Faculty of Education

Implementing Innovative Technology:
Towards the Transformation of a University

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Declaration

I declare that this thesis is my own account of my research and has not previously been submitted for a degree from any university. To the best of my knowledge, this thesis does not contain any material written or published by another person except where duly acknowledged in the text.

Signed

Date

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Abstract

Growing pressure is being placed upon educational institutions as students, employers and governments look at the economic, demographic and technological environments of the present, expecting them to have the answers for the future. Many institutions are turning to information and communication technology (ICT) for some of these answers. The focus of this study is two fold - the use of ICT in teaching and learning by teaching staff within an Australian tertiary institution (Curtin University of Technology) and the mechanisms the University has established in order to realign themselves with the information age. At certain stages these two coincide to provide an insight into the organisational culture and teaching environment of one Australian University. The key research questions that guided this study are as follows: How are Curtin University teaching staff utilising ICT in their teaching and learning?; What is the relationship between the ICT behaviour of a University's teaching staff and the strategies used to implement the University's ICT strategic planning initiatives?; What is an appropriate model for future implementation of ICT into teaching and learning at an Australian university?

A combination of qualitative (interview and case study techniques) and quantitative (survey and Likert-type instruments) methods was employed. Overall, this study can be described as longitudinal in nature, relying upon such tools as observation, interviews and survey instruments, to collect data at appropriate points in time from the various samples. Since it has already been acknowledged that such change takes time, the study focused specifically on those changes which occurred during the two academic years (1999-2000) at Curtin University of Technology.

It appears that the critical mass stage for integrating ICT into teaching and learning has been reached by the teaching staff involved in the Curtin survey sample. The most common teaching mode adopted by the survey sample is the traditional lecture and tutorial (workshop or laboratory) mode. However, the data revealed that over the 16 month period of the study there was a large increase in the use of Web-based material for teaching and learning.

The data revealed that a number of factors emerged which affected the adoption of ICT. These factors included: leadership across the university, attitude toward the use of ICT; the perceived benefits of adopting ICT in teaching and learning; incentives, modeling mechanisms, the provision of adequate support structures; the time factor; training; facilities and resources. The reflective monitoring system utilised in this study (the TracIT reports) revealed the changes in ICT behaviour and the changes in the ICT environment, as well as the source of initiation of the change. It appears that most of the 'real changes' which occurred in the teaching practice of the case study sample were individually driven, with some others being influenced by their own Department/School or by student pressure. The study also found that the adoption of ICT into the working environment of a university teacher significantly increases the workload of individual staff. The existence of transformational leadership across all levels of the University was identified as a major factor in the promotion and adoption of ICT and ultimately in the development of a truly professional learning community.

From the extensive data collected in this longitudinal study an empirical model or framework, the "Curtin University Professional Learning Community Model", was introduced. Many of the teaching staff at Curtin University involved in this particular study have clearly demonstrated their commitment to the adoption of ICT for teaching and learning. The detailed case study data has also revealed that many of the teaching staff possess professional attributes which would be admired and valued in any university.

Universities are facing the challenge of identifying what role ICT will play in the future of higher education and how to implement the appropriate strategies which will meet these needs. This study has found that the key to meeting the challenge seems to be to harness strategies that lead to the development of a professional learning community. The Curtin University Professional Learning Community Model has identified the key elements which need to be in place if the use of ICT for teaching and learning is to be not only adopted, but sustained and more importantly, effective in the teaching and learning process. This study has clearly revealed that it is only through the synergy of university commitment and individual commitment that real change can actually take place, the change in this case being the adoption of ICT in teaching and learning practices. The strategies suggested by the empirically derived model can begin this journey to a truly professional learning community.

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CHAPTER ONE

Introduction

> *Society is undergoing a fundamental transformation from the Industrial Age to the Information Age. This is a global phenomenon with very significant local implications. All people, organisations, societies and nations are affected, although not at the same pace or to the same degree. Those who realign their practices most effectively to Information Age standards will reap substantial benefits. Those who do not will be replaced or diminished by more nimble competitors.* (Dolence & Norris, 1995, p 2)

Introduction

The focus of this study is two fold – the use of information and communication technology in teaching and learning by teaching staff within an Australian tertiary institution, and the mechanisms the University has established in order to realign themselves with the Information Age. At certain stages these two coincide to provide a synergy which offers a valuable insight to the culture and environment of the University.

