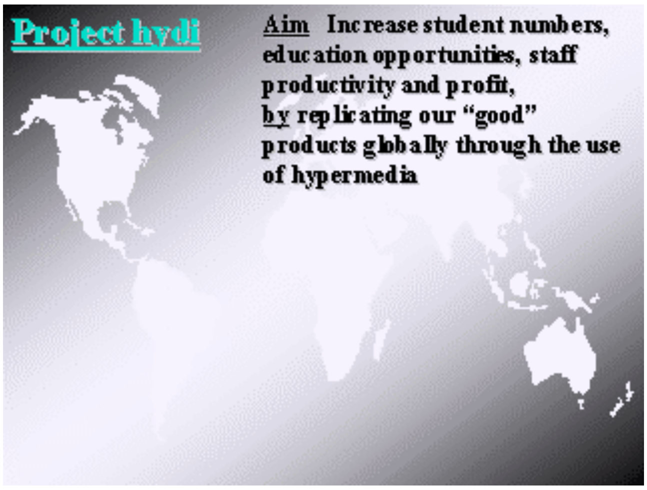
Bandwidth : the amount of characters possible to send over a network
Client-server : where the processing of a client-computer can be performed on another computer, the server, which has a bigger capacity

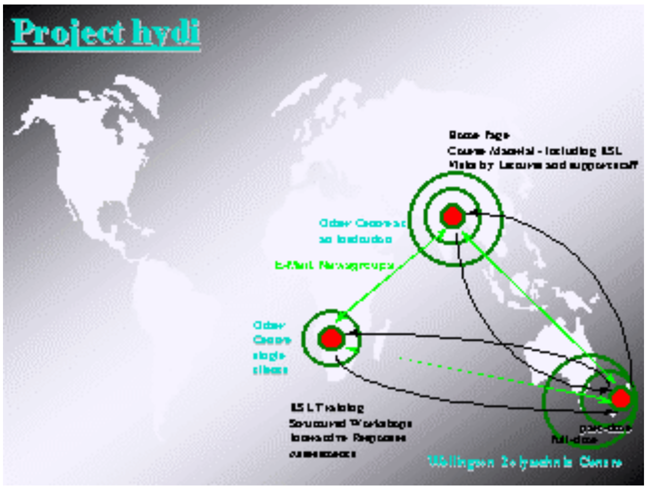
Hypermedia : multi-media over a wide area network like the Internet
Multimedia : digital media which combines sound, text, pictures, data, video and navigational elements
SEACC : South East Asian Computer Confederation
World Wide Web : the graphical user interface to the Internet

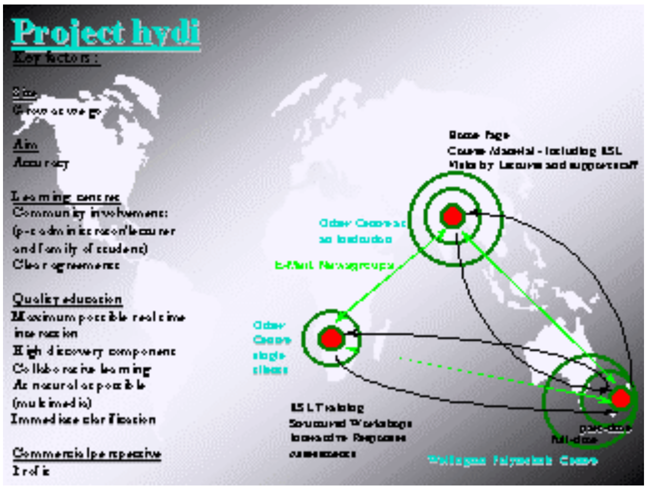
9. Resumè : September 1995

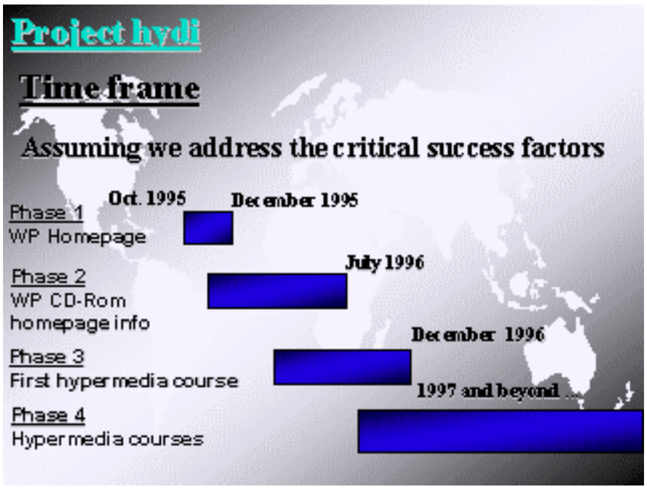
…..

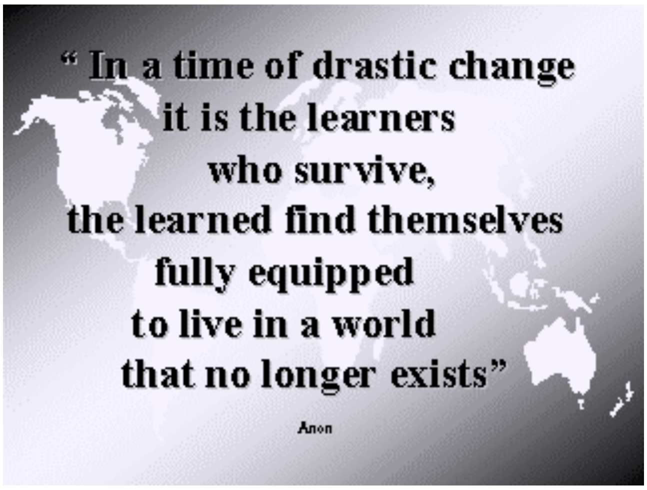
Appendix 2
HYDI Presentation


Project hydi
Aim Increase student numbers, education opportunities, staff productivity and profit,
by replicating our "good" products globally through the use of hypermedia


Project hydi
E-Mail Newsgroups
Wellington Polytechnic Centre


Project hydi
Key factors :
Size
Aim
Accuracy
Learning centres
Community involvement:
(p-t administrator/lecturer and family of student)
Clear agreements
Quality education
Maximum possible real time interaction
High discovery component
Collaborative learning
As natural as possible (multimedia)
Immediate clarification
Commercial perspective
Profit
E-Mail Newsgroups


Project hydi
Time frame
Assuming we address the critical success factors
Oct. 1995
December 1995
Phase 1
WP Homepage
July 1996
Phase 2
WP CD-Rom
homepage info
December 1996
Phase 3
First hypermedia course
1997 and beyond ...
Phase 4
Hypermedia courses


" In a time of drastic change
it is the learners
who survive,
the learned find themselves
fully equipped
to live in a world
that no longer exists"
Anon

Appendix 3
Project HYDI: Progress Report 1

Project HYDI

CONFIDENTIAL

Progress report 1

Presented to Bob Bubendorfer on 20 September 1995

Copies : (the author's head of school, the author's head of department)

Contents

1. Terms of reference

This report was compiled by Philip Uys, Senior Lecturer, Department of Computer Studies, School of Business and Information Systems, Wellington Polytechnic.

The aim of this report is to report on the progress of project HYDI.

2. Name of proposed project/venture

The project will be nick-named "HYDI" from "**hy**permedia in **di**stance education".

3. Personal involvement

I have considered your proposal to be the project manager for this project and would like to declare my availability in this capacity.

I will be happy to discuss changes in my job description and employment conditions with you.

…

5. Action plan of possible strategies :

The rough time span for each time period is displayed after each of the three headings.

The activities are neither in priority nor time order.

5.1 Short term (October to December 1995)

1. Conduct a pilot project to determine feasibility of project and to evaluate core participants' skills and ability to work effectively in a project team.

   Proposal: develop a Web home page for the Wellington Polytechnic by November 1995.
   Resources required: 50 person hours (2 weeks) to develop the page, time to obtain the contents and plan the project, time to set up the server, 16MB RAM (approx. $1000), possible additional equipment in CSG.
   Design: based on VUW, CIT and international home pages PLUS links to NZQA, Government, Tourism in NZ, NZ News and possibly to other tertiary institutions' pages etc. (provide good reasons for people to access our page; and measure the access) *(CSF)*

2. Establish a special interest group (SIG) on " Computer technology in education" at the Wellington polytechnic to :
   - create a pool of internally motivated people

- avoid political motivations
- obtain innovative ideas
- establish an openness among academic staff to use computer technology in education

3. Formulate project management philosophy
4. Compile the core project team (to ensure availability in 1996 and beyond)
0. Finalise changes in the project manager's job description and employment conditions (to ensure readiness in 1996) *(CSF)*
6. The Computer Services Group (CSG) to provide applicable infrastructure especially to:
   - provide Internet software (various products) and links *(CSF)*
   - provide links from home
7. Identify key individuals and share vision with them eg (Bob Bubendorfer, …,……) CSG, ….,….,,…,,…., Nick Zepke etc.
8. Play project low-key in terms of general and public awareness *(CSF)*
9. Attend conference in Australia on On-line Media and Commerce :
   - obtain info
   - make contacts
10. Senior management to share vision *(CSF)*
11. Establish contact with SEARCC
12. Establish contact with visionaries, developers and educationalists in hypermedia in the USA, Canadian and other developed countries (UK, SA etc)
13. Discuss Asian Market with HYDI Ext Adviser
14. Obtain suitable equipment for core project team members (work and home, where applicable) *(CSF)*

5.2 Medium term (February 1996 to July 1996)

15. Compile design principles
16. Compile HTML programming standards
17. Develop criteria to select the first qualification and courses to be offered via hypermedia *(CSF)*
18. Identify the first qualification and courses to be offered via hypermedia
19. Investigate :
    payment methods for courses
    security and access to courseware
20. Establish educational contacts in the markets to provide local support (whatever is required in this area)
21. Establish a marketing strategy *(CSF)* including:
    - determine key target markets
    - determine key target market needs
    - formulate strategies to achieve it
    -
22. Determine effective administrative services *(CSF)*:
    - registration
        - fees

- assessment procedures
    - logistics of visits to centra
    - logistics of visits to Wellington Polytechnic

23. Retain the core project team *(CSF)*
24. Determine applicable organisational structures, physical structures and facilities to support this venture *(CSF)*
25. Determine effective educational support services for students :
    - library facilities
    - Learning Support
26. Link with "Wire Wellington Project"
27. Extend software and hardware of our Web server *(CSF)*
28. Establish feasibility of the project *(CSF)*
29. CSG to provide further infrastructure especially Internet software and links *(CSF)*

0. Play project low-key in terms of general and public awareness *(CSF)*

Conduct second pilot project

Proposal : develop a CD with the "Web home page" information for the Wellington Polytechnic by July 1996.

Design : based on VUW, AIT and international CD's PLUS our own innovative ideas

0.0 Longer term A (August 1996 to December 1996)

31. Implement applicable organisational structures *(CSF)*
32. Retain the core project team *(CSF)*
33. Give project high profile in terms of general and public awareness *(CSF)*

0. Develop first course *(CSF)*

35. Make first course available *(CSF)*

0.0 Longer term B (January 1997 and beyond)

36. Implement applicable organisational structures *(CSF)*

37 Make further courses avialable *(CSF)*

40. Ensure continual quality assurance and effective management *(CSF)*

Appendix 4

PROPOSED CHANGE PROCESS FOR PROJECT HYDI

SUBMISSION OF NEW MATERIALS OR ALTERATIONS FOR WELLINGTON POLYTECHNIC HOME PAGE

Types of Data	May be submitted to project HYDI by:
Corrections marked on HYDI printouts; New data in hard copy from School, etc; New data on disk from School, etc; New data in email file from School, etc; Brochure or advertising material that regularly goes to Course Info. Centre; Events/news in Staff Memo, etc;	Directorate; Head of School or Department or Centre; HOS or HOD's delegate; Authorised Course Info. Centre contact person for a School or Centre - (Whoever this is, the person is referred to below as the **Link Person**.)

1. Incoming material goes to Technical Content Director, …….:

He checks whether graphic design is involved, and if so sends it to the Art Director.

He updates Course Information Centre documents if that is also appropriate.

2. Art Director makes any changes needed and returns material to …..

3. …….. sends approved data for entry into the Home Page by designated member of HYDI team. Printout of URL of the screen goes to Link Person to check.

4. The Link Person checks printout/screen data submitted. It is that person's responsibility to do any further checking required within their School or Centre.

5. Approved material or further alterations are sent back to ……. If alterations are required, steps 1-5 are repeated. If OK, go to step 7.

6. The new material is made active in the Home Page. Note: Any programming changes are carried by the "Web Master", ……..

7. If ……. does not receive any new material from an area, after a month he will check with the Link Person for data. It is important to keep the Home Page alive by updating materials regularly. This can be done much more quickly than waiting for the next print run of brochures or for print advertising deadlines.

To HOS/HOD:
…………………………………………
We would like to know if this quality process will work for you and your School or other Centre. We welcom suggestions for making this process work!
It is important that not too many peo are submitting material for the Hom Page, and that Link People are clear identified - so please confirm name(s Link People to ………….

Appendix 5
Extract

2 October, 1995

To: Philip Uys, Project manager, HYDI
From: ....

Confidential report regarding my participation in HYDI Project.

My interest and willingness to participate in this project

Thank you for inviting me to be involved in this exciting project. Education is one of many business opportunities on the Internet, and, in particular, the World Wide Web. I am very interested in being part of it.

…

Appendix 6

The Internet and Education: Possibilities and Challenges

Some examples and issues

Philip Uys
Senior lecturer: New Media
Project Manager: Hypermedia in Distance Education

18 July 1997

	Educational Areas	
Intrinsic qualities of the Internet	**Quality learning**	**Effective teaching**
1. It is a global phenomena The Net is available in hundreds of countries around the globe	• both real time and asynchronous international student interaction is facilitated • information sources that may be scattered across the globe can be made available to the students via hyperlinks	• whatever is produced local also available internationall • research resources that ma scattered across the globe a available to lecturers
2. Ease of publishing and maintenance HTML is a very simple and easy to learn rendering language; various software packages now have facilities to convert documents in other formats into HTML	• up-to-date material can be accessed since it is easy for lecturers to keep course materials up to date (only one source) • cyber students do not only have to be "consumers" of the information, but can be providers / publishers as well.	• keeping material up-to-dat easy (one source) • very few technicalities to l to start developing on-line course materials
3. Consistency of interface With Intranets becoming more popular, the Web browser interface is the same for both internal and external documents; this interface is also consistent across computer	• students doing internal / external studies have a consistency of interface • students can use their preferred computer brand / type to access course materials and course	• lecturers can use the same materials for on and off-ca students because of the consistency of interface; t convergence of traditional campus educational and traditional distance educati

platforms (eg MAC / PC)	related on-line facilities	major contribution of the N • lecturers can use their prefe computer brand / type to produce course materials a select course related on-lin facilities
4. Natural interface Using sound, movement, colour, text, video in both asynchronous and real time modes, an interface much closer to face-to-face communication than paper-based materials is offered	• better learning through supporting the narrative with sound, movement, colour, video, and the student therefore using more faculties	• can emphasise and present course materials in a more effective way
5. Seamless access Web information are linked together via hyperlinks in a seamless way - transfer is passed from one Web site to another in a way which makes it hardly noticeable	• students uses the same interface to access a range of materials • other resources around the globe on the Web can be easily accessed instead of just the materials in a local library or through inter-library loans)	• lecturers uses the same inte to access a range of materia research and course prepar purposes • other resources around the on the Web can be easily li to and in such a way be incorporated in the course readings / materials
6. Highly interactive Facilities like pop-up comments, e-mail, on-line forms, message boards, news groups, on-line real time communication makes this interface very interactive	• high level of involvement with the course materials through personal questions and responses • the social need of students to communicate with other students and the lecturer is provided for in a variety of ways; on-line real time meetings,	• support students individua better through personalised feedback • accountability and motivat students can be achieved th periodic on-line real-time meetings or asynchronous communications means

	which includes video conferencing on the Net, create a near “face-to-face” experience	
7.Unbound in space/time On-line information is available every day, around the clock, and around the world (pending network operation).	• On-line courses can be done in a truly open and flexible way at the convenience of the student	• through asynchronous communication facilities lik mail, message boards and r groups, lecturers can communicate effectively w students, fellow researcher others bridging both distan time barriers
8. Distributed, non-hierarchical The Web's technical organization is based on a distributed network model	• independent student learning and learning by discovery is facilitated in a natural way • the constructivist learning approach is naturally facilitated: students can construct their own knowledge • an on-line course supports a range of navigational paths from totally random navigation to a strict linear approach	• the lecturer can be more of facilitator through indepen student learning., learning b discovery and the construc learning approach • a range of navigational path be provided / engineered fo students
9. Is in line with the dawning of the Information Society Developed countries are moving away from an industrialised society (where physical production technologies strongly influenced the forms of service and way of living) to an information society (where information technology plays a key role in the forms of service and way of living)	• telelearning will increasingly become a very natural way of learning, just like tele-banking, tele-shopping etc. have become natural ways of performing those activities	• tele-teaching will increasing become a very natural way teaching

Appendix 7
Cycle 1: A Selection Of E-Mail Messages

In most cases pseudonyms or position titles replaced personal names to ensure anonymity.