This chapter has five main sections. The following section provides background information in order to identify the focus for this particular study. The purpose of the study is also identified, followed by the specific research questions which were addressed. The next section provides definitions of key terms that are used throughout this study. The final section provides an overview of the organisation of the thesis.

Background

Traditionally, the role of education has been to prepare students to live and work within their own society. However, the current nature of many jobs in the workplace is constantly changing, to the extent that Twigg & Oblinger (1996) note that an average worker can anticipate having six or seven different career moves in the course of their working life – also it seems most likely that a large number of today's students will grow up to do work which has yet to be designed (Papert, 1998).

Two recognised factors contributing to this situation are the increasing globalisation of world economies and the introduction of more sophisticated technologies into working environments. In order to respond to these new demands, education institutions need to modify the content and intent of what is being provided as well as the way it is delivered (Dolence & Norris, 1995; Ehrmann, 1995). Growing pressure is being placed upon these institutions of higher learning as governments, employers and students clearly expect them to have the answers for the future. Such institutions are turning to information and communication technology (ICT) for many of these answers.

It is well recognised that Australian society has now truly entered into the 'Information Age', an era characterised by electronic transmission of information. Such technologies have brought to the forefront such educational concepts as 'flexible modes of delivery', 'open-learning', 'life long learning', 'virtual classrooms' and 'institutions without walls'. Although traditional technologies such as print, radio, and television still exist, newer technologies involving computers, computer-based learning packages, interactive video and multimedia, audiographic communication systems and video conferencing, have now surfaced throughout our universities. Over the past decade teaching staff at Australian universities have been using such information and communication technologies in a number of different ways. These initiatives have included – the word processing of course outlines and articles for publication, utilising spreadsheets as electronic mark books, communicating with colleagues via e-mail and accessing online information resources via the Internet. In addition, a number of successful courses and projects utilising innovative information and communication technologies have been developed by many universities, often through special Commonwealth funding. The diffusion and subsequent uptake of such innovations within an Australian University is the essential substance of this research project.

One well known and respected model concerning the diffusion of educational innovations is based on the work of Rogers (1995). He identifies at least five categories of innovation uptake from high level through to low level – innovators, early adopters, early majority, late majority and laggards. In this model, for significant change to occur, a 'critical mass' of individuals need to have adopted and implemented a given innovation (Green & Gilbert, 1995; Rogers, 1995; Deden, 1998; Rogers & Hart, 1998). This 'critical mass' occurs when enough individuals have adopted the innovation so that the innovation's further rate of adoption becomes self-sustaining. According to Rogers (1995), the key category is the 'early adopters' cohort as this group can trigger the movement to a 'critical mass' of adopters. In the words of Rogers' (1995) model then, one would say that for the teaching staff of a tertiary institution to have reached a 'critical mass' level in the adoption of ICT (the innovation) then the use of ICT in teaching and learning would be self-sustaining. The literature suggests that this can be a slow and in many cases, painful process. For example, it has evidently taken 15 years for a major computer initiative to reach the 'critical mass' stage at Drew University in Madison, New Jersey (Candiotti & Clarke, 1998).

In addition to such 'critical mass' factors, the pedagogical forces that have driven the push for universities to adopt and incorporate ICT are numerous (greater information access, the importance of being able to communicate electronically, asynchronous learning, pedagogical improvement and faculty renewal). With such obvious pedagogical benefits one must wonder why these new and powerful technologies have not permeated to any great extent (with few exceptions) into the fabric of tertiary education institutions around the globe. An examination of the literature reveals a variety of factors that have contributed to the lack of adoption, diffusion and effective use of information and communication technology at the tertiary level by teaching staff. One of the key research questions of this study will investigate this point further.