1. <u>Subject: e-mail</u>

From: Graphic Designer.
Date sent: Thu, 5 Oct 1995 15:39:12 +0200
To: philip.uys@wnp.ac.nz
Subject: e-mail

I've read everything. I don't believe you do sleep! Very exciting.
...
Cheers, Graphic Designer.

2. <u>Subject: design doc/HYDI</u>

From: Graphic Designer.
Date sent: Mon, 9 Oct 1995 18:25:35 +0200
To: philip.uys@wnp.ac.nz
Subject: design doc/HYDI

Here is the first draft of our design document.

Design Document for Wellington Polytechnic Homepage

The design guidelines as set down in the signature document for the Wellington Polytechnic will be followed, for the Would Wide Web homepage. However, there are certain considerations and constraints when dealing in a cross platform electronic digital format.

Typefaces:
In the signature document the typeface Helvetica is listed as an alternative for Futura. In the case of a Windows environment Aerial is the copywrited name of the Helvetica font. This will be the body copy font.

Colours:
The two PMS colours; PMS 280 (Blue) and PMS 320 (Green) will be used for bullets, highlighting, and window dressing.
Computer terminals use RGB colour. The RGB version of the signature colours are as follows:

Colour	RGB	
Blue	0/0/100%	
Green	10%/100%/60%	(out of 255:25/255/153)

Master signature:
The Wellington Polytechnic master signature will be used with adherence to

specifications in terms of minimum area of isolation, reversal, and misuse or rearrangement of elements.

Cheers, Graphic Designer.

3. <u>Subject: Thursday Meetings</u>

From: "Bob" <DIRECTORATE/BOB>
Organization: Wellington Polytechnic, NZ
To: DIRECTORATE/PHILIP
Date sent: Tue, 10 Oct 1995 08:15:25 +1200
Subject: Thursday Meetings

Information Sessions on Plans for our WWW Page and our Project "HYDI", electronic media based education.

Two Sessions have been planned

Session 1 Thursday 12 October at 7.00am, Coffe and eats provided!
The Project Group plus invited people: PA, BP, TK, JO, AF, GI, BB

Session 2 Thursday 12 October at 8.30am
The first 15 minutes of the SMG meeting will be set aside for an introduction to "HYDI"
and the WWW page project.

Please comment and correct any misunderstandings

Bob

4. <u>Subject: Presentation by Philip Uys</u>

From: ....
Organization: Wellington Polytechnic, NZ
To: ....
Date sent: Tue, 10 Oct 1995 15:07:56 +1200
Subject: Presentation by Philip Uys
Copies to: DIRECTORATE/PHILIP

Philip will be making a presentation on Thursday 12 October, in T23, at a time to be confirmed, between 12 & 3.00pm. The subject is "..using hypermedia in distance education". This will take 40minutes.

Please email me by return asap, your availablility to attend the presentation, and include what 40 minute/flexible/ options between 12 & 3pm best suit.

Thank you
....

5. Subject: hypermedia presentation by Philip Uys

From: ....
Organization: Wellington Polytechnic, NZ
To: ....
Date sent: Mon, 16 Oct 1995 15:13:22 +1200
Subject: hypermedia presentation by Philip Uys
Copies to: DIRECTORATE/PHILIP

For those of you who were unable to attend either presentation last week - Philip will be arranging another session after Labour Weekend - to be advised.

....

6. Subject: HYDI etc.

Date sent: Tue, 17 Oct 1995 13:52:37 +1100
To: Team member B.
From: UserId@opennet.net.au (Real Name Unknown)
Subject: HYDI etc.
Copies to: philip.uys@wnp.ac.nz

Hi

Good day from Perth !
Trust that everything is going well.
How's the transfer of files from the Mac going ?
A few things that I've been thinking of :

…

Greetings to the team !

Philip Uys

7. Subject: Meeting on Friday

Date sent: Wed, 18 Oct 1995 20:42:26 +1000
To: c.latchem@info.curtin.edu.au
From: UserId@opennet.net.au (Philip uys)
Subject: Meeting on Friday

Dear Colin

Good meeting you and Helen at the conference in Bunbury.

Thank you very much for your availability to discuss issues of common interest in the open learning arena and for setting up these meetings.

The following areas are of specific interest to me. Please evaluate and decide whether we can't use the time more effectively, if you could for instance point me to an URL or literature that discusses these ISP Rep.ers, so that we rather concentrate on areas which is not in text format !

Category A : General ISP Rep.ers
^^^^^^^^^^^^^^^^^^^^^^^^^^^^
* at the leading edge : philosophy, developments and terminology
* infrastructure required in the "Open Learning Unit" at tertiary insitutions, both internally and externally within good role model organisations relating to :
  - people
  - IT
  - procedures
* good contacts in open learning :
  - international organisations
  - universities/polytechnics as good AND growing role model organisations
  - specifically polytechnics
  - specifically institutions in NSW, QLD and WA in Australia
* key educational elements to be addressed in open learning
  eg collaborative work, high discovery component, interactivity etc.
* current limitations and hurdles in open learning
* critical success factors in addressing the needs of
  - the part-time market
  - students in other cultures in other countries
* collaboration among tertiary institutions nationally and internationally
* international opportunities
* URL's or literature that is really "spot-on" (!)

Category B : Technical Issues
^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
* preferred media trends eg hypermedia, interactive video etc
* prefered hardware and network trends eg Web, CD-Rom, text etc
* overcoming bandwidth and other technical limitations

Category C : OLA (more in Helen's court)
^^
* nitty gritty issues of managing the screening and selection process of universities and their courses
* vision for extension and growth strategy
* key factors in OLA's successes and
* what can be learnt from OLA's difficult patches.

This is my wish-list - please address whatever you feel is more important.

Can you please confirm the approximate time of the appointments and where I should arrive.

…

Looking forward to your confirmation and meeting with you on Friday.

Regards

Philip Uys

8. <u>Subject: Re: Important HYDI decisions on the strategic level</u>

From: "Bob " <DIRECTORATE/BOB>
Organization: Wellington Polytechnic, NZ
To: "Philip Uys" <DIRECTORATE/PHILIP>
Date sent: Fri, 3 Nov 1995 09:30:50 +1200
Subject: Re: Important HYDI decisions on the strategic level

Philip,
We will be discussing this issue again at next weeks SMG meeting.
Currently my thinking is that our BEd would benefit most from being
the first HYDI project. Will keep you informed

Bob

> From: "Philip Uys" <DIRECTORATE/PHILIP>
> Organization: Wellington Polytechnic, NZ
> To: Bob
> Date: Tue, 31 Oct 1995 19:06:31 +1200
> Subject: Important HYDI decisions on the strategic level

> Bob
>
> We actually have to have another talk soon, but because of the time
> commitments that both of us have, I would like to try and discuss one
> or two things with you by e-mail which is within the strategic
> domain.
>
> Can you please arrange for the following agenda points on next week's
> SMG meeting to read something like :
>
> 1. "Formulating the criteria for the selection of the first hypermedia course
> to be developed in 1996 for distance education"
>
> It is essential that this process starts NOW so that the course can
> be selected later this year or very early next year, because a lot
> of extra work will go into the first course that can obviously be replicated
> for other courses.
...
> Regards
>

> Philip Uys
> Senior Lecturer : Computer Studies
> Project Manager : Hypermedia in Distance education

9. Subject: WP Home Page

From: Team member C.
Organization: Wellington Polytechnic, NZ
To: All heads of schools and heads of departments
Date sent: Fri, 17 Nov 1995 09:07:34 +1200
Subject: WP Home Page
Copies to: philip@directorate.wnp.ac.nz

As most of you know, the WP Home Page includes the following headings:

Why study at the School of...?
Why Study at the Dept of...?

New developments/events(School)
New developments/events (Dept)

Background on us (School)
Background on us (Dept)

Please could each School and Department put together material suitable for inclusion under the above headings and let me have it as soon as possible as it needs to be added to the Home Page in time for the next draft viewing by Schools on Fri 24 November.

(The Home Page goes live on 4 December)

Many thanks for your help and I look forward to hearing from you

Team member C.

10. Subject: Re: Something for the future ......

From: Vice-President
Organization: Wellington Polytechnic, NZ
To: "Philip Uys" <DIRECTORATE/PHILIP>
Date sent: Sun, 19 Nov 1995 12:43:24 +1200
Subject: Re: Something for the future ......

I RAISED THIS ISSUE WITH THE SMG SOME 6 M0NTHS AGO BUT THERE IS A RELUCTANCE TO LEAVE PAPER BASED COMMUNICATION. IT IS ALSO TRUE THAT MANY STAFF DON'T HAVE COMPUTER ACCESS. HOWEVER IT WILL COME

AND WE AGREED TO LOOK AT THE ISSUE EARLY IN 1996.
THERE IS THE POTENTIAL TO SAVE SEVERAL THOUSAND
DOLLARS FROM OUR COPYING BILL.
THANKS FOR THE THOUGHT.

11. Subject: Structure of launch

From: Self <DIRECTORATE/PHILIP>
To: Bob,Executive Director
Subject: Structure of launch
Date sent: Wed, 29 Nov 1995 17:57:06

Bob and Executive Director

Please advise whether you agree on the structure of the launch as discussed by the HYDI team at our final meeting before the launch:

#12:00

- 12:15
Background music and people arriving (we will have a nice picture / animation of the screen going about the launch)

Everybody receives a "Launch brochure" as they come in (and can read a bit if they want to before 12:15)

12:15 - 12:25

Bob welcomes those present and explains
- the value of having a Homepage on the Internet
- what is the Internet, and the growth of it

12:25 - 12:30
"someone" (please advise who, since we need to invite that person) registers the first official hit on our homepage and makes a very short "launch" speech

The person I was thinking of is Prof. Suave Lobodzinski, a FullBright scholar currently at Auckland University, who ran the hypermedia workshop (organised and hosted by the Research Committee) in August this year.

At that workshop I got excited about hypermedia and based on that workshop I proposed the HYDI project! So in a real way, he was instrumental in getting the whole process going.

Maybe we can combine his visit with a follow-up workshop on Tuesday if the Research Committee has any funds left?! (I will arrange the visit and workshop if you agree)

#12:30 - 12:45
I will take our visitors on a 15 minute tour through our Homepage.

#12:45 - 12:50
Bob thank those present and invite to the light refreshments in the
Student Common Room

Also invite staff (who do not have suitable computers in their
offices) to browse through our Homepage on the two computers in the Library foyer and the
one computer in the Staff Room on H-floor that will be available for the week

#1:00pm to 1:30pm
Light refreshments served in the Student Common Room and visitors
can browse through the Homepage on a few computers that are there

Please comment on the above a soon as it is possible for you

Thanks

12. Subject: Personal invitation

From: "Philip Uys" <DIRECTORATE/PHILIP>
To: #everyone
Date sent: Sun, 3 Dec 1995 09:58:36 +1200
Subject: Personal invitation

Hi

Have you entered 12:00 for 12:15
****
TODAY : Monday 4 December 1995
****
in your diary?

IT IS THE LAUNCH OF YOUR HOMEPAGE ON THE INTERNET

Yes, EVERY Department, Unit and School is represented in the
Wellington Polytechnic Homepage.

Light refreshments will be served after the launch

From today, your Department, Unit and / or School will be visible to 50 million Internet users representing students of all ages, mothers, fathers, academics, business people, health staff, government officials, etc etc.- from most of the developed and developing countries of the world.

The program is as follows :

12:00 - 12:15
You will receive a "Launch Brochure" and enjoy the background music

12:15 - 12:20
You will be welcomed by the Principal, Bob

12:20 - 12:25
Dr Mimi Recker, lecturer in educational technology at VUW and software engineer on the original INTERNET project in the 1970's, will address you on the growth of the Internet, the opportunities for education in using the Net, and the significance of having a Homepage

12:25 - 12:30
Prof. Suave Lobodzinski, Fullbright scholar from California and currently at Auckland University will address you (via LIVE video / teleconferencing from Auckland) on hypermedia in distance education and using the Internet

12:30 - 12:35
Mr Devon Sutcliffe, Chairman of the Council, will register the first official hit on our Homepage

12:35 - 12:50
Philip Uys, Project Manager:Hypermedia in Distance Education, will take you on a 15 minute tour through the Homepage and answer questions from the floor

12:50 - 12:55
Bob will introduce you to the development team and direct you to where the light refreshments will be served

The chairperson for the launch of this new INFORMATION service is Elizabeth Griffiths, our Librarian.

Can you please also invite colleagues who are not as privileged as those of us who have electronic mail.

After the launch, you will be able to browse through our Homepage (and other interesting sites) on your OFFICE computer by using Netscape.

There are also two computers in the Library foyer and one computer in the Staff Room on F-floor which are set up for this purpose (it will be available for the whole week - compliments of CSG and the Library).

We are looking forward to welcoming you at 12:00 today,Monday, 4 December in LT200.

See you there!

Kind regards
Philip Uys
Senior Lecturer: Computer Studies
Project Manager:Hypermedia in Distance Education

Appendix 8

Memo: REPORT ON USA VISITS AND ED-MEDIA AND ED-TELECOM CONFERENCE

To : Bob Bubendorfer
Principal

cc …..
Operational adviser : HYDI
…..
External relations adviser : HYDI
…….
Academic adviser : HYDI

From : Philip Uys
Project manager : HYDI

Date : 15 July 1996

REPORT ON USA VISITS AND ED-MEDIA AND ED-TELECOM CONFERENCE

Thank you for your support of the HYDI project and for allowing me to visit educational institutions in the USA as well as to attend the ED-MEDIA and ED-TELECOM conference.

The visits at MIT and California State University at Long Beach proved to be particularly helpful since the people I saw are all working actively in this field and have solid practical experience.

The conference overall proved to be very valuable with excellent tutorials, good contacts and a large number of good sessions; unfortunately there were also some papers of a low quality and which touched only on the very basics of what we are doing.

The strategic initiative of the development of hypermedia courseware at Wellington Polytechnic as a way of utilising modern computer technology in education and as a means to increase student numbers, has undoubtably been validated at the conference and the visits.

Attached please find a report on the visit and a list of the conference sessions attended.

Comprehensive tutorial notes were provided as well as two sizeable volumes that contain the papers presented at the conference (1274 pages).
…

With gratitude

REPORT ON USA VISITS AND ED-MEDIA AND ED-TELECOM CONFERENCE

1. Introduction

Most of the aspects discussed in this report is not the result of a single session, tutorial or visit but rather a thread through a number of presentations, or different aspects in various presentations that together pointed to a specific aspect. The report is therefore structured around these aspects rather than each specific session.

2. Findings and recommendations

2.1 Blend of courses

The resources available for hypermedia courseware development in other institutions (like MIT and Military Academy) are huge in comparison to what we currently have (due to a number of acceptable and good reasons).

All our resources in the next year or two can easily be tied up in the development of the B.Ed alone which will yield a limited income.

Furthermore the hypermedia course development should reflect the nature of the offerings at Wellington Polytechnic which are both full formal courses as well as shorter courses.

Recommendation:

That short courses for niche markets be selected based on thorough market research and that these be developed in parallel to the core formal courses.

2.2 Hypermedia course development

The institutions who have demonstrated the most advanced usage of hypermedia in education like the UC, have made a firm decision and commitment towards this at a strategic level.

California State University :

- small group of lecturers have reached a level where they are able to develop computer-based courseware themselves
- the New Media Lab (part of Academic Computing Services) :
  - runs short training courses in incorporating multi-media in courses, use of the Web and the Internet for academic staff
  - assist lecturers on a one-to-one basis in the production of computer-based courseware
  - produce computer-based courseware *for* lecturers

MIT :

- a large group of lecturers have the ability to develop computer-based courseware themselves
- the Academic Computing Services unit
  - they use the Web extensively as a delivery platform
  - produce computer-based courseware *for* lecturers - only in exceptional cases

ED-MEDIA and ED-TELECOM:

- in general, after initial familiarisation with multi-media and the Web, a section of academic staff seems to be developing courses themselves for their students - often not in a distance education fashion!
- training and multi-media / hypermedia support seems to be either from a specific unit or from particular lecturers who have a personal interest and experience with it
- the Open University (UK) naturally have formalised all the processes for developing computer-based courseware and have different formal departments responsible for the development, marketing and maintenance of courses as well as student support
- the Hong Kong Polytechnic University has a unit within their academic development department that provides lecturers either with assistance to develop multi-media courseware or that does the development of multi-media courseware for the lecturers. They also act as consultants in this field to lecturers.

At most institutions (including MIT, California State University and Hong Kong Polytechnic University) a dedicated unit or department is responsible for assisting lecturers in these activities and developing courseware for them.

These units also run short training courses on incorporating multi-media in courses, use of the Web and the Internet for academic staff , act as consultants to academic staff and assist them on a one-to-one basis in the production of computer-based courseware.

One of the key functions of these units is ongoing research in the appropriate application of information technology in education.

<u>Recommendation</u>:

The hypermedia project should be placed on a firmer footing from 1997 to achieve the goals of this venture as specified by the Principal. It is felt that the current structure does not provide adequate focus and potential for the achievement of these goals.

A unit could be formed, perhaps to be called “The New Media Unit”, that will be serving all the schools in the Polytechnic and will as such be a general support unit like the Library and the Education Development department.

In 1997 this unit could still consists of staff that have vertical reporting lines in their current appointed units eg schools.

It's mission could be : To research and implement appropriate new information technology in appropriate curricula at the Wellington Polytechnic.

Its main activities could be to:

- research new educational information technologies for feasibility of use in curricula at Wellington Polytechnic
- develop hypermedia courses
- train academic staff in the use of IT, and specifically hypermedia, in the preparation, delivery and assessment of courses
- provide consultation on a one-to-one basis
- maintain the Wellington Polytechnic Homepage.

This unit will combine and balance the principles of education and of information technology to achieve its goals. Therefore it is felt that such a unit could reside within EDD, on its own (like EDD and the Library) due to its general support function or linked in some or other way with the computer development group (with the Academic Registrar).

Due to the above reasons, it is felt as first preference that the unit should function as an independent general support unit, and as second preference due to the educational basis of the activities, that it could be part of EDD.

2.3 Database

It is clear from the development of data management in the history of computing, that using a proper database is the most appropriate way to store information.

Some organisations like California State University has an established practice in this regard and use an object-oriented database (ILLUSTRA) for this purpose.

One of the tutorials I attended was on another object-oriented database called HYPER-G (which has now been renamed to HYPERWAVE), which is free to educational institutions but is more risky since it is not a commercial product in the true sense.

Quite a few of the institutions with the most impressive developments in hypermedia courseware development, including the University of Calgary which has a large number of files manage, uses directory structures - like us - to store files.

Recommendation:

That we acquire either ILLUSTRA or HYPER-G in 1997 / 1998 for more appropriate management of the courseware data. We will also have to employ someone with database management skills on the project to fulfil this function.

2.4 Specific aspects of hypermedia courseware

2.4.1 In Tutorial 3 the use of scripts to make the hypermedia more interactive was explained and demonstrated. The possibility of having an area on the screen where a student can make personal study notes that are kept on their own computers should be investigated.

2.4.2 In general, pages should be longer so that a student can already start reading the top of the page while it is loading the rest of the page. This approach is faster for the student than having to wait for a larger number of smaller pages that must each be loaded.

2.4.3 In Tutorial 6 the emphasis was placed on having adaptive educational hypermedia which, although complex to achieve, should be a key design goal in hypermedia development at Wellington Polytechnic from 1997 onwards. This means that educational material is presented in a specific and perhaps unique way for each student on the basis of a user model that is created for each student; this is one of the basic advantages of hypermedia learning above the traditional classroom method. A skilled programmer in some or other scripting language eg JAVA or PERL would be required.

2.4.4 A search tool where students can enter a search word / phrase should be incorporated in each hypermedia course.

2.4.5 As demonstrated by the University of Twente, students can actually develop valuable hypermedia "text books" as part of their course assignments which can be used by future students.

2.4.6 Distance education via hypermedia delivery has been validated as an important delivery medium. In eastern Canada the government of a province and all the tertiary education providers has joined forces to make hypermedia delivery to most homes over high-bandwidth networks a reality.

2.4.7 Huge resources are required to translate a large proportion of courseware into hypermedia for distance education delivery and therefore a number of institutions represented at the conference has entered into collaborative research and development agreements with other institutions. Collaboration with other institutions in New Zealand should be sought eg Victoria University, Auckland University and others.

2.4.8 The Western Australian telecentre network had a presentation on developments there, which re-emphasised the opportunity we have through them and the UK Telecentres organisation (with whom good contact were made in November in Brisbane) for marketing and support for our courses.

2.4.9 "Electronic Data Systems" emphasised the importance to have a clear hypermedia development methodology which includes assisting the content providers to formulate clear training goals, training programs and markets. A WELLINGTON POLYTECHNIC hypermedia development manual should be constructed based on knowledge and experience gained so far for use from 1997 onwards (naturally to be altered as required).

2.4.10 Eventually back-end application should be developed to enhance the administration of hypermedia courses including assessment (an excellent assessment application was demonstrated by the US Air Force Academy and the Indiana and Purdue Universities).

2.4.11 Hypermedia is not specifically related to distance education and can be used to enrich the traditional classroom activities in a variety of ways eg to present material in class, to publish student notes, to publish important notices as well as to publish results (with appropriate anonymity) on an intranet / the Internet. A presentation by the University of Quebec identified five models of hypermedia learning : the enriched classroom, the virtual classroom (what the HYDI project currently focus on), the information base, the teaching media and the communication channel.

2.4.12 The University of Twente illustrated how hypermedia courses can include examples of previous students' work as a learning resource for future students. This approach also worked very well at UC; students did not - as expected - copy materials from previous years but rather used it as a base to create their own projects.

2.4.13 The University of New South Wales described a paperless system for the collection, testing and assessment of assignments. This is achievable through hypermedia courses and can be implemented through the use of the Internet.

2.4.14 Taking cultural differences and preferences into account in the design of courseware was re-emphasised in a paper by the National Chengchi University, Taiwan. They discussed how Taiwanese students would interpret certain codes of communication eg humour, colours etc. Our target markets will have to be well researched to establish any specific cultural preferences.

2.4.15 The use of virtual reality was also dealt with in various sessions. In a panel discussion on this topic, Veronica Pantelides, explained how virtual reality can enhance the learning experience of students because it allows the learner to proceed through an experience at their own pace, it encourages active participation and the lecturer can more accurately illustrate some features, processes etc. than by other means.

2.4.16 Our design philosophy of having all the various learning and communication tools as an integrated set within easy reach to students, has been confirmed by the work being done by the Chung Yuan Christian University and telecommunication Laboratory of Taiwan.

2.4.17 Prof Hiroshi Ishii of MIT demonstrated some of his work on collaborative learning environments which is a future development to take note of. These systems allow users which are physically removed to work together on a “white board” as if they are in the same room.

2.4.18 Prof Mitchel Resnick discussed the creation of intellectual stimulation in children through various practical experiments with objects of computer intelligence. This illustrated “learning by discovery” which the World Wide web can support so powerfully.

Appendix 9

Hypermedia Projects

Progress report to SMG : March 1996

By Philip Uys, Project Manager : Hypermedia in Distance Education

1. <u>Sampler hypermedia course</u>

- completion date : 30 June 1996
- goal : to convince the Internet users and their families that Wellington Polytechnic is the right choice for hypermedia distance education
- progressing well according to plan
- contains two learning outcomes of 101 (“Introductory course to Adult learning”)
- process :
    - cyclic prototype approach ie each content chunk is taken through analysis, design, coding, testing, implementation (hidden)
    - testing : local and international students will experiment and feedback
- multi-media students in Computer Studies will do the majority of the technical production (5 groups of 3 or 4 students) as their project
- we will have a four hour, intensive workshop where all the role-players will participate on Monday
- good news : the first two content chunks are ready for production

2. <u>Wellington Polytechnic Homepage</u>

- ongoing development
- goal : to promote the Wellington Polytechnic and its programs both nationally and internationally
- steady hit rate of approximately 300 hits per day
- ***new info and freshness*** drastically required! : events, text, ownership, photographs, more e-mail addresses (contact Content provider)
- fortnightly statistics is available under Netscape by typing as URL
  file:///i:/users/HYDI/homepage/stats
  and then selecting the .htm file which interests you
  (the date in the name of the file is the last day of the stats period eg "96-03-25.htm" contains the stats from 11/3/96 to 25/3/96)
- Netscape 2.0 has been installed by CSG
- 256 colours : please let CSG know about your requirement!

3. Wellington SIG on Educational Hypermedia

- being formed

4. Wellington Polytechnic represented on speaker panel at the annual NZEIL Conference (April 1996)

- project manager invited as speaker on “The Internet : how to make it work for you!”.

Appendix 10

Hypermedia Projects

Progress report to SMG : May 1996

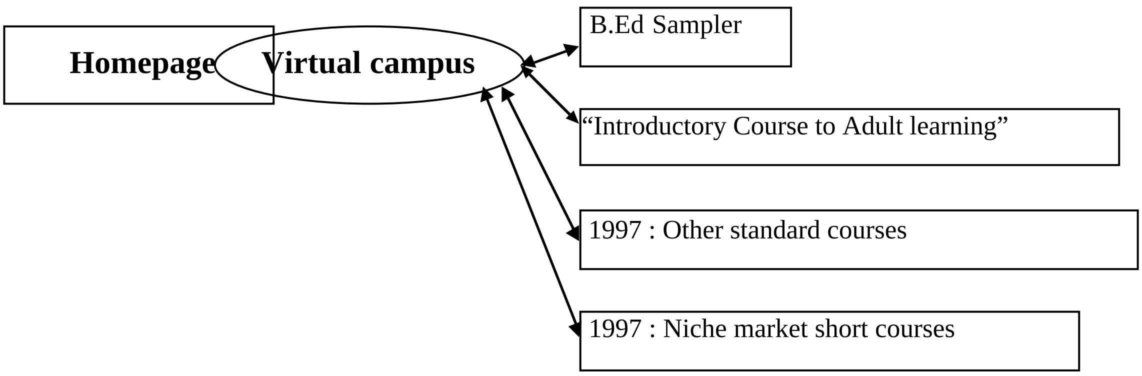
Philip Uys, Project Manager : Hypermedia in Distance Education

1. <u>B.Ed Sampler : first Internet course</u>

- completion date : 30 June 1996
- progressing well: content of the three "chunks" completed and construction and design now under way (first two "chunks" already in html)
- would need additional testing time before deployment
- involvement of students not as effective as would have liked
- also creating a "virtual campus" which will link to the Homepage; the virtual campus will contain all the services available to "cyber students" (meetings this coming week with all the support departments)

(lecturers are called "cyber guides" in one Internet course!)

- model :



2. <u>Wellington Polytechnic Homepage</u>

- included in the Government's Blue On-line pages
- steady hit rate of around 300 hits per day
- still early days; it is a living document!
- promotion of our address http://www.wnp.ac.nz needed; on brochures etc.
- more direct e-mail response facilities have been added
- ***new info and freshness*** still required : please revise the info under your **<u>departments</u>**
- proposal: compile a small homepage action group of interested people in your school / each department to take initiative on developing your school's image on the Internet?
- work of students work can add some dynamics to your school's homepage (approached by student in School of Design)
- save on Internet cost : rather access the local mirror image at
  file:///i:/users/HYDI/homepage/index.htm

3. <u>Internet developments</u>

- more possibilities opening up for animation, video-clips and real time voice communication over the Internet : will be using some of this in the B.Ed sampler.

Appendix 11
Cycle 2: A Selection of E-Mail Messages

In most cases pseudonyms or position titles replaced personal names to ensure anonymity.

1. <u>Subject: Re: Launch of the sampler!</u>

From: "Bob Bubendorfer" <DIRECTORATE/BOB>
Organization: Wellington Polytechnic, NZ
To: "Philip Uys" <DIRECTORATE/PHILIP>
Date sent: Wed, 14 Aug 1996 07:27:24 +1200
Subject: Re: Launch of the sampler!

Hi Philip,
The idea appeals to me, lets do it.
Bob

> From: "Philip Uys" <DIRECTORATE/PHILIP>
> To: Bob
> Date: Tue, 13 Aug 1996 22:11:42 +1200
> Subject: Launch of the sampler!

> Bob
>
> We are working very hard towards finalising and testing the sampler
> to be ready on 31 August.
>
> I do not propose a glamorous event at all, but I would like to
> suggest that we have a formal launch of the sampler in LT200 in the
> first week of September.
>
> This could simply consists of myself and Nick / Alison
> demonstrating the sampler and yourself having a word about the
> significance of launching our very first hypermedia course on the
> Internet into the national and international market.
>
> Maybe we could have a small 'celebration' afterwards with the HYDI
> team, directorate and The Head of Business and Information Systems School attending?
> Regards
>
> Philip Uys
> Senior Lecturer:Computer Studies
> Project Manager:Hypermedia in Distance education

2. <u>Subject: HYDI and the fact that you are leaving next year</u>

From: "Bob Bubendorfer" <DIRECTORATE/BOB>
Organization: Wellington Polytechnic, NZ

To: "Philip Uys" <DIRECTORATE/PHILIP>
Date sent: Mon, 12 Aug 1996 07:30:36 +1200
Subject: Re: HYDI and the fact that you are leaving next year
Copies to: nick

I already am.
Bob

> From: "Philip Uys" <DIRECTORATE/PHILIP>
> To: Bob
> Date: Sun, 11 Aug 1996 12:51:16 +1200
> Subject: HYDI and the fact that you are leaving next year
> Cc: nick

> Bob
>
> As the sponsor and principal support behind HYDI, I am
> concerned about its future when you leave at the end of 1997 and
> believe that we should take an appropriate step from January 1997.
>
> A future which not only you and I see as important for the
> Wellington Polytechnic, but which Nick Zepke and Alison Viskovich
> strongly shares.
>
> I had a serious discussion with Nick about this last week and we both
> are convinced that it would provide continuity to this development
> (while not being a permanent structure) if the project can be located
> in 1997 closer to where it *might* reside in future.
>
> The request is thus to consider the above in the light of two
> factors : yourself leaving next year as well as the importance of
> the HYDI project, and to move the reporting structure of the project
> and the budget to either EDD, or alternatively to myself as project
> manager reporting to someone like Vice-President.
>
> Since the second alternative is less likely for 1997, the proposal is
> for the HYDI project - as a *project* - to be located within EDD.
>
> I trust that you will seriously consider this issue - thanks.
> Regards
>
> Philip Uys
> Senior Lecturer:Computer Studies
> Project Manager:Hypermedia in Distance education

3. Subject: Re: Thanks and management

Date sent: Thu, 6 Jun 1996 13:01:21 +1200 (NZST)
To: "Philip Uys" <philip@directorate.wnp.ac.nz>

From: J_Lennon@cs.auckland.ac.nz (Jennifer Lennon)
Subject: Re: Thanks and management

Hi Philip.

>, I'm very interested in just HOW you are organised in
>terms of positions and people please?