Many significant issues have surfaced at the institutional level where institutions have often failed to match the technology investment with an appropriate investment in people (Ehrmann, 1995; Gilbert, 1995; Lan, 1997; Williams, 1997; Alexander, 1998). In some institutions, plans appear driven by information and communication technology and not by a pedagogical rationale and focus (Deden & Carter, 1996; Gilbert, 1996b; Brown, Burg & Dominick, 1998). Perhaps the lack of models for integrating ICT into the curriculum (Schofield, 1995; Gilbert, 1996a; Northrup, 1997), and the lack of committed and dedicated leadership (Ehrmann, 1995; Middlehurst, 1995; Lan, 1997) have contributed to the perceived lack of effective institutional planning. There also appears to be an assumption that technology will reduce operating costs and increase productivity (Gilbert & Green, 1995). As with many innovations, even when technology has been well established, its greatest potential is rarely achieved (Candiotti & Clarke, 1998; Lan, 1997). In a similar vein, some institutions are using ICT to replicate their traditional practice, content and control (Ehrmann, 1995; Tyack & Cuban, 1995).

The major question however, facing most educational institutions such as Curtin University of Technology, is how can the desired changes that need to take place in order to realign themselves effectively with the 'Information Age', be best achieved? Curtin University has embarked on this challenge by initiating a number of ICT initiatives to complement the University's vision statement. The vision statement driving these changes specifically states the mission as follows:

> *To apply information technology in a cost effective manner to support teaching, research and administration to enable the University to achieve its goal of becoming Australia's world-class University of Technology.*
>
> *(Curtin University of Technology, 1998a)*

In an effort to transform and realign Curtin University into a university that will not only survive but flourish in this 'Information Age', a major restructuring of the teaching, administration and research divisions within the university occurred during 1997. One of the major changes was the establishment of a Teaching and Learning Division, a parallel division to the Research and Development Division. The inaugural Divisional Vice Chancellor, Professor Ian Reid, is on record as being strongly committed to increasing the use of ICT in the University's teaching and learning. One of the main goals of this Division is the upgrading of teaching skills amongst the teaching staff at the University. The introduction of such courses as the 'Innovative Teaching Practice in Higher Education' program and the establishment of a number of significant ICT projects reflects the importance given to this key goal. These projects have been designed to assist teaching staff in the development of a range of new skills as well as integrating ICT into their teaching and learning practices.

Significant time, effort and funding have previously been spent providing appropriate infrastructure, such as mobile bunkers, projection and audio visual facilities in lecture suites, and training workshops, such as 'Surviving IT'. These workshops, previously run by the Computer Training Centre have traditionally catered for teaching staff and postgraduate students – with little penetration into the majority of teaching staff (Curtin University of Technology, 1998b). An application of Rogers' (1995) categories to the current teaching staff at Curtin University suggests that ICT use by teaching staff has not yet reached the 'critical mass' stage. Some good examples of the 'innovators' and the 'early adopters' at Curtin University are outlined in the publication *Quality in Practice: Teaching and Staff Development Projects 1996* (Butorac, 1996).

Many educational institutions are developing new capabilities and skills through reorganisation, restructuring and reallocation, which can enable such successful transformation to a university reflecting the Information Age. It is clear though, that just because a great deal of change is occurring at a tertiary institution it does not necessarily mean that a real transformation process is taking place. One of the world's foremost experts on educational change, Michael Fullan (1982), has consistently emphasised the point that educational change is a process and not an event. In the context of an Australian University this would mean that the development of ICT initiatives and accompanying restructuring strategies for the University, does not necessarily guarantee that change will occur for any, or all individuals. Rather, that change needs to be seen as a process in which each individual actually participates in these initiatives and applies them to their teaching and learning practice. This study examines not only the process of change but also seeks evidence of the phenomenon of transformation (a concept taken up in some detail in Chapter Two).

The population involved in this research was the Curtin University of Technology's teaching staff. With such an approach the assumption is made that the findings of this study are not only pertinent to Curtin University of Technology but also to other similar Australian universities. The researcher acknowledges the reality that Curtin University is made up of many macro and micro units each designed for a variety of purposes, organised around different structures, adopting different approaches and practices due to individual experiences and attitudes. Consequently, the researcher expects to identify and monitor a vast range of practices and strategies as they exist across such an eclectic institution.

A combination of qualitative (interview and case study techniques) and quantitative (survey and Likert-type instruments) methods was employed. Surveys and similar tools were administered to Curtin University's teaching staff in order to collect baseline data and identify individual and group profiles (with regards to their ICT use in their teaching and learning) from which a stratified subsample was selected for in-depth case study. Overall, this study can be described as longitudinal in nature, relying upon such tools as observation, interviews and survey instruments, to collect data at appropriate points in time from the various samples. This allowed the researcher to note changes in the behaviour and attitudes of specific individuals and to explore in some detail the origins of these changes. Since it has already been acknowledged that such change takes time, the study focused specifically on those changes which occurred during the two academic years (1999-2000) at Curtin University of Technology.

Definition of Key Terms

Andragogy: 'The art and science of helping adults learn' (Knowles, 1970, 38).

Asynchronous: Electronic communication between people which does not occur in real time.

DETYA: Department of Training and Youth Affairs.

Diffusion: The process by which an innovation is communicated through certain channels over time among the members of a social system (Rogers, 1995, p5).

Information and Communication Technology (ICT): Technologies that are used for accessing, gathering, manipulating, interpreting and presenting or communicating information. In this particular study this includes all types of computer-based software and tools used for teaching and learning and only assumes the existence of the hardware and network infrastructure required to utilise these tools.

Innovation: An idea, practice or object perceived as new.

Learning Organisation: An organisation where people at all levels work together to strengthen their capacity to achieve and create.

Level of ICT integration rating: The criteria for this rating is linked to the theoretical framework of Rogers' (1995) innovation uptake model where he identified five categories of innovation uptake from high level through to low level – innovators, early adopters, early majority, late majority and laggards. This particular study chose to adopt alternative terms: very high (innovators), high (early adopters), medium (early majority), very low (late majority), and low (laggards).

Organisational Culture: The beliefs, values and norms shared by the members of an organisation form the culture of the organisation (Gibson, Ivancevich & Donelly, 1995).

Professional Communities: A community that is characterised by shared purpose, collective activity, and collective responsibility among staff (Fullan, 1998).

Professional Learning Community: A community of people who work collaboratively and collectively towards a shared vision. The leadership of such a community is distributed and learning is seen as the key, while failure provides an opportunity for learning. An important ingredient is that members choose to belong to such a community.

Real Change: A behaviour or situation which had not been identified earlier.

Self Assigned Level of ICT Integration: The degree to which a teaching staff member had integrated information and communication technology into their own teaching and learning practices, based on Rogers' (1995) adoption of innovation categories. They were required to rate themselves against their colleagues within their own Department/School. The rating required was on a five point scale, ranging from very low (1) to very high (5).

Synchronous: (or real time) When people involved in electronic communication are online simultaneously.

Teaching Staff: The focus of this study is on the academic staff who are actively involved in teaching at the University.

Teaching & Learning: The term 'teaching and learning' refers to face-to-face, practical, clinical, field and work-based and technology-delivered activities, distance education and open and flexible learning and on-shore and off-shore provision. (Curtin University of Technology, 1997b).

Transformation: Involves change, however goes beyond simply changing appearance, it involves changing the very nature and function of the institution.

Transformational Leadership: Leaders who help people develop and foster a collaborative and professional culture, encourage and stimulate staff development as well as promote the effective use of collective problem-solving (Leithwood, 1992).

University Rating: A level of integration of ICT into teaching and learning rating assigned to each case study participant by the researcher through the close examination of individual profiles which were developed through a synthesis of the three instruments used over the 16 month period.

Overall Purpose of the Study

Higher education institutions are having to re-examine their existing structures and practices in order to meet the needs of the Information Age. This is requiring a major transformation (Dolence & Norris, 1995; Le Grew, 1995; Daniel, 1997). According to Dolence & Norris (1995) one of the major concerns that hinders the transformation process is the lack of useful models and success stories to lead the way. The present study proposes to identify the most successful strategies adopted at one tertiary institution in order to identify and characterise the transformation processes adopted across the University. In light of these strategies, another important goal of this study is to develop a model for implementing information and communication technology into teaching and learning practices across a University.

As identified earlier the case study method will be adopted to achieve such a task. With such a method the assumption is made that the findings of this study are not only pertinent to Curtin University of Technology but also to other similar Australian universities.