It was very interesting for me to see the differences too. All of our personel are only partime since we earn our bread and butter with various projects such as the MONZ work. We have:

A Director - me
A Projects manager
A programmer
A graphics programmer

Our conclusion was certainly that we were under financed both with personnel and Hardware and software.
...

So, best wishes with your project,
Jennifer.

>Since our project is still in an experimentation phase, it is being
>run with the principal's development fund and with keen and interested
>people (although some of us have a lesser teaching load this year) !
>We have people in the positions of
>- project manager (myself)
>- educational director
>- content director (rotating from project to project)
>- computer specialist (we need more skills and time in this area)
>- graphic designer (we're seriously short on this aspect at the
> moment)
>- online media developers (use multi-media students via their
> projects in this regard but not totally satisfactory).
>
>How about you?
>
>Kind regards
>
>
>Philip Uys
>Senior Lecturer : Computer Studies
>Project Manager : Hypermedia in Distance Education
>Wellington Polytechnic e-mail : philip.uys@wnp.ac.nz
>Private Bag 756 voice : +64 4 801-2794 x8926

>Wellington fax : +64 4 801-2696
>New Zealand internet: http://www.wnp.ac.nz

Jennifer Lennon
Director
HyperMedia Unit
University of Auckland
Ph +64 9 3737-599 x7625

4. <u>Subject: RE: Nice to hear from you :-)</u>

From: kirkwood@dec.usq.edu.au (Jannette Kirkwood)
To: philip@directorate.wnp.ac.nz (Philip Uys)
Organization: University of Southern Queensland, Toowoomba, AUS
Date sent: Fri, 10 May 1996 14:58:31 +1000
Subject: RE: Nice to hear from you :-)

Hello Philip
…..

I am putting in the mail to you a document which outlines our flexible delivery committee. Hope this helps you.
Regards
Jannette

From: Philip Uys
To: Jannette Kirkwood
Subject: Nice to hear from you :-)
Date: Friday, 9 February 1996 1:10PM

From: "Philip Uys" <philip@directorate.wnp.ac.nz>
Organization: Wellington Polytechnic, NZ
To: kirkwood@dec.usq.edu.au (Jannette Kirkwood)
Date: Fri, 9 Feb 1996 13:10:30 +1200
Subject: Nice to hear from you :-)
X-mailer: Pegasus Mail for Windows (v2.21)
Message-ID: <6A5B853663@directorate.wnp.ac.nz>

Jannette

> When you mention 'hypermedia' I am not sure what you include in this
> category.

A very simple definition we use for "hypermedia" = multi-media over a wide area network (like the Net).

> We have established here a University Flexible Delivery Committee to

promote
> and organise the use of new technologies.

Very interesting!

Part of my vision and responsibilities is to ensure that appropriate
organisational structures are established for the long term continuity of
the project eg the reporting structures, the type of management structures, whether it should be a separate unit or project teams etc.

> We are encouraging and supporting
> staff to implement the use of CMC, WWW, IMM and CDROM. At this stage most
> of the projects are fairly new.

Kind regards
Philip Uys

5. Subject: CTAG Committee Meeting
From: "Nick Zepke" <nick@directorate.wnp.ac.nz>
Organization: Wellington Polytechnic, NZ
To: CTAG COMMITTEE
Date sent: Fri, 22 Nov 1996 16:31:25 +1200
Subject: CTAG Committee Meeting
AGENDA
The CTAG Committee will meet on Monday 25th November at 11am in the
Registry Meeting Room opposite the Library.

1. Apologies
2. Introductions.
3. Terms of Reference
4.Working Style
5.Operating Environments for Teaching in 1997(Document to be tabled)
6.New Media Group Concept (Document to be tabled)
7General Business.

I look forward to meeting with you.

6. Subject: Computing Advisory Committee
From: MIS director
Organization: Wellington Polytechnic, NZ
To: …………………….
Date sent: Thu, 15 Aug 1996 17:02:27 +1200
Subject: Computing Advisory Committee

Dear CAC Members

I have scheduled the next meeting of the CAC for

WEDNESDAY 4th SEPTEMBER
3-5 PM (THE ONLY TIME WE CAN MEET)
ROOM 7C07

Please mark in your diaries (hopefully this is enough notice !). I will circulate an agenda closer to the day, but any suggestions for it would be welcome now (I will be away the week of 26-30 August, so don't expect anythin then).

The MIS director

7. Subject: Re: JAVA Courses

From: Self <DIRECTORATE/PHILIP>
To: Computer Specialist,lecturer in Computer /Studies
Subject: Re: JAVA Courses
Copies to: the Head of Business and Information Systems School
Date sent: Thu, 22 Feb 1996 11:44:24 +1200

Computer Specialist and Lecturer in Computer Studies

Especially after Monday's seminar, I am hesitant about initial Java use, although we definitely need to keep a close eye on developments in this regard - especially when Progress and others let you develop in their 4GL environment and then just export as Java applets field or html.

8. Subject: Update on Hypermedia projects

From: Self <DIRECTORATE/PHILIP>
To: <group>
Subject: Update on Hypermedia projects
Date sent: Fri, 23 Feb 1996 17:11:00 +1200

Hi

The success of the hypermedia seminar on Monday by prof. Suave Lobodzinski seems to have created a higher level of interest in the hypermedia projects of the Wellington Polytechnic (both internally and externally - staff from NZEIL, APNZ, VUW and the Careers Service also attended)!

I have included you in this special mailing list of Polytech staff who are interested in the hypermedia ("HYDI" for short) projects at this Polytechnic because of a personal interest that you have expressed in the past in educational hypermedia, your role at this Polytech or because of your current involvement in these projects.

However, if you would not like to receive periodical (planned for about forthnightly) info on the hypermedia projects at this Polytechnic through this mailing list, please let me know and I will happily remove your e-mail id from this special list :-)

Some news and a request :

At this stage, there are two HYDI projects in action and two other lower priority projects

the Homepage HYDI project :

- moving from development to on-going operation

- a lot of design changes and language style re-work for the target audience is required to make the homepage more inviting

- schools and departments will hopefully start to take more ownership now

- averaging around 300 hits per day during the last week (12-18/2)

- *NEW*
  the weekly stats is available under Netscape by typing as URL
  file:///i:/users/HYDII/homepage/stats
  and then selecting the .htm file which interests you
  (the date in the name of the file is the last day of the stats
  period eg "96-02-18.htm" contains the stats from 12/2/96 to 18/2/96)

- Team member A will launch a major content refresh cycle next week

- needs :
 * "software specialist" and "creative director" roles currently vacant
 * more interested people to support core team PLEASE

the B.Ed HYDI project

- target dates : Sampler by end of first semester 1996

- first full course and appropriate support structures in place for delivery in second semester 1996

- the B.Ed HYDI team has just started and is already working hard towards our goals

- needs :
 * software specialist and creative director roles currently vacant
 * more interested people to support core team PLEASE

possible CD-ROM for the Polytech

- lower priority
- by end of 1996 (if required)
- there might be other ways to learn the CD-Rom technology
  required for the development of the Web courses

another sampler?

- lower priority
- there might be a possibility for another sampler in the second
  semester eg in Journalism

I would like to invite you, if you are not part of the two core development teams, whether you would like to assist in some or other way in these projects?

We would be most thankful for additional help in these projects which are undoubtably at the forefront of the new technological waves in education.

Looking forward to your reply!

9. Subject:(Fwd) Hypermedia at the Wellington Polytechnic

From: Self <DIRECTORATE/PHILIP>
To: directorate/Bob
Subject: (Fwd) Hypermedia at the Wellington Polytechnic
Copies to: directorate/the Head of Business and Information Systems School,directorate/HYDI Ext Adviser,directorate/Vice-President,directorate/nick
Date sent: Tue, 27 Feb 1996 09:06:21 +1200

Bob

Suave's message after the seminar - for your information.

(I actually found the conference he mentions through Yahoo at
  http://aace.virginia.edu/aace/conf/edmedia.html)

------- Forwarded Message Follows -------
Date: Mon, 26 Feb 1996 23:54:33 +1300 (NZDT)
To: "Philip Uys" <philip@directorate.wnp.ac.nz>, slobo@cs.auckland.ac.nz
From: suave lobodzinski <slobo@cs.auckland.ac.nz>
Subject: Hypermedia at the Wellington Polytechnic

Dear Philip,

Thank you very much for inviting me again to the Wellington Polytechnic. I would like to congratulate you on your very ambitious hypermedia program. As I mentioned at the seminar, it may be beneficial to the Polytechnic to start participating in an international conference called Ed Media that is totally

devoted to educational applications of Hypermedia. You'll find the
information about EdMedia and other conferences at http://www.websoc.org.

Best Regards
Suave Lobodzinski

10. Subject: How you organise yourselves

From: Self <DIRECTORATE/PHILIP>
To: c.latchem@info.curtin.edu.au (Colin Latchem)
Subject: How you organise yourselves
Date: Mon, 11 Mar 1996 09:29:29 +1200

Colin

Very good to hear from you :-)

…..
I have to start planning the formal structures for the hypermedia projects at this Polytechnic eg a kind of department, the reporting lines (internal and external), the different position outlines, base documents etc. and would not like to re-invent the wheel.

I would appreciate it immensely if you can find the time to pass on your expertise in this regard by
* the way that you at Curtin has organised yourself for the production of distance education courses
* contact info of one or two Universities (anywhere in the world) where you believe they are doing it "right" …..

11. Subject: Re: Addressing the full HYDI team on Monday

From: Self <DIRECTORATE/PHILIP>
To: "Bob Bubendorfer" <DIRECTORATE/BOB>
Subject: Re: Addressing the full HYDI team on Monday
Date sent: Fri, 29 Mar 1996 14:34:32 +1200

Bob

> Yes I would like to meet and talk to the HYDI team.

Thanks for your willingness and support.

Your PA said 3:30pm on Monday and that will be just great!

12. Subject: THANK YOU

From: Self <DIRECTORATE/PHILIP>
To: Bob
Subject: THANK YOU

Date sent: Thu, 5 Sep 1996 12:39:56 +1200

Bob

Thank you for the talk yesterday at the launch and sponsoring the meal afterwards - much appreciated!

BTW :
Had an hour discussion with MIS director today about on-line application issues from January 1997 and the future of HYDI in terms of the homepage maintenance and of the possible future placing of the "HYDI unit".

13. <u>Subject: New Media Unit / Centre / Lab</u>

From: Self <DIRECTORATE/PHILIP>
To: nick
Subject: New Media Unit / Centre / Lab
Date sent: Thu, 10 Oct 1996 12:11:06 +1200

Nick

Regarding a name for the new section / group within EDD, some observations:

The following four models is a basis for the concept of a New Media group that could be called
New Media Lab (emphasising research and development) or
New Media Centre (or perhaps Unit) or
New Media Section (which minimises a bit what has to be achieved).

MIT in Boston has a New Media Lab (called the Media Lab)
http://www.media.mit.edu/
which predominantly does research.
MIT also has an Academic Computing group
that seeks to promote and enable technology-based educational improvement at MIT at
http://web.mit.edu/org/a/acs/www/acs.html
Theses two activities should be addressed in a New Media Unit.

Teaching and Learning Group at Curtin University
http://www.curtin.edu.au/curtin/dept/tlg/
wants to create a New Media Group. This will also involve their Computing Centre and some of the schools. The purposes of this group will be teaching innovation, research, product and technological development.

California State Univ (where Suave is) at
http://www.csulb.edu/ua/ua-frame.html
has an

Academic Computing Services Group which offers general academic computing support at
http://www.csulb.edu/ACS/
and within it a New Media Centre that offers a wide range of state-of-the-art new media services, consulting and equipment for faculty and students.

The Learning Systems group at Edith Cowan Univ (Oz)
http://www.cowan.edu.au/lrn_sys/lshompag.htm
has two groups that constitute their "New Media Unit":
Flexible Learning Production Services and an
Educational Resources Development Centre.

Some other places have an "Educational Technology" unit which does similar things.

I personally prefer "New Media" since it is not restrictive and yet definitive.

14. <u>Subject: Feedback on sampler course (1)</u>

Date sent: Thu, 29 Aug 1996 00:13:42 -0400
From: <no@mail>
To: philip.uys@wnp.ac.nz
Send reply to: no@mail
Subject: Feedback on sampler course
...
Look, Feel and Missing -> Section Five
viewfeel -> Some of the text chunks are a bit of an eye-sore as there is
some much text but generally it was good to use and was help-
ful to my training topic
missinginLCS -> I feel that it needs a few more questions but is generally
alright to use
comperewithprinted -> More interactive (by way of questions)and easy to learn from as you can consolidate your learning as you go by answering
the questions
Send -> Send

15. <u>Subject: Feedback on sampler course (2)</u>

Date sent: Thu, 29 Aug 1996 00:21:35 -0400
From: <no@mail>
To: philip.uys@wnp.ac.nz
Send reply to: no@mail
Subject: Feedback on sampler course
...
Look, Feel and Missing -> Section Five
viewfeel -> I think that it is a good product however it could do with more graphical directons, the links could be more pronounced and a touch more space between the choices so mistakes could be minimised missinginLCS -> the oppurtunity to use graphics to help users could be utilised and to make it more interesting

webincorporate -> aspects that could make it more exciting might be use of advertising for course specific requirements ie. stationary, online plytech association? etc
comperewithprinted -> much more interesting and involving to the user, makes you want to use it
Send -> Send

16. Subject: Feedback on sampler course (3)

Date sent: Thu, 29 Aug 1996 00:13:11 -0400
From: <no@mail>
To: philip.uys@wnp.ac.nz
Send reply to: no@mail
Subject: Feedback on sampler course
...
Look, Feel and Missing -> Section Five
viewfeel -> I did get a bit lost the further I got into it.
May be more interesting if we had the pictures and their
colours to look at to, but from looking at it now it was
just lots of text, page after page The idea of the discussion page was interesting and no doubt quite helpful to those enrolled

Lots of jumps within jumps etc (hence got lost), but the
information is quite thorough within each jump

missinginLCS -> Why not give some background on the tutors rather than just
their name, address??
comperewithprinted -> obviously much easier to keep up to date
more interactive for off-campus students
Send -> Send

17. Subject: Feedback on sampler course (4)

Date sent: Thu, 22 Aug 1996 22:59:22 -0400
From: <no@mail>
To: philip.uys@wnp.ac.nz
Send reply to: no@mail
Subject: Feedback on sampler course

Feedback on sampler course
...
Look, Feel and Missing -> Section Five
viewfeel -> There was too much text. I did not have any/much fun, which is an essential learning element for me. I have no doubt that a lot of work has gone into this production. What I have seen so far is basically very good.
comperewithprinted -> I am not sure that a comparison can be made. It is a different medium which takes some time getting used too. I have only just learnt how to read books quickly!
Send -> Send

18. Subject: Update for sampler evaluation

Date forwarded: Wed, 5 Jun 1996 13:02:20 +1200
From: "Philip Uys" <DIRECTORATE/PHILIP>
Organization: Wellington Polytechnic, NZ
To: directorate/graphic designer, Computer specialist, directorate/alisonv, directorate/nick,
directorate/……, directorate/…., nurseadmin/……, directorate/computer specialist,
Computer Specialist@……..co.nz, directorate/Team member
Date sent: Wed, 5 Jun 1996 12:53:16 +1200
Subject: Update for sampler evaluation

Hi

We are entering an exciting phase - soon we will see and experience the draft sampler and virtual campus!

After our meeting last week, here is an update regarding the steps we are taking now:

1. The creative director will select the best chunk1 and chunk2 from the student work by Wednesday, 5 June and will comment on the selected chunk2 - to be communicated to the student on Wed eve

2. The students involvement in the sampler project will end on Wed evening, 5 June.

3. Chunk3 will be constructed and tested by the graphic designer and creative director.

4. On Thu, 6 June the creative director and graphic designer will have chunk1, chunk2 and chunk 3 ready as a draft (Philip will transfer it to the Web) to be tested individually by each HYDI project member (a draft "evaluation guide" that can assist will be circulated shortly for comments and alterations).

   Computer specialist will also have the draft virtual campus ready on Thu, 6 June to be evaluated with the sampler.