Specific Research Questions

Thus the key research questions that guided this study are as follows.

1. How are Curtin University teaching staff utilising information and communication technology (ICT) in their teaching and learning?
2. What is the relationship between the ICT behaviour of a University's teaching staff and the strategies used to implement the University's ICT strategic planning initiatives?
3. What is an appropriate model for future implementation of ICT into teaching and learning at an Australian University?

Significance of the Study

This study should be of particular interest to those policy makers at tertiary institutions who intend planning for the adoption of ICT in a practical way to enhance the teaching and learning at their university. This study develops a practical model, which promotes the adoption of specific strategies over others. The recognition and adoption of a particular model and subsequent strategies by an institution would certainly be of significance to the staff and students at that University.

Educational institutions at all levels around the nation have been focusing on developing teacher competencies and associated skill development with respect to such use of information and communication technology in teaching. More immediate and relevant to Western Australia (WA) is the release of funds ($100 million) which have been distributed to Western Australian (WA) schools from the State Government. With this innovative pressure from the school arena, the state's tertiary institutions have little option but to identify and develop their own 'bench-marks' for teaching staff performance in this area. Another of the objectives of this study therefore, is to establish such 'bench-marks' for teaching staff at a WA tertiary institution.

Overview of this Thesis

Chapter Two of this thesis examines the literature which identify the global changes which are impacting on higher education institutions and how these changes are forcing institutions to restructure, redesign and realign themselves with the Information Age. This need to transform also forces the issue of examining the very essence of higher education institutions and how they are conceptualised. In particular the literature addresses the organisational culture of higher education institutions with specific reference to Alvesson's (1993) multiple cultural configuration approach, Senge's (1990) 'learning organisations', Sergiovanni's (1993a) community building, and Fullan's (1998) 'professional community'. This chapter ends with a description of the case study site with specific links to the transformation process underway at the University.

Chapter Three provides the theoretical foundations upon which this study is based, more specifically in terms of change and innovation. The review identifies the various theories of change and how these concepts and processes impact on learning environments. Rogers' (1995) diffusion of innovation theory is examined in detail and examples of other studies which have utilised this model are presented. The main purpose of this chapter is to provide conceptual links between the theories presented and the present study.

Chapter Four focuses on the literature which addresses the impact of ICT on higher education institutions – ultimately it looks at technological change. The current climate of ICT use is described followed by the factors which affect the adoption of ICT by higher education institutions and by individuals within these institutions.

Chapter Five outlines the important elements of a professional learning community and how ICT is part of such a community. The key elements of, effective leadership, the actual culture regarding the nexus between research and teaching, team based approaches, developing professionals and professional development are identified and discussed. This final chapter of the literature review ends with highlights of the key issues, concepts, ideas and models presented in Chapters Two to Five in a succinct overview.

Chapter Six reveals the research methodology adopted by this study and outlines the design, describing each of the five phases. This is followed by a description of the triangulation methods adopted as well as the processes involved in managing, analysing and storing the data. Ethical issues have been addressed in this chapter, including the precautions which were carried out in order for the research to be conducted in a professional and ethical manner. Finally this chapter concludes with a review of the problems encountered in this particular research study.

Chapter Seven presents the results of the data which is directly linked to research question one. In particular, it provides background information for the various data sets, as all three instruments are combined to provide a comprehensive picture of how the University staff utilise ICT in their teaching and learning.

Chapter Eight presents the interpretation and analysis of the results presented in chapter six specifically for research question number one. The rationale and process used for the 'university rating' is described, enabling a discussion of the concept of 'critical mass' with specific reference to Curtin University of Technology. Existing patterns of

ICT use by Curtin University teaching staff are examined and various factors affecting the adoption of ICT are documented.

The purpose of Chapter Nine is to present the results for research question two, which attempts to identify the ICT initiatives implemented by Curtin University of Technology and how they have impacted on the participants involved in this study. The aim is to identify at which stage there has been a synergy between the initiatives and the case study participants in order to identify the origins of these changes. The University initiatives are restricted to the years, 1999 and 2000, while the case study sample were involved in the monthly tracking device from August 1999 to August 2000.