5. A collaborative evaluation session of the sampler for all HYDI project members will be held in 5A20 from 11:30am to 1:00pm (it will be great if we all can individually have a look at the sampler before this session)

BTW : welcome to Graphic designer (HYDI graphic designer) to the e-mail world<g> who now can be contacted at directorate/graphic designer

Regards

Philip Uys
Senior Lecturer:Computer Studies
Project Manager:Hypermedia in Distance education

19. Subject: (Fwd) HYDI progress report and design ideas

From: Computer specialist
Organization: Wellington Polytechnic, NZ
To: "MA200, Group Five (HYDI)" <Computer Specialist>, "MA200, Group Four (HYDI)" <Computer Specialist>,
Others Interested in MA200/HYDI things <Computer Specialist>, "MA200, Group One (HYDI)" <Computer Specialist>,
"MA200, Group Six (HYDI)" <Computer Specialist>, "MA200, Group Two (HYDI)" <Computer Specialist>
Date sent: Wed, 15 May 1996 16:19:44 +1200
Subject: (Fwd) HYDI progress report and design ideas
Send reply to: Computer specialist

Only one group has given me a Project Plan. Where are the others please??????

Tonight:
……
*) At 6:30 our Creative Director is going to come to meet everyone. Please be there then. He will talk a little bit about what plans he has.
...

20. Subject: Regular meetings/promo ISP Rep.ers.

From: "Team member " <Team membert@directorate.wnp.ac.nz>
Organization: Wellington Polytechnic, NZ
To: philip@directorate.wnp.ac.nz
Date sent: Thu, 21 Nov 1996 12:01:22 +1200
Subject: Regular meetings/promo ISP Rep.ers.

Philip

I think that there would be mutual benefit in having regular meetings re promotional issues and initiatives as I do believe that the H/Page is a promotional tool that we increasingly need to use.
...

If WP is to undertake effective promotion, it is essential that there are not too many people trying to reinvent the wheel or develop different "looks" or "images" for the institution - whether on paper or electronically. I therefore feel that there is a need for you/your staff to be aware of what is being done "in the mainstream" and to fit in with it. The institution must speak with one voice...

Maybe we could meet and discuss the possibilities and alternatives.

Tks, Team member

21. Subject: Re: Our WWW pages ..where to?

> From: <…..@eng.wnp.ac.nz>
> To: Computer Specialist@directorate.wnp.ac.nz
> Date sent: Fri, 9 Feb 1996 18:01:58 +1200
> Subject: Our WWW pages ..where to?

> Since our HOD has moved on, I've become the HYDI
> contact here in E & C.S. Considerable scope exists to revamp/compact
> the Polytech's WWW home page ! Points made to me for passing on
> include...
>
> * After the initial Dec 4th "planting" (garden style), no weeding or
> pruning has been done- surely crucial to update staff/courses etc
> (Thought => set up in house email/staff newsletter slot for
> material submission & perhaps train/EMPLOY someone for this job
> rather than heaping it on the goodwill of stressed academics!
>
> * Current pages (approx.280 !) are FAR too long winded
> ... even staff here can NOT *find* their teaching subjects.
> (Solution => REORGANISE layout into "magazine" rack choices)
>
> * Although some 380 hits daily , this only translates to several
> email enquiries weekly (with Tea) at the Course Info. Centre
> (Improvement => hot link teaching staff email addresses)
>
> * Local (on campus) students are now often aware of our Internet
> presence, but have NO WAY to easily view what we offer. (Perhaps
> a WWW accessing PC should be at least set up in the C.I.C.)
>
> * Although we are seen to be "preaching" the Info. Highway, NO
> (on campus) STUDENT WWW ACCESS POLICY is in place. Of course
> issues such as security/abuse/costing need to be addressed, but
> currently staff goodwill has to be tapped for even genuine student
> browsing (file downloads etc). Solution => setup an Internet
> connected PC in the WePSA Computer room, where the supervisor
> (Lynne) can charge (say $1 for 10 minutes) as part of normal duties
> - offers costs recovery,removes onus from Polytech & is supervised!
>
> I am happy to co-ordinate ideas, personally viewing this technology as
> one of THE most important educational/computer developments
> imaginable! (……. & I have an innovative Internet delivered
> teaching project - unrelated to HYDI - planned later this year as it
> happens). Lecturer in Elect. Eng)

Appendix 12

NEW MEDIA GROUP - CONCEPT

18 November 1996

MISSION

Enabling technology-based educational improvement and innovation for open and flexible learning.

FUNCTIONS

- **PROMOTION:**

promote technology-based education

- **TRAINING:**

train academic staff in the use of technology-based education

- **DEVELOPMENT:**

develop multi-media, hypermedia and on-line courses and course materials including the Wellington Polytechnic homepage

- **RESEARCH:**

on-going research in this area

- **SUPPORT:**

offering a wide range of state-of-the-art new media services, consulting and equipment for academic staff

Appendix 13
Cycle 3: A Selection of E-Mail Messages

In most cases pseudonyms or position titles replaced personal names to ensure anonymity.

1. <u>Subject: HYDI - virtual teams</u>

From: Alison Viskovic <DIRECTORATE/ALISONV>
Organization: Wellington Polytechnic, NZ
To: philip
Date sent: Wed, 5 Nov 1997 14:28:34 +1200
Subject: HYDI - virtual teams
Send reply to: a.viskovic@wnp.ac.nz

Dear Philip
I have mentioned to Nick that I was concerned that Virtual Teams did not appear to exist as an approved course, and that this could cause glitches when it came to be ready for students to join on the Net.

He suggests that one of the questions you should ask in future, when people want a course developed via HYDI, is what its approval status is. If it is just an alternative occurrence of an existing course (as our EDD ones have been) then there is no problem. But if it is a new idea, then it needs to be approved by Academic Board (via the Programme Committee for whatever programme it would attach to) before it can have any SEARS status for enrolments and funding etc. Possibly an exception could be made for a very small -course+ that was the equivalent of a one-day seminar.

Alison
Alison Viskovic
Educational Development Department

2. <u>Subject: CTAG: Next meeting</u>

From: Self <DIRECTORATE/PHILIP>
To: "Nick Zepke" <nick@directorate.wnp.ac.nz>
Subject: Re: CTAG: Next meeting
Date: Mon, 17 Nov 1997 11:48:24

Hi Nick
Below my item for the CTAG agenda - as promised:

> 1.2. Philip would like to create a group to conceptualise the
> further development of distributed on-line education. I
> think a subgroup of CTAG might be suitable for this.

> 2. If you have any items for a formal agenda, please let me know. I
> will circulate an agenda towards the end of next week.

Forum For Enabling Distributed On-line Education

Mission: To conceptualise and enable the further
development of distributed on-line education.

Definitions:

1. Distributed on-line education (D.O.N.E): education (teaching, learning, research) done via the Internet or an intranet.
It deals with education that involves both on-campus students and distance students.

2. Forum: a relatively open discussion group operating in a fairly informal way.

Objectives:

1. To create a theoretical framework for distributed on-line education both now and for the future
2. To identify practical issues involved in distributed on-line education and propose effective and efficient systems to deal with it

Composition:

1. CTAG members who are interested
2. Invited members proposed: …
3. Other clearly interested staff members who will commit to project teams and probably monthly meetings

Operation:

1. Probably monthly work meetings which can be brainstorm-type meetings
2. Identify specific targets and projects

Deliverables:

1. Formal reports to CTAG
2. Other reports (as it sees fit)

3. Subject: [unilearn] Digital Diploma Mills Part 2

Date sent: Sat, 28 Mar 1998 09:02:15 +1000 (EST)
To: unilearn@UWS.EDU.AU
From: Peter.Hanley@JCU.EDU.AU (Peter Hanley)
Subject: [unilearn] Digital Diploma Mills Part 2
Send reply to: unilearn@UWS.EDU.AU

With the commoditization of instruction, teachers as labor are drawn into a production process designed for the efficient creation of instructional commodities, and hence become subject to all the pressures that have befallen production workers in other industries undergoing rapid technological transformation from above. In this context faculty have much more in common with the historic plight of other skilled workers than they care to acknowledge. Like these others, their activity is being restructured, via the technology, in order to reduce their autonomy, independence, and control over their work and to place workplace knowledge and control as much as possible into the hands of the administration. As in other industries, the technology is being deployed by management primarily to discipline, deskill, and displace labor.

Once faculty and courses go online, administrators gain much greater direct control over faculty performance and course content than ever before and the potential for administrative scrutiny, supervision, regimentation, discipline and even censorship increase dramatically. At the same time, the use of the technology entails an inevitable extension of working time and an intensification of work as faculty struggle at all hours of the day and night to stay on top of the technology and respond, via chat rooms, virtual office hours, and e-mail, to both students and administrators to whom they have now become instantly and continuously accessible. The technology also allows for much more careful administrative monitoring of faculty availability, activities, and responsiveness.

Once faculty put their course material online, moreover, the knowledge and course design skill embodied in that material is taken out of their possession, transferred to the machinery and placed in the hands of the administration. The administration is now in a position to hire less skilled, and hence cheaper, workers to deliver the technologically prepackaged course. It also allows the administration, which claims ownership of this commodity, to peddle the course elsewhere without the original designer's involvement or even knowledge, much less financial interest. The buyers of this packaged commodity, meanwhile, other academic institutions, are able thereby to contract out, and hence outsource, the work of their own employees and thus reduce their reliance upon their
in-house teaching staff.

Most important, once the faculty converts its courses to courseware, their services are in the long run no longer required. They become redundant, and when they leave, their work remains behind. In Kurt Vonnegut's classic novel Player Piano the ace machinist Rudy Hertz is flattered by the automation engineers who tell him his genius will be immortalized. They buy him a beer. They capture his skills on tape. Then they fire him. Today faculty are falling for the same tired line, that their brilliance will be broadcast online to millions. Perhaps, but without their further participation. Some skeptical faculty insist that what they do cannot possibly be automated, and they are right. But it will be automated anyway, whatever the loss in educational quality. Because education, again, is not what all this is about; it's about making money. In short, the new technology of education, like the automation of other industries, robs faculty of their knowledge and skills, their control over their working lives, the product of their labor, and, ultimately, their means of livelihood.

None of this is speculation. This Fall the UCLA faculty, at administration request, have dutifully or grudgingly (it doesn't really ISP Rep.er which) placed their course work - ranging from just syllabi and assignments to the entire body of course lectures and notes - at the disposal of their administration, to be used online, without asking who will own it much less how it will eventually be used and with what consequences. At York university, untenured faculty have been required to put their courses on video, CD-ROM or the Internet or lose their job. They have then been hired to teach their own now automated course at a fraction of their former compensation. The New School in New York now routinely hires outside contractors from around the country, mostly unemployed PhDs, to design online courses. The designers are not hired as employees but are simply paid a modest flat fee and are required to surrender to the university all rights to their course. The New School then offers the course without having to employ anyone. And this is just the beginning.

Educom, the academic -corporate consortium, has recently established their Learning Infrastructure Initiative which includes the detailed study of what professors do, breaking the faculty job down in classic Tayloristic fashion into discrete tasks, and determining what parts can be automated or outsourced. Educom believes that course design, lectures, and even evaluation can all be standardized, mechanized, and consigned to outside commercial vendors. "Today you're looking at a highly personal human-mediated environment," Educom Bob Robert Heterich observed. "The potential to remove the human mediation in some areas and replace it with automation - smart, computer-based, network-based systems – is tremendous. It's gotta happen."

Toward this end, university administrators are coercing or enticing faculty into compliance, placing the greatest pressures on the most vulnerable - untenured and part-time faculty, and entry-level and prospective employees. They are using the academic incentive and promotion structure to reward cooperation and discourage dissent. At the same time they are mounting an intensifying propaganda campaign to portray faculty as incompetent, hide-bound, recalcitrant, inefficient, ineffective, and expensive – in short, in need of improvement or replacement through instructional technologies. Faculty are portrayed above all as obstructionist, as standing in the way of progress and forestalling the panacea of virtual education allegedly demanded by students, their parents, and the public.

The York University faculty had heard it all. Yet still they fought vigorously and ultimately successfully to preserve quality education and protect themselves from administrative assault. During their long strike they countered such administration propaganda with the truth about what was happening to higher education and eventually won the support of students, the media, and the public. Most important, they secured a new contract containing unique and unprecedented provisions which, if effectively enforced, give faculty members direct and unambiguous control over all decisions relating to the automation of instruction, including veto power. According to the contract, all decisions regarding the use of technology as a supplement to classroom instruction or as a means of alternative delivery (including the use of video, CD-ROM's, Internet websites, computer-mediated conferencing, etc.) "shall be consistent with the pedagogic and academic judgements and principles of the faculty member employee as to the appropriateness of the use of technology in the circumstances." The contract also guarantees that "a faculty member will not be required to convert a course without his or her agreement." Thus, the York faculty will be able to ensure that the new technology, if and when used, will contribute to a genuine enhancement rather than a degradation of the quality of education, while at the same time preserving their positions, their autonomy, and their academic freedom. The battle is far from won, but it is a start.

The second set of implications stemming from the commoditization of instruction involve the transformation of the university into a market for the commodities being produced. Administrative propaganda routinely alludes to an alleged student demand for the new instructional products.

At UCLA officials are betting that their high-tech agenda will be "student driven", as students insist that faculty make fuller use of the web site technology in their courses. To date, however, there has been no such demand on the part of students, no serious study of it, and no evidence for it. Indeed, the few times students have been given a voice, they have rejected the initiatives hands down, especially when they were required to pay for it (the definition of effective demand, i.e. a market). At UCLA, students recommended against the Instructional Enhancement Initiative. At the University of British Columbia, home of the WEB-CT software being used at UCLA, students voted in a referendum four-to-one against a similar initiative, despite a lengthy administration campaign promising them a more secure place in the high tech future. Administrators at both institutions have tended to dismiss, ignore, or explain away these negative student decisions, but there is a message here: students want the genuine face-to-face education they paid for not a cybercounterfeit. Nevertheless, administrators at both UCLA and UBC decided to proceed with the their agenda anyway, desperate to create a market and secure some return on their investment in the information technology infrastructure.

Thus, they are creating a market by fiat, compelling students (and faculty) to become users and hence consumers of the hardware, software, and content products as a condition of getting an education, whatever their interest or ability to pay. Can all students equally afford this capital-intensive education?

Another key ethical issue relates to the use of student online activities. Few students realize that their computer-based courses are often thinly-veiled field trials for product and market development, that while they are studying their courses, their courses are studying them. In Canada, for example, universities have been given royalty-free licenses of Virtual U software in return for providing data on its use to the vendors. Thus, all online activity including communications between students and professors and among students are monitored, automatically logged and archived by the system for use by the vendor. Students enrolled in courses using Virtual U software are in fact formally designated "experimental subjects." Because federal monies were used to develop the software and underwrite the field trials, vendors were compelled to comply with ethical guidelines on the experimental use of human subjects. Thus, all students once enrolled are required to sign forms releasing ownership and control of their online activities to the vendors. The form states "as a student using Virtual U in a course, I give my permission to have the computer-generated usage data, conference transcript data, and virtual artifacts data collected by the Virtual U software. . . used for research, development, and demonstration purposes. "

According to UCLA's Home Education Network Bob John provider Korbara, all of their distance learning courses are likewise monitored and archived for use by company officials. On the UCLA campus, according to Harlan Lebo of the Provost's office, student use of the course websites will be routinely audited and evaluated by the administration. Marvin Goldberg, designer of the UCLA WEB-CT software acknowledges that the system allows for "lurking" and automatic storage and retrieval of all online activities. How this capability will be used and by whom is not altogether clear, especially since websites are typically being constructed by people other than the instructors. What third parties (besides students and faculty in the course) will have access to the student's communications?

Who will own student online contributions? What rights, if any, do students have to privacy and proprietary control of their work? Are they given prior notification as to the ultimate status of their online activities, so that they might be in a position to give, or withhold, their informed consent?
If students are taking courses which are just experiments, and hence of unproven pedagogical value, should students be paying full tuition for them? And if students are being used as guinea pigs in product trials masquerading as courses, should they be paying for these courses or be paid to take them? More to the point, should students be content with a degraded, shadow cybereducation? In Canada student organizations have begun to confront these issues head on, and there are some signs of similar student concern emerging also in the U.S.

In his classic 1959 study of diploma mills for the American Council on Education, Robert Reid described the typical diploma mill as having the following characteristics: "no classrooms," "faculties are often untrained or nonexistent," and "the officers are unethical self-seekers whose qualifications are no better than their offerings." It is an apt description of the digital diploma mills now in the making. Quality higher education will not disappear entirely, but it will soon become the exclusive preserve of the privileged, available only to children of the rich and the powerful. For the rest of us a dismal new era of higher education has dawned. In ten 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.

(Historian David Noble , co-founder of the National Coalition for
Universities in the Public Interest, teaches at York University. His books
include "The Religion of Technology", "America by Design" and "Forces of
Production". . He is currently writing a book on this subject entitled
Digital Diploma Mills).

Notes

* Tuition began to outpace inflation in the early 1980's, at precisely the moment when changes in the patent system enabled the universities to become major vendors of patent licenses. According to data compiled by the National Center for Educational Statistics, between 1976 and 1994 expenditures on research increased 21.7% at public research u universities while expenditure on instruction decreased 9.5%. Faculty salaries, which had peaked in 1972, fell precipitously during the next decade and have since recovered only half the loss.

** Recent surveys of the instructional use of information technology in higher education clearly indicate that there have been no significant gains in either productivity improvement or pedagogical enhancement. Kenneth C. Green , Director of the Campus Computing Project, which conducts annual surveys of information technology use in higher education, noted that "the campus experience over the past decade reveals that the dollars can be daunting, the return on investment highly uncertain." "We have yet to hear of an instance where the total costs (including all realistically amortized capit al investments and development expenses, plus reasonable estimates for faculty and support staff time) associated with teaching some unit to some group of students actually decline while maintaining the quality of learning," Green wrote. On the ISP Rep.er of pedagogical effectiveness, Green noted that "the research literature offers, at best, a mixed review of often inconclusive results, at least when searching for traditional measures of statistical significance in learning outcomes."
>>

4. <u>Subject: US server access</u>

From: Computer consultant
Organization: Wellington Polytechnic, NZ
To: …..
Date sent: Mon, 11 Aug 1997 17:24:12 +1200
Subject: US server access
Copies to: philip

Hi ISP Rep.

Ages ago you mentioned it was possible for me to update
scripts on the US server. This would actually be very useful
as I could do my own troubleshooting.
Can you please set up the special account mentioned below.

Thanks

Computer consultant
Wellington Polytechnic
New Media Centre

> > > Is there a way to upload scripts to both servers simultaneously?
> > > This is vital to us for testing.
>
> Not presently - however if it is urgent that you have scripts setup
> on both machines we can facilitate this for you. Just let us know
> what your requirements are - if necessary we could setup a special
> account that will just give you access to your cgi-bin directory
> on the US site.

5. <u>Subject: Course 204 for HYDI</u>

From: Alison Viskovic <DIRECTORATE/ALISONV>
Organization: Wellington Polytechnic, NZ

To: PHILIP
Date sent: Tue, 8 Apr 1997 11:39:55 +1200
Subject: Course 204 for HYDI

Dear Philip
This is to let you know that I have passed on my illustrations ideas for this course to the Graphic designer. I did ring you first, intending to go through you, but as you were out I talked direct to Graphic designer. I have where possible used existing elements, but did need a few new ones.

Have tried to propose new elements that will be useful again in other areas, ie not unique to this course. The Graphic designer says he understands what I want and considers it reasonable and workable.

Over the weekend I did rework the file 204Hist, which does not have new links but does now have more subheadings to break up the text, and is a bit longer. Will tomorrow's meeting be soon enough to give it to you on disk? Cheers, Alison Viskovic Educational Development Department

6. Subject: Clothing and Textile
>Date: Wed, 05 Mar 1997 17:54:35 -0600
>From: ...
>Mime-Version: 1.0
>Subject: Clothing and Textile
>X-Url: http://www.wvu.edu/~womensu/
>
>Dear Sir or MComputer consultante,
>
>Do you know of any distance learning school that offers
>programs in clothing and textile(fashion design)?
>I would like to learn how to design and make clothes of all
>sorts. There are many good schools in Texas but I can't use
>them because their classes are offered during the day while
>I am at work.
>
>Thank you for your assistance.
>
>Sincerely,
>...

7. Subject: wn2560/2 HYDI student enrol fees
From: MIS Director
Organization: Wellington Polytechnic, NZ
To: philip@directorate.wnp.ac.nz,
…
Date sent: Mon, 17 Feb 1997 17:42:42 +1200
Subject: wn2560/2 HYDI student enrol fees

Philip, …

Vice-President has agreed that international students can technically be allowed to enrol in this qual and I have made that change. I have also altered the international tuition fees to $6765 per 1EFTS, the standard amount for quals that are predominantly 'a' funding category (in the absence of a specific int fee approved by Council, this is the approach we use).

MIS Director

8. Subject: Re: "Paris"

Date sent: Fri, 22 Aug 1997 14:14:07 +1200 (NZST)
To: "Philip Uys" <PHILIP@directorate.wnp.ac.nz>
From: info-nzcs@nzcs.org.nz (NZCS)
Subject: Re: "Paris"

Philip

We have received your email for the booking of the "Breakfast in Paris". Sorry it has taken so long to confirm this reservation.

Could you please advise us of where you would like the invoice to be sent for this.

Kind Regards
…..

>Dear …..
>
>"Breakfast in Paris"
>>The purchase order# is: W55917
>>Table for seven please - one NZCS member.
>>Total: $240 excl GST
>>Names:
>>…..
>
>Please confirm reservation - thanks!
>>Kind regards
>
>Philip Uys
>Senior Lecturer: Educational New Media

New Zealand Computer Society
PO Box 10044
Level 12, Paxus House
73 Boulcott Street
WELLINGTON

Ph: 04 473 1043
Fax:04 473 1025

9 . Subject: For Wednesday's HYDI meeting at 8:30am

From: Self <DIRECTORATE/PHILIP>
To: @LIST2059.PML,nick
Subject: For Wednesday's HYDI meeting at 8:30am
Copies to: davidp
Date sent: Fri, 26 Sep 1997 12:59:07

Hi

We meet again this coming Wednesday, 1 October at 8:30

Trust you all got copies of the article yesterday in the Evening Post (page 43) on Wellington Polytechnic's distributed on-line education? Although the "journalistic freedom" again is evident, overall it looks ok - what do you think?

A few pages prior, there is mention of how Massey students can use e-mail to communicate with each other; also with having most of their extra-mural material on paper, it signals that we might be able to and/or called upon to serve the wider Massey institution with research and consultancy in their desire to grow the area of on-line education.

Can we please discuss the following (any other major points? - e-mail them thru plse):

1. Arranging the joint evaluation meeting of the current courses and the on-line campus - please bring your diary along?

2. using a public listserver and hypermail board on the Web for national and international discussions on "Distributed On-line Education" (do you know of any newsgroup. listservs or hypermail boards dealing exclusively or particularly with this topic?)

3. how the HYDI Educational New Media Centre can serve the wider, new Massey institute if the merger occurs as expected

   For this discussion, you can have a browse through the updated HYDI Web site (www.wnp.ac.nz/HYDI) as well as Massey's College of Education at www.massey.ac.nz/~wweduc/
   and Massey's Extramural Open University Study
   www.massey.ac.nz/~wwcues/
   and their Extramural On-line Handbook
   www.massey.ac.nz/~wwcues/adminh/welcome.htm

4. The "Virtual teams" short course

We will also quickly look at
1. status of download zip files
2. database support
3. Meeting with ISP Rep. (technical fundi at WebNZ)

If we can start at 8:30 sharp and come with proposals ready for action, we'll be finished by 9am!

Please browse through www.wnp.ac.nz/HYDI
if you havn't had a good look in the last two weeks?

See you :-)

10 . <u>Subject: Staff memo item please</u>

From: Self <DIRECTORATE/PHILIP>
To: Vice-President
Subject: Staff memo item please
Copies to: …..
Date sent: Mon, 25 Aug 1997 11:59:06

Vice-President

Can we please announce in the Staff memo that the Polytech's first commercial on-line courses for student enrolment is on the Web?

Something like?:

++

"Polytech launches its first commercial on-line courses on the Web!

Our first two commercial on-line courses for student enrolment were launched on the Web last Monday. These courses are part of the B.Ed and is initially targeted for enrolment by New Zealand students.

EDD Staff and the HYDI Educational New Media Centre worked (among other things!) since March to create a highly interactive and visual learning experience. Message boards, hypermail, on-line publishing facilities,e-mail and a constructivist learning approach are key aspects of these hypermedia courses which is part of our On-line Campus.

Real-time communication facilities over the Net including voice, video, Relay Chat, shared white boards as well as short courses in

areas like Nursing, Virtual teams, Statistics and Web delivery is in
the pipe line for release later this year.

Have a look, by taking the link to the Wellington Polytechnic
On-line Campus from our homepage, or go directly locally to
file:///f:/homepage/onlinec/virtcamp
or on the Web to
http://www.wnp.ac.nz/onlinec/virtcamp

++

I am also discussing a press release re the above with the marketing officer which Nick, ……. and I will be involved in.

Thanks!

11 . <u>Subject: (Fwd) Microsoft/Apple Alliance</u>

From: Self <DIRECTORATE/PHILIP>
To: ……………….
Subject: (Fwd) Microsoft/Apple Alliance
Date sent: Thu, 7 Aug 1997 12:12:00

For your info - some interesting news.

Microsoft and Apple Affirm Commitment To Build Next Generation
Software for Macintosh

* Companies Announce Patent Cross-License Agreement
* Microsoft Announces Office 98 for Macintosh
* Apple Announces Internet Explorer To be Bundled with Mac OS.
* Product Commitment Backed Up With $150M Microsoft Investment in Apple Computer

BOSTON - Aug. 6, 1997 - In a keynote address delivered today at MacWorld Boston, Apple Computer Inc. director and co-founder Computer specialist Jobs and Microsoft Corp. chairman and CEO Bill Gates announced a broad product and technology development agreement between Apple and Microsoft including the following:

•Microsoft will develop and ship future versions of its popular Microsoft Office productivity suite, Internet Explorer and other Microsoft tools for the Mac platform.

…..

Appendix 14

Extracts from the three-year plan 1998 - 2000 of the Educational Development Department

DRAFT THREE-YEAR PLAN 1998 - 2000

CONTEXT

…

- Competition

…

- The Australian universities with their distance capability, are serious competitors and market aggressively, particularly in the Auckland area.

- Competitive Advantage

…

- Our HYDI delivery gives us a considerable competitive advantage among people with Internet access.

- Internal

…

- The Internet provides a great opportunity for distance delivery of both BEd and MEd programmes. The Intranet will offer new opportunities for staff development.

VISION
While retaining and strengthening its central service functions, EDD will try to get out of central overhead funding as much as possible by increasing its own income by ♦ earning EFTS by offering a portfolio of programmes ranging from a top-of-the-line MEd to the Framework Level 4/5 courses. Planning for a PhD will begin towards the end of this planning period. ♦ earning external consultancy fees in, particularly, curriculum design for distance delivery on the Internet, assessment methods and capturing a proportion of the public good research dollar. ... EDD will over the years 1998-2000 define and develop a number of specialist consultation portfolios. These will probably include - ♦ contract research - with particular reference to curriculum theory and design ♦ assessment and recognition of prior learning ♦ human relations and communication ♦ distance education via the Internet and Intranets ... Two specific development costs associated with the vision ♦ ... ♦ investment in programme/course development via the Internet and Intranet* to achieve national and international distance delivery capability * like the Internet using Internet software to service in-house corporate computer networks

PROPOSALS FOR ACTION 1998-2000

To achieve the vision and its strategic objectives requires the polytechnic to make decisions about the following proposed actions.

1. About Structure

   1.1. Structurally, EDD needs to remain a central service unit. The synergies between its teacher education and educational development functions are great.

   ...

2. About Programmes

2.1. Bachelor of Education

…

2.2. Master of Education

The early part of the triennium will see changes resulting from the Accreditation exercise, the Bachelor of Education Review and the usual changes resulting from new programme glitches. By the end of 1998 all MEd courses should be available by distance, including the Internet.

...

3. About Delivery

3.1 Distance Delivery

EDD's three-year growth projections depend on its capacity to deliver programmes at a distance. It is envisaged that the following two modes will dominate.

(a) Delivery at Other Sites

The very practical 5100-level courses of the BEd will continue to be delivered in face-to-face mode at other sites. While co-ordination is done from Wellington for the various consortium partners, we have assumed teaching will be done by local educators who have joined the already established EDD College of Teacher Educators.

(b) Other distance education will be centred on the Internet although advanced courses will also be readings-based. It is intended to have all suitable courses in the BEd and MEd available for distance delivery by the beginning of 1999.

3.2. Teaching Resource Development

(a) The New Media Centre, established in 1996, will be crucial to the development of a full distance teaching capacity. Its services must, therefore, continue to be available to EDD. It would facilitate the development and maintenance of distance courses by providing the technical services needed for distance course development. A separate strategic plan is under development for the New Media Centre.

3.2 The Teaching Resource Centre is intended to operate as at present. However, there may be synergies between its work and that of the New Media Centre. Possible synergies will be explored during 1998 to ascertain whether the functions of the Teaching Resource Centre and the New Media Centre can be combined.

...

Marketing

1. SWOT Analysis (TOWS, actually)

1.2 Opportunities abound.

...

_ Technological Developments: EDD staff have the experience to use distance learning technologies in delivering teacher education programmes. Embryo developments through HYDI give Wellington Polytechnic a substantial advantage also in South East Asia.

1.4 Strengths

_ Wellington Polytechnic has extensive experience in teacher education. Its staff are respected and have the potential to become leaders in the field.

...

2 The Market

The environmental scan has exposed much marketing information. In summary:

_ higher qualifications are in high demand
_ the BEd/MEd catchment area is New Zealand wide
_ there is considerable potential to expand offshore via the Internet

The biggest limiting factors are:

_ the market is very small and niche
_ potential students are dispersed throughout New Zealand

2.1 Market Trends

...

_ The vast majority of students will be part-time; small scale part-time at that.
_ ...
_ Potential students will look for maximum flexibility in starting times and places of learning.

…

Appendix 15

Extracts from the 1997 Performance Agreement of the HYDI educational consultant who is a Educational Development Department staff member

Alison R Viskovic

1997 Performance Agreement:

Meet Position Outline primary objectives, ie:
…

5. Work with Schools of the Polytechnic to meet their specific lecturer education needs, providing consultation, short courses, seminars etc as requested, within available resources.
In 1997: focus on support for project HYDI related consultation etc

…

8. Provide consultation / advice on teaching and learning ISP Rep.ers to the academic staff of Wellington Polytechnic, and to external clients of Wellington Polytechnic - as requested, within available resources. In 1997: focus on support for Project HYDI-related consultation.

….

10. Carry out research related to tertiary teaching and learning:

…

• Major: Participate in interdepartmental “Project HYDI”, focussed on developing distance delivery using Internet world wide web, CD ROM, etc, commenced late 1995.
Continue in 1997 - focus on completing Course 6204 and developing 6206 .