The interpretation and analysis of the results for question two are outlined in Chapter Ten. This chapter has two main sections. The first section examines the impact of each initiative on the case study sample, while the second section looks specifically at the issue of change.

The final chapter, Chapter Eleven provides a number of assertions which have been generated from a synthesis of the research findings. Some of these assertions have evolved beyond the initial research questions. This discussion chapter presents the assertions and the summarised data which warrant them. This chapter also deals with addressing the last research question, which was to identify what is an appropriate model for future implementation of ICT into teaching and learning at an Australian University. The 'Curtin University Professional Learning Community Model' which was empirically derived from the data is introduced, as well as more global model, the 'Professional Learning Community Model'. These models are designed to aid tertiary institutions such as Curtin University of Technology, to move closer toward a truly professional learning community.

CHAPTER TWO

Transforming Higher Education

Introduction

This chapter examines in some detail the global changes that have affected higher education institutions around the world. The impact of these global changes on academic staff is addressed in the following section, while the notion of transformation as identified by various authors is also examined. The organisational culture of higher education focussing on professional learning organisations and communities is discussed. The processes designed to assist in transforming Curtin University of Technology are also detailed in this chapter, together with an outline of how the changing times have challenged the traditional strategic planning approach. A synthesis of the main issues, concepts and models in this chapter as well as the remaining literature review Chapters Three, Four and Five will be presented as an overview at the end of Chapter Five.

Global Changes

Clark (1998) argues that modern universities tend to develop a disturbing imbalance with their environments. He characterises the typical university – environment relationship as a "deepening asymmetry between environmental demand and institutional capacity to respond" (p xvi). This imbalance creates the problem of institutional insufficiency where existing methods are not adequate or appropriate for the new demands placed on higher education. A number of factors have been identified as contributing to this imbalance. In particular:

- More students with diversified backgrounds seeking and obtaining access to higher education (IRHE, 1995; Thorley, 1995; Twigg & Oblinger, 1996; Daniel, 1997; Milliron & Leach, 1997; Robertson, 1997; Ramsden, 1998; Fox, 2000; Twomey, 2001).

- Universities are expected to train graduates for highly specialised occupations as well as continually retrain professionals throughout their careers (IRHE, 1995; Brown & Duguid, 1996). Twigg & Oblinger (1996) note that an average worker can anticipate having six or seven different career moves in the course of their working life. They also note that a technical degree is likely to have a shelf life of less than five years. Papert (1998) notes that it seems likely that a large number of today's students will grow up to do work which has yet to be designed.

- Higher education is faced with considerably less financial support at a time of higher expectations (Middlehurst, 1995; Twomey, 2001). Governments and universities are no longer conceptualised as partners but as in many cases as "two parties with different interests and priorities that sometimes converge and sometimes sharply conflict" (Clark, 1996, p 417).

- Finally, and most importantly, the growth in knowledge has been massive - there is not a university or institution that can control this knowledge growth (Twigg & Oblinger, 1996; Robertson, 1997; Ramsden, 1998).

According to Clark (1998), demand overload in higher education is caused by the convergence of these four factors, with each contributing factor producing a high rate of change. He argues that these changes tend to pressure individual institutions to become more enterprising and self sufficient. More specifically, Daniel (1997) notes that the university model that we know and love basically costs too much. Robertson (1997), in a similar response to that of Clark (1998), also notes that the changes that higher education is experiencing are disturbing the longstanding relationships between universities and the wider society.

Tony Bates (2000) in his recent book, *Managing Technological Change,* reinforces many of these comments, in particular the challenge to do more with less. Ramsden (1998) electronically surveyed 100 heads of university departments from the UK, Australia, Singapore, Hong Kong and New Zealand. The staff were from both traditional and new universities and were asked to identify up to three key challenges facing academic leaders such as themselves, in the years 1997 – 2005. Maintaining quality with diminished resources, or doing more with less was the single issue most identified by three quarters of the respondents. Other issues identified in the study included the management of finances more effectively, being able to balance teaching and research funds, generating income, and developing strategies for new student markets. Bates (2000) goes further by identifying the changing learning needs of society and the impact of new technologies on teaching and learning (Middlehurst, 1995; Baldwin, 1998; Flew; 1998; Fox, 2000). Robertson (1997) pointedly notes that with the introduction of these new technologies and the rapid growth in knowledge, universities are no longer the only source and supplier of knowledge, thus requiring them to be far more competitive.