…

Appendix 16
Evaluation Meeting

10 October 1997

Present:

- HYDI Educational New Media Centre team - Computer consultant , Alison Viskovic, Media developer 1, Graphic designer, Media developer 2, Philip Uys
- on-line course designers: David Pauleen, Nick Zepke

<u>Product: courseware and facilitation processes</u>

1. Continue
   1.1 good visual design
   1.2 various navigational paths
   1.3 personal style ("Hi, I'm old Nick")
   1.4 sound content
   1.5 based on educational principles / objectives

2. Start

	What?	How?	
2.1	clearer instructions on technical aspects; specifically down load		
2.2	reduce text (more constructivist approach)		
2.3	less fragmentation of narrative add exercises		
2.4	closer integration of design and narrative		
2.5	new media elements: video clips / sound		
2.6	closer integration of message boards etc. with narrative		
2.7	less restrictive navigation		
2.8	Numbering for sequential path		
2.9	more clarity on navigation plan		
2.10	more creative navigation eg start in gym		
2.11	more enticement	2.11.1 clearly list benefits in intro 2.11.2 more info in public area	Nick Nick

<u>Development and other processes</u>

3. Continue

3.1 accuracy of on-line media development
3.2 open to ideas
3.3 labelling of files as separate
3.4 management of project
3.5 enthusiasm / “happy to be part of” feeling
3.6 provides interesting “research projects”
3.7 critiquing everything all the time
3.8 experimentation / research approach

4. Start

	What?	How?	
4.1	properly synchronising updates of files		
4.2	increase QA (testing): content, educational processes, graphic design, on-line media development, technical aspects	4.2.1 Moderators involved	
4.3	increase QA on ext links		
4.4	increase critiquing		
4.5	database support		
4.6	clearer conventions on content provision		
4.7	quick way of finding and identifying graphics		
4.8	tracing accesses and down loads		
4.9	develop house style guide - including other guidelines		
4.10	proper training of on-line facilitator		
4.11	early and clear explanation and negotiation of the facilitator’s role and responsibilities		
4.12	notice of new postings on message boards		
4.13	inter-disciplinary qualifications in distributed on-line education	4.13.1 smaller, modular development	
4.14	more creative and effective promotional strategies : both courses and the HYDI Educational New Media Centre		

Appendix 17
Discussion with Business Analyst

DSS Project : Interview with Philip Uys, Education New Media, Distance Education
21 September 1998, 2pm
……..

Online Courses

Putting courses online is treated as a research project and is labeled with the acronym HYDI. Philip faces many issues with respect to this project. The most pressing are a lack of technical skills (or support) especially in the area of database/web integration, and motivating lecturers to put their courses online.

The culture at WNP tries to encourage lecturers to get their own courses online after some initial assistance and guidance is given. Due to the complexities of the task, many lecturers will not bother to follow through, preferring their traditional teaching methods. They lack the skills and support needed to make this a success.

There is a very real financial and time cost incurred to convert course material for online delivery. It has not been properly established whether this is more or less in relation to setting up a course for classroom or lecture room delivery, but is assumed to be comparable. The perceived benefits of the online approach are in the future savings, and the individualisation of the teaching style to individual students, allowing different methods and pace to be applied. It is believed that online courses can be delivered to a much larger base of students, and at the same time the learning can become more one-to-one. This approach also requires more complex support structures to be in place to support the students with their learning as access to the lecturers will become more limited. Presently, there is not sufficient competitive demand to drive this at a faster pace. Currently, there are three online courses offered at WNP, plus a sample course for general viewing.

For the online courses that do exist, there is a lack of technical support for the students doing these courses. Students have to "hunt around" for someone with the skills and time to assist them if the run into problems. This is much easier for students on campus, but must be very difficult and frustrating for remote students. It was suggested that a Help Desk facility should be established to support these students.

Teaching New Media

Major problems exist getting the internal labs working. In this area new products are being tested and need to be integrated into the broader campus IT infrastructure. This area is disconnected from the mainstream IS function so support is difficult to obtain requiring the unit to gain its own skills and independence. The danger here is overlapping duplication of skills, skill shortages and divergence from established standards. This can result in learning environments being established for students which are not properly architected or supported.

If online learning and teaching is to become more mainstream than further investment in computer labs will be necessary (and less lecture rooms). A better support infrastructure will need to be developed to assist with this area as it develops.

Appendix 18

First Draft Guidelines and Regulations for On-line Education

9 October 1997

Rough draft

This document provides principles and guidelines concerning on-line educational (teaching and learning) materials on both the intranet and the Internet.

It deals with the responsibilities of
- academic staff
- the HYDI Educational New Media Centre

Principles

1. A clear distinction is made between:

    1.1 Putting teaching and learning accessories on-line on the intranet eg class notes, examples, results, announcements

    1.2 Distributed on-line education (teaching and learning) on the intranet or Internet: as a supplement to classroom education or as a dedicated on-line course

2. The approach is one of support, service and opportunity within a framework of training, guidelines and necessary regulations.

A. Guidelines relating to aspects 1.1 and 1.2

- HYDI is available to provide informal or formal consulting and training
- HYDI is responsible to spearhead and coordinate the use of new media in education at Wellington Polytechnic to enable technology-based educational improvement and innovation for open and flexible learning
- the general guidelines on how to publish on-line in paper and digital format should be consulted by academic staff
- on-line education is to be incorporated in the *Introductory Teaching and Learning course (101)* for new academic staff , as well as in *102 : Learning and Teaching*
- a new core course on the 100 level in the Diploma for Tertiary Education dealing with *On-line Education* needs to be developed and introduced
- …

B. Putting teaching and learning accessories on-line on the intranet (1.1)

- learning accessories are materials like static class notes, examples, results, announcements
- academic staff use contents, formats and processes as per personal preference within the wider guidelines and regulations of the institution and department
- ..
- ......

C. <u>Guidelines relating to distributed on-line education (teaching and learning) on the intranet or Internet (1.2)</u>

- distributed on-line education include
  ⇒ supplements to classroom education: case studies, links to Web sites, ...
  and
  ⇒ complete on-line courses
- these materials needs to be prepared, developed and placed on-line in conjunction with HYDI
- academic staff need to negotiate time-frames, educational processes and templates with HYDI
- HYDI provide the specific graphic design directives formats which include preferences of the content provider
- HYDI assists in the creation of graphical elements; this could be advice and training or the actual construction of these elements
- HYDI is responsible to place these items on-line (on the intranet and Internet)
-
- ......

D. <u>Regulations</u>

- all teaching and learning materials relating to Wellington Polytechnic courses will reside on the official Polytechnic Web site or intranet
- ....

Appendix 19

PART A   P O S I T I O N O U T L I N E   1997

OVERVIEW:
Position Title: Senior Lecturer: Educational New Media **Department**: Education Development Department **Position Summary**: Is responsible to spearhead and coordinate the use of new media in education at Wellington Polytechnic to enable technology-based educational improvement and innovation for open and flexible learning by directing the activities of the HYDI Educational New Media Centre. … **Person Specification**: …
REPORTING RELATIONSHIPS:
Responsible to: Head of Education Development Department Responsible for: Approved Members of New Media project teams (including the Hypermedia in Distance Education Programme Team) whilst they are working on these programmes/projects.

REQUIRED LIAISON/ WORKING RELATIONSHIPS:
Within Wellington Polytechnic: (other than immediate colleagues): EDD staff “Computers in Teaching Group” members CSG staff Other staff whose activities relate to New Media programmes/projects. **Outside Wellington Polytechnic:** Authorities in the area of New Media including directors of Hypermedia and New Media units both in New Zealand and overseas.

PRIMARY OBJECTIVES OF THE POSITION:

1. Research and develop the use of new media in teaching and learning at Wellington Polytechnic.

This includes:

- **promotion:** promote technology-based education both internally and externally
- **liaison:** liaise with known authorities in these areas
- **planning:** plan to introduce New Media projects
- **training:** train academic staff in the use of technology-based education
- **development:** develop multi-media, hypermedia and on-line courses and course materials including the Wellington Polytechnic homepage
- **research:** on-going research in this area
- **support:** offering a wide range of state-of-the-art new media services, consulting and equipment for academic staff

2. Managing the development of hypermedia on-line courses (the project is titled "HYDI").

This includes activities which are generic for all new media projects:

◊ obtain the Head of EDD's agreement for specified outcomes
◊ negotiate and establish project time frames
◊ develop annual goals and objectives for Hypermedia in Distance Education
◊ negotiate approval for participation in Hypermedia in Distance Education by appropriate Wellington Polytechnic staff
◊ identify the work required and assign tasks to appropriate personnel
◊ coordinate the activities of the project team
◊ negotiate the purchase of equipment needs
◊ ensure that the project costs remain within budget
◊ accept responsibility for all equipment purchased
◊ ensure that time frames are met
◊ undertake appropriate publicity within Wellington Polytechnic as well as arranging external advertising and marketing
◊ behave appropriately in the external environment to ensure that Wellington Polytechnic maintains its competitive advantage within this field
◊ ensure that all Wellington Polytechnic and Department rules, procedures and policies are complied with
◊ prepare an Annual Report on Hypermedia in Distance Education.

The Project Manager for Hypermedia in Distance Education is the link between those involved in this programme and the Senior Management of Wellington Polytechnic. He/she accepts responsibility for all administrative ISP Rep.ers relating to these activities and ensures that the interests of Wellington Polytechnic in general are always protected. The Project Manager will attend regular meetings with the Head of EDD to facilitate processes.

3. Assist the Head of EDD with administration including the preparation of data for the annual report and business plan, on-going budgetary controls and marketing of relevant programmes and courses.

Appendix 20

Media Release **4 September 1997**

Wellington Polytechnic Offers Degree Courses On-line

Wellington Polytechnic has enrolled its first students on courses over the Internet which are part of the polytechnic's Bachelor of Education degree.

The courses were launched on the Internet two weeks ago and are thus immediately available worldwide, although the courses were designed with New Zealand students in mind, according to senior lecturer in Educational New Media, Philip Uys.

The polytechnic's distributed on-line courses, which is part of the Wellington Polytechnic On-line Campus, aim to combine the flexibility of distance learning with the benefits of 'real-time' social interaction, although the initial focus is on the asynchronous ('any time') mode of learning, says Mr Uys.

Students are currently able to apply for enrolment on-line and then study in the same way as for conventional distance learning, but can contact polytechnic tutors whenever they want using electronic discussion boards, hypermail and email. They are also able to submit and publish their work directly on to the World Wide Web.
On-line communication among students are supported and encouraged through electronic discussing boards and hypermail.

Later this year, the Educational New Media Centre will implement 'real time' visual, audio and drawing methods such as video conferencing and shared white boards over the Internet to enable students to exchange information and receive instant feedback in 'real time'.
Learning on-line means students can enrol for courses at any time throughout the year and complete the courses according to their schedules instead of being restricted to a specific time schedule on campus.

The two current courses being offered are Curriculum Design and Development and Introduction to Educational Research. On-line short courses on nursing, statistics, virtual teams and Web delivery will also be offered in the next few months. A free Sampler course is also available in the on-line campus.

Wellington Polytechnic's on-line campus

can be reached from: http://www.wnp.ac.nz

For further information please contact: Philip Uys, senior lecturer Educational New Media, phone 04 801 2794 ext. 8926; fax 04 8012697, email philip.uys@wnp.ac.nz

Appendix 21

MEMORANDUM

TO:	HOS's / HOD's / All academic staff / Others interested
FROM:	Philip Uys Project Manager: HYDI
DATE:	30 April 1997

INVITATION TO PROPOSE A SHORT ON-LINE COURSE FOR WEB DELIVERY

We would like to invite you to join in the exciting venture of delivering courses via the World Wide Web to an international audience, by proposing a **short** course in your academic area which you believe will:

- √ have a wide **international** audience and success (this will hopefully enable us to offer it at a modest fee)
- √ be a **short** course not more than the equivalent of 4 or 5 credits (40 - 50 total learning hours).

We will provide the following support:

- two opportunities to attend an information session for interested staff in 5E17 on Monday, 5 May or Wednesday, 7 May at 12 noon
- educational and technical information on how to design a course like this
- conversion of the content, photographs and graphics into Web documents
- linking the course to the Wellington Polytechnic On-line Campus
- assistance in marketing the course on-line.

What we would require from the content provider is

- the content in electronic form (word-processed)
- teaching / learning structure that will provide navigational ideas
- assessment strategy
- editing and testing the course
- a commitment to keep to an agreed schedule of development.

The first step is to attend one of the information sessions in 5E17 on Monday, 5 May or Wednesday, 7 May at 12 noon (if you can) or to contact us for a form which will assist you in preparing your proposal.

Proposals will be prioritised, and we hope that development of the first short course will start early June. All proposals will not necessarily be accepted for development. (Follow up discussions might be needed to determine the order in which on-line courses will be developed).

Courses that might be successful in this regard include

- on-going professional development courses eg "New techniques in ..."
- seminar type courses
- a shortened version of some current part-time programmes or introductory courses.

Feel free to request more information from Alison Viskovic or myself.

Looking forward to your participation
Philip Uys

Appendix 22

hydi Educational New Media Centre

BUSINESS PLAN
August 1997

TABLE OF CONTENTS

INTRODUCTION

1 Terms Of Reference

Compiled by Philip Uys, Senior Lecturer and Project Director : Educational New Media.

This document refers to the HYDI Educational New Media Centre which has a mission of spearheading and coordinating the use of new media in education at Wellington Polytechnic from an integrated management, educational and technical perspective to enable technology-based educational improvement and innovation for open and flexible learning.

It started in September 1995 as the “HYDI research project” and has been establishing itself as a growing research centre in the area of educational new media.

2 The Three Year Plan

This is a strategic overview of the functions of the HYDI Educational New Media Centre.

As it is looking into the future and involves concepts, it will be narrative in form and general in description.

3 The Annual Capital And Operating Budget With Notes

This section deals with the 1998 budget.

PART ONE:
THE THREE YEAR PLAN

1 Executive Summary and Mission

The HYDI project is establishing itself as a growing research centre in the area of educational new media and became the HYDI Educational New Media Centre in 1997. Its main area of research and development currently is in on-line education for both distance and on-campus delivery.

On-line delivery, whether more targeted to distance (extra-mural) or on-campus delivery, is not seen as an end in itself, but is based on sound educational and business principles to enhance learning and increase student numbers. The term that we use to describe this kind of learning and teaching is: “distributed on-line education”.

It is envisaged that on-campus delivery will increasingly make use of hypermedia and Web technologies on an intranet(s).

Five main responsibilities have been emerging and will be more formally established over the next three years to fulfil the mission of this centre.

They are:

- research
  - ⇒ formal ie leading to formal qualifications, publications and presenting papers
  - ⇒ informal ie generic as well as specific scanning of the applicable environments
- education and training
  - ⇒ the project director will do formal teaching on the B.Ed. and M.Ed
  - ⇒ staff development in the form of seminars and workshops
- consulting
  - ⇒ internally assisting academic staff
  - ⇒ external ie as an entrepreneurial activity to non-competitors
- development
  - ⇒ various projects: main focus for the next three years will be on developing distributed on-line courses
  - ⇒ internal: support the development of distributed on-line courses for both distance and on-campus education
  - ⇒ external: assist non-competitors with distributed on-line education as an entrepreneurial activity
- promotion and liaison
  - ⇒ internally: promote the appropriate use of educational new media
  - ⇒ externally: promote the activities of the centre to generate external consulting, research and development projects as well as establishing external links.

These responsibilities in the next three years will progress from

- ♦ less formal to more formal structures
- ♦ experimentation to more structured research
- ♦ small scale development of distributed on-line courses to large scale development
- ♦ ad-hoc staff involvement to full-time involvement
- ♦ research funding only to research funding and own income generating through consulting and research projects, central funding for both staff development as well as for assisting academic staff to increase student EFTS by developing distributed on-line education courses.

2 Vision

The HYDI Educational new Media Centre is to spearhead and coordinate the use of new media in education at Wellington Polytechnic from an integrated management, educational and technical perspective to enable technology-based educational improvement and innovation for open and flexible learning.

A key focus is on combining hypermedia on the World Wide Web and on intranets as a learning and teaching medium with current educational strategies, to provide quality education to on-campus, other New Zealand and overseas students in an open and flexible manner. This teaching and learning approach is called "distributed on-line education". The aim is to offer both formal qualifications and shorter courses for certain niche markets in this mode.

In conjunction with traditional delivery strategies, the centre aims to use the Internet and intranet(s) to facilitate the development and deployment of courses and services of Wellington Polytechnic to students

- at their choice of place
- at times of their choosing
- at their own pace
- in a variety of ways.

Distributed on-line education can take on a variety of forms but often includes:

- hypermedia presentations on the Web or intranet
- asynchronous and synchronous on-line communications through technologies like electronic mail, message boards, on-line real time meetings
- visits by lecturers to major centres/pockets of on-line students or bringing students on-campus for periods to conduct:
  - student group work
  - present key lectures and
  - address learning problems.

- The centre is also responsible for developing a conceptual framework for distributed on-line education and to ensure a smooth implementation of it.

6 Goals

6.1 To grow research, education and training, consulting, development, promotion and liaison in the area of educational new media.

6.2 To build a reputation for

- technical innovation
- quality of products
- client focussed services
- in a global education market.

6.3 To investigate and propose strategies for internal and external clients covering a range of areas including:

- development of distributed on-line courses
- graphic design for on-line delivery
- video and voice applications for the Web

- internal promotion
- appropriate development methodologies
- appropriate software and hardware for both the institute and students
- on-line instructional design
- roles and responsibilities of the on-line educator
- student support systems eg library services, socialisation opportunities, on-line communication
- effective administration procedures
- training of on-line educators
- effective marketing of on-line courses
- security and access
- intellectual property right and copyright issues.

6.4 To research, develop and facilitate on-line (ie via the Internet and Intranet) hypermedia programmes for distance and on-campus education at the Wellington Polytechnic, with an aim to increase

- educational opportunities
- profit
- quality of learning
- student numbers and
- staff productivity.

7 Critical success factors

7.1 Senior management support

7.2 Central research funding as a strategic investment to establish the use of educational new media at Wellington Polytechnic.

7.4 Continued national and international research and development in this rapidly expanding educational area.

7.3 Effective national and international marketing of the services of the centre.

7.4 Expanding links with local and international experts and bodies in the area of educational new media.

7.5 Strategic alliances with approved educational institutions within New Zealand and Australia who are working in this field to enhance the development of on-line courses.

7.6 Controlling physical and educational access to on-line educational materials.

7.7 Bridging the gap of ESL and EFL to penetrate the Asian and other similar markets.

7.8 Finding effective niche markets.

7.9 Obtaining appropriate resources (people, finances, procedures).

7.10 Thorough planning and management of the centre.

3 Overviews

3.1 1995/1996

The hypermedia project started on 8 September 1995 when a project proposal presented by the current project director was accepted by the Principal at that time, Mr Bob Bubendorfer.

The first pilot project to develop the Wellington Polytechnic Homepage was successfully implemented on the Internet on 4 December 1995 with a project team of interested individuals from various schools and departments.

We defined the roles within the project and compiled the core project team:

- sponsor : supports the progress of the project (Bob Bubendorfer)
- operational adviser : advises on resource ISP Rep.ers and controls the development budget (HYDI Ops Adviser)
- external contacts adviser : advises on external relations and implications (HYDI Ext Adviser)
- academic adviser : advises on all academic ISP Rep.ers (Vice-President)
- project director : directs the project (Philip Uys)
- content director : organises and ensures the quality of the content

(EDD : Nick Zepke and Alison Viskovic)
(Homepage : …. - academic content)

- creative director / graphic designer : responsible for all visual aspects including the production of graphical elements (……… and ………)
- computer specialist : advises on and supports all relevant software, hardware and networks (……….. in 1995; ………… in 1996)
- educational director : ensures sound educational processes (Alison Viskovic).

We formulated a project management philosophy based on effectiveness and goal achievement.

We initiated contact with visionaries, developers and educationalists in hypermedia both in New Zealand and internationally via electronic mail and the following conferences: “World Conference on Educational Hypermedia and Telecommunications" in Boston, USA (June 1996), a conference in Brisbane, Australia on "On-line Commerce" (October 1995) and the "Australian National Telecentres Conference" in Bunbury, Western Australia (October 1995).

We obtained most of the short and medium term equipment required for the project.

We created the Wellington Polytechnic On-line Campus accessible from: http://www.wnp.ac.nz

The first on-line course was developed as a sampler titled: “Teaching Techniques for Adult Learning”.

At the start of 1996, the project director’s duties regarding teaching as a senior lecturer in the Computer Studies Department was reduced to 70% to allow 30% time towards HYDI.

3.2 1997

At the start of 1997, the HYDI project was established as a centre within the Educational Development Department. At the start of 1997, the project director’s duties regarding teaching as a senior lecturer in the Computer Studies Department was further reduced to 50% to allow 50% time towards HYDI. At the same time the project director changed departments: from Computer Studies to Educational Development.

The first two commercial on-line courses for student enrolment were launched on the Web on 18 August 1997. These two courses, “Curriculum Design and Development” and “Introduction to Educational Research”, are part of the B.Ed and are initially targeted for enrolment by New Zealand students. The course convenors are Alison Viskovic and Nick Zepke of the Educational Development Department.

Academic staff worked with the HYDI Educational New Media Centre to create a highly interactive and visual learning experience. Message boards, hypermail, on-line publishing facilities, e-mail, and a constructivist learning approach are key aspects of these hypermedia courses which are all part of the Wellington Polytechnic On-line Campus.

The project director presented two international papers at the “18th World ICDE (International Council for Distance Education) Conference" in Pennsylvania, USA (June 1997) titled "Supporting Cyber Students Over The Web: The On-line Campus of Wellington Polytechnic" and "Managing a Hypermedia Courseware Development Project: Dynamics and Conclusions". He was also a member of two panels that dealt with : “An Infrastructure to Support the Use of Education Technology for Sustainable Development” and “Moving Course materials from Paper-Base To Screen-Base”.

In July 1997 the Web administrator in MIS took over the Wellington Polytechnic homepage maintenance.

4 SWOT Analysis

4.1. Strengths

- The principal was the sponsor when the centre was a project in 1995 and 1996
- In 1997 the Vice-President,…………, publicly stated that the work of the centre has become a strategic direction for Wellington Polytechnic
- At the start of 1997, the HYDI project was established as a centre within the Educational Development Department which provided more permanence for the centre and also highlighted its strong educational base and focus
- Since the beginning of 1997, the project director's duties regarding teaching as a senior lecturer in the Computer Studies Department was reduced to 50% to allow 50% time towards HYDI
- Since the start of 1997, the centre operates an own budget which is centrally funded
- People involved are internally motivated, committed and hardworking
- The centre demonstrated an ability to be both innovative and pragmatic by successfully delivering on its vision and goals
- Suitable equipment for all basic requirements has been obtained.

4.2. Weaknesses

- The Internet and related technologies are developing at an exponential rate
- A research centre is new to Wellington Polytechnic (in fact to most Polytechnics in New Zealand and abroad) and fits more easily into a university environment
- The financial resources limit the research outcomes severely, especially in not being able to employ a computer technician for a substantial number of hours per week
- Most people involved in the centre has other stronger commitments in their working day
- The operational processes within this centre is often different than the processes within vertical departments and schools due to its nature as a growing research centre and entrepreneurial focus
- Marketing and promotion of the services of the centre is not adequate
- Students desiring to do on-line courses might not have adequate computing facilities

4.3. Opportunities

- A research centre of Wellington Polytechnic will enhance its academic status and assist it in its move towards university status
- On-line education is a new and fast developing field
- The Internet is a very prominent national and international development
- A large number of tertiary institutes in New Zealand and internationally is embarking on on-line education and require assistance and advice
- Most academic staff at Wellington Polytechnic will require training in this area in the next three years
- Most people in full-time jobs find on-line learning more attractive than attending evening classes

- In a large number of countries - especially developing countries in Asia, Africa and South America - there is a tremendous need to obtain quality education where they live.

4.4. Threats

- A large number of educational institutes in New Zealand and internationally are entering the field of distributed on-line education
- A larger proportion of income needs to be generated externally
- The centre needs to be more widely accepted in the organisational structure of the Polytechnic
- Information Technology can become out-dated and redundant very quickly.

8 <u>Strategies and actions 1997/1998/1999</u>

<u>Rest of 1997</u>

1. The first on-line short course, “Virtual Teams: Meeting On-line” is to be launched in November 1997 for national and international delivery. The course convenor is David Pauleen of the Department of Communications.

2. The first teaching and learning resource of the On-line Campus is to be launched in November 1997 and comprises a comprehensive set of evaluated and categorised links to statistical organisations, resources and statisticians across the world. The compiler of this resource is Misha Lovrich of the Computer Studies Department

3. The project director will highlight some of the key trends and developments in Cyberspace education (distributed on-line education) in a paper at the "Virtual Technologies in Tertiary Education: A Vision for New Zealand?" conference to be held 11-12 October, 1997.

<u>1998 and 1999</u>

1. The project director has accepted an invitation to contribute a chapter for a book on "The Electronic University" with researchers from the University College of London, to be published in August 1998 by Springer-Verlag.

2. The project director will deliver a paper in Tours, France in April 1998 at the "Towards the Global University: Strategies for the Third Millennuim" conference titled: “New Educational Technology And The Global Village: Key Management Issues In Higher Education“.

3. The project director has accepted an invitation by the Knowledge Media Institute of the Open University in the UK to hold a seminar regarding the work of the centre in April 1998.

4. The project director has also been invited to hold a seminar on the work of the centre at the Open University of the UK (en route to the conference in France).

5. Grow external consulting, research and development projects in 1998 and extend in 1999. The project director has been invited by the Technikon Pretoria in South Africa to lead a project in 1998 to establish on-line education in the institute.

6. Broaden the interest base in on-line education at Wellington Polytechnic by establishing a "Forum for Distributed On-line Education" as a sub-committee of CTAG

7. Document guidelines for the on-line course development process in 1998

8. Investigate and experiment with real-time communication facilities over the Net including voice, video, Relay Chat, shared white boards in 1998

9. Design and implement database support for on-line course generation in 1998.

10. Establish a marketing strategy in 1998 to include:

- key target markets
- key target market needs
- strategies to achieve it

11. Establish effective administrative services in 1998 for:

- registration
- international fees
- payment of fees
- assessment procedures
- security and access to courseware
- logistics of visits to centra
- logistics of visits to Wellington Polytechnic

12. Create on-line communication facilities for all the M.Ed courses in 1998.

13. More BEd degree courses on-line in both 1998 and 1999

14. More short niche market courses. Short courses in Nursing, Virtual teams, Web delivery and Business Writing are in the pipe line for release in 1998

15. Other degree courses and parts of programmes. A course in Statistics is planned for 1998

16. The project director will teach formal courses on distributed on-line education as part of the BEd in 1998

17. Having a range of seminars and workshops on distributed on-line education. For 1998 the following workshops are being planned: “How to use the Intranet for teaching”, “Finding Things on the Web Fast”, “Developing courses for on-line delivery”.

18. Ensure continual quality assurance and effective management of new media developments and products

19. Extend educational contacts in international markets to provide local support for students (wherever required).

20. Forge closer links with institutes, organisations and individuals conducting research and development in this area

21. Conduct our own continual research into this area via the above contacts, the limited number of publications in this area, conferences, experimentation

22. Document course and technical design principles ie how our on-line courses are being designed from a educational and technical perspective (1999)

23. Document HTML programming standards (1999)

24. Extend and implement appropriate organisational structures, physical structures and facilities to support this centre

25. Establish effective educational support services for students through negotiations with the applicable managers, specifically library facilities and Learning Support
26. Create internal and external awareness of the services of the centre

27. Further research and publications. Nick Zepke has published in the area of on-line instructional design, Alison Viskovic in teaching and learning in general, and Philip Uys in the development of on-line courses and management of such developments.

9 <u>Marketing and Promotion</u>

8.1 On the Internet : extend the HYDI Website, promote on search engines, guides, newsgroups and related sites
8.2 Develop a brochure for external promotion
8.3 Inform other educational institutes of our services
8.4 Target specific markets - including tertiary institutes in New Zealand and in developing countries

8.5 Advertise in educational publications like the Educational Gazette
8.6 Internal marketing within the Polytechnic.

10 <u>Staff</u>

The HYDI team for 1997 and 1998:

Philip Uys : Project Director
Alison Viskovic : Educational Director
….. : Computer Specialist
….. : Creative Director / Graphic Designer
….. :On-line media developer
…..: On-line media developer
In 1998, ……, will join the HYDI team as a consultant in the area of virtual teams.
Content Director: the course convenor of an on-line course
(The Web administrator in MIS took over the Wellington Polytechnic homepage maintenance in July 1997)

…

11 Revenue

11.1 Central research funding to grow the research centre as a strategic Wellington Polytechnic direction.

11.2 Central funding for staff development.

11.3 Own income generated through external consulting and research projects.

11.4 Central funding for assisting academic staff to increase student EFTS by developing distributed on-line education courses. (If central funding is not possible, it is envisaged that a costing system will be put in place to generate income for the HYDI Educational New Media Centre from the content provider's department paying for the development of on-line courses.)

11.5 Create high on-line readership ("traffic") areas within the on-line campus to generate income through external banner advertising.

Appendix 23

MEMORANDUM

TO: Philip Uys
FROM: Nick Zepke
DATE: December 1996
TOPIC*:** ***Your 'Home' for 1997 and Beyond
==

Bob, the Vice-President, the Head of the School for Business and Information Systems, Head of the Computer studies Department and I met on 4 December to discuss where you might be most effectively placed in 1997 and beyond. The following summarises the discussion.

1. It was agreed that HYDI and the development of 'new media' involving computer mediated learning is very important for the polytechnic. Such development work needs both a 'home' and the facility to train other staff as polytechnic-wide initiatives are envisaged.

2. It was decided that the Educational Development Department (EDD) was a suitable 'home' for a 'new media' initiative.

   It was agreed that the work of coordinating 'new media' developments would grow to a full-time load from 1998 and that the polytechnic would commit itself to funding such a full-time position from 1998. (The polytechnic will review the programme from time to time as it does with all its programmes.)

3. It was agreed to ask you to join EDD as HYDI leader and to spearhead the further development of computer mediated learning across the polytechnic. For 1997 it is envisaged that you work 0.5 FTE on HYDI or its successor and 0.5 FTE for the School of Business and information Systems, as agreed with your Academic group leader, for an average of nine hours teaching per week. There was discussion that for some of your BIS work you might consider developing trial computer mediated packages.

   From 1998 it is envisaged that you will work full-time on the 'new media' development programme. In addition to programme leadership you would teach staff to become self-sufficient developers as well as teach courses (probably within the BBusInf) about computer mediated learning.

4. Accommodation was discussed. It was agreed that for 1997 the present accommodation provisions would most likely prevail. From 1998, however, EDD will be responsible for housing the new media work.

5. It was agreed that from 1997 performance ISP Rep.ers will be administered by EDD with input from BIS.

6. It was agreed that going to international conferences was important for a ‘new media’ leader and that the arrangement with your Academic group leader to release you in early June to give papers in the United States should stand.

If there is anything that is not clear, you know how to find me. We don’t expect an immediate response. However, this proposal shapes up similarly to the way new media is developed overseas and is in line with some of our previous discussions.

….

Appendix 24
Cycle 4: A Selection of E-Mail Messages

In most cases pseudonyms or position titles replaced personal names to ensure anonymity.

1. <u>Subject: Re: Meeting with Vice-President</u>

From: Self <DIRECTORATE/PHILIP>
To: nick
Subject: Re: Meeting with Vice-President
Date sent: Wed, 21 Jan 1998 15:02:30

Hi Nick
…
I received an e-mail from Pretoria Technikon on Friday that
1. they have meeting this Friday, 23 Jan where they will make a final decision on their inivitation to me to lead an Internet teaching project for them (duration etc.) 2. the possible start date that they wanted to know if it will be ok for me - I indicated positively - is end of Feb (which will effectively be mid- Feb so that I can set things up before the project starts)

…

2. <u>Subject: Connecting</u>

From: …….
Organization: University of Botswana
To: philip.uys@wnp.ac.nz
Date sent: Sat, 18 Apr 1998 15:03:14 GMT+2
Subject: Connecting

Hi Philip. How very nice to meet you in Tours. …..

I am interested in knowing when you will be coming to South Africa to do some work and what time frame you might have to stop by Botswana.
…
If we can afford you, then we can chat about what is the most important for us...we have a need to have some expertise to help with technology planning, to help design training programs for staff, to perhaps do a workshop or two for academic staff on what this new technology is all about as it impacts a new approach to teaching.

Look forward to hearing from you.

3. Subject: Web course graphics

From: …..
Organization: ……. Polytechnic
To: p.uys@wnp.ac.nz
Date sent: Thu, 28 May 1998 15:30:54 GMT+12
Subject: Web course graphics

Kia ora Philip
Ive just been given the graphic designer’s name by Alison Viskovic - when I was talking with her this morning about …… first online course.

I would like to make contact with him as soon as possible - would you please tell me how I can? I'd also like to have a chat with you sometime about your HYDI project.
…….