Plomp, Brummelhuis & Rapmund (1996) remind us of the ever present notion that higher education is expected to aid in the solution of most social, cultural and economical problems within society. They see that universities can no longer opt not to participate in solving society's problems (e.g. isolation, ethnic integration, and unemployment). Lynton & Elman (1987), Boyer (1990) and Plater (1995) also argue that academic staff should be more engaged in solving real world problems.

A former Australian University Vice-Chancellor, Le Grew (1995), noted that many institutions were in the process of reconstructing their infrastructure, redesigning their policies and realigning external partnerships in order to gain competitive advantage in the Information Age. He identifies a number of trends which have contributed to the transformation – 'a paradigm shift' in postsecondary education. Table 2.1 outlines the transformations Le Grew (1995) identified.

Table 2.1: Trends Causing a 'Paradigm Shift'

From	To
Industrial society	Information society
Technology peripheral	Multimedia central
Once-only education	Lifelong learning
Fixed curriculum	Flexible, open curriculum
Institutional focus	Learner focus
Self-contained organisation	Partnerships
Local Focus	Global networking

(Le Grew, 1995).

Dolence and Norris (1995) identify an even more comprehensive list of characteristics which highlight the extreme differences in the practices and structure of higher education institutions in the Industrial Age and the Information Age. Traditionally, education prepared individuals for the Industrial Age (making things) whereas today's system is faced with preparing individuals for the Information Society (handling information). Table 2.2 outlines these changes.

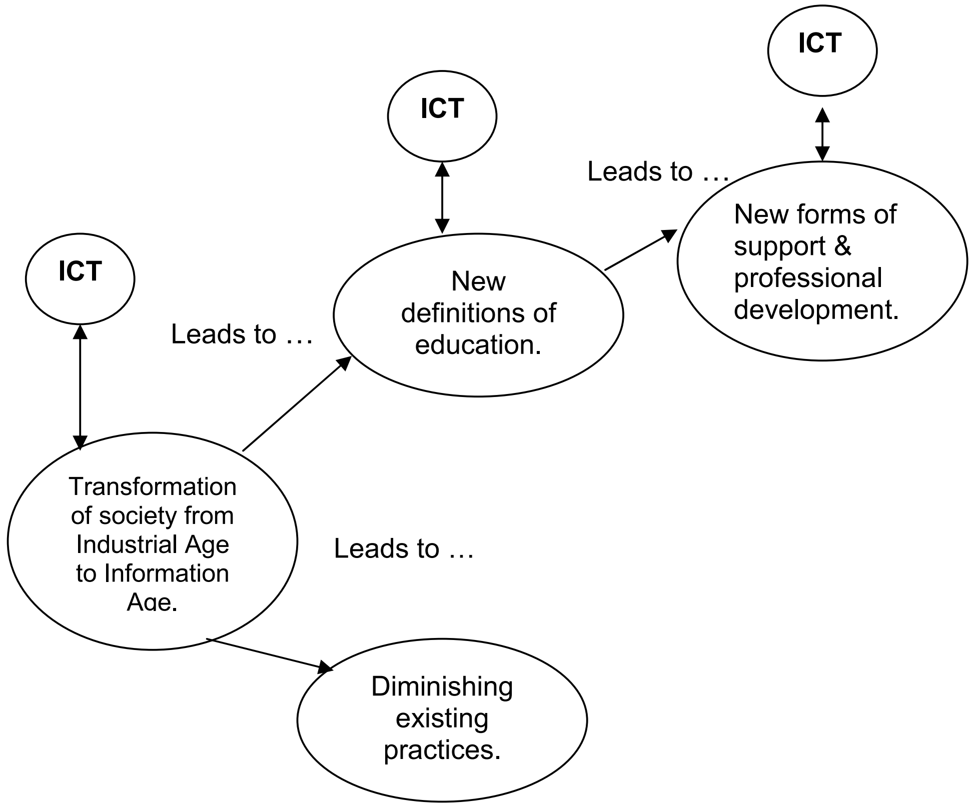
Table 2.2: The Industrial and Information Age

Industrial Age	Information Age
Teaching franchise	Learning franchise
Provider-driven, set time for learning	Individualised learning
Information infrastructure as support tool	Information infrastructure as the fundamental instrument of transformation
Individual technologies	Technology synergies
Time out for education	Just-in-time learning
Continuing education	Perpetual learning
Separate learning systems	Fused learning systems
Traditional courses, degrees, and academic calendars	Unbundled learning experiences based on learner needs
Teaching and certification of mastery are combined	Learning and certification of mastery are related, yet separable issues
Front-end, lump-sum payment based on length of academic process	Point-of-access payment for exchange of intellectual property based on value added
Collections of fragmented, narrow, and proprietary systems	Seamless, integrated, comprehensive, and open systems
Bureaucratic systems	Self-informing, self-correcting systems
Rigid, predesigned processes	Families of transactions customisable to the needs of learners, faculty, and staff
Technology push	Learning vision pull

(Dolence & Norris, 1995).

Plomp, Brummelhuis & Tapmund (1996) also note that society is undergoing a transformation, and that education is 'reacting' to the emergence of the Information Society. Le Grew (1995) and Plomp et al., (1996) see that these trends have contributed to, and are causing a transformation – a paradigm shift. Le Grew (1995) and others (Dolence & Norris, 1995; Mason, 1998; Marchese, 1998) all argue that new information and communication technologies (ICT) will cause the traditional boundaries of study to erode, and that the information society will generate completely new definitions of education. Figure 2.1 represents the Plomp et al., (1996) view of the results of the transformation of society and how ICT can play a role in every stage.

Figure 2.1: Transformation of Society



(Plomp et al., 1996, p11).

Kay McClenney, the Vice President of the 'Education Commission of the States' in the USA in 1998 also calls for transformation in higher education. She notes that higher education has survived comfortably over the past 30 years by introducing innovative practices – however in the current climate, innovation on its own is no longer adequate. She asserts that "innovation does not equal transformation, and multiple innovations do not add up to fundamental change" (McClenney, 1998, p1). She further claims that organisations are continually allowing innovations to occur on the periphery of an organisation as this prevents them from contaminating existing core functions. She asserts that there are three major transformational forces which are affecting higher education and if institutions ignore these forces they are at risk. These forces are markets, technology, and accountability.

The Impact of Global Changes on Academic Staff

The literature has revealed that the global changes identified in the previous section have impacted on academic staff within tertiary institutions in a variety of ways. The following is a summary of this impact:

- The special status of academic staff as an elite group in society has been eroded by an influx of new people (Ramsden, 1998). This notion is also supported by Halsey (1992), Thorley (1995) and Robertson (1997). Nixon (1996) adds that higher education is facing a crisis, which he refers to as a crisis of professional self-identity.

- According to Ramsden (1998), academic staff have lost their position of power and advantage in their work environment and market position. They have changed from being "largely autonomous professionals in indulgent organisations to being somewhat more like supervised workers in a tightly-managed business" (p 19).

- Academic staff work patterns have altered significantly. There has been a decline in the amount of time given to research with an increase in other duties such as administration, quality assurance, staff development, developing alternative modes of delivery (Bates, 2000) and marketing faculty/department courses and services (Middlehurst, 1995). Information and communications technologies (ICT) have enabled academic staff the flexibility of working where and when they choose to do so.

- Academic staff are having to work harder as they have larger class sizes and less time to spend with students (Coffield & Williamson, 1997). This has been exacerbated by the fact that many continue to employ traditional methods of teaching and assessment.

- Academic staff not only have a larger group of students to teach but a larger and more diversified group who require a greater amount of energy and time. Less than 20% of Australian academic staff surveyed in 1994 agreed that undergraduates were adequately prepared in writing and mathematical skills (Boyer et al., 1994).

- This larger more diversified group of students (clients) have become more critical about the lack of eagerness for teaching and low level support for learning (McInnis & James, 1995). Ramsden (1998) and McClenney (1998) both acknowledge that as tuition fees increase, higher education must continue to deliver high quality education and importantly, must be seen to be doing it.

- Due to the escalation in knowledge growth and economic demands, academic staff are facing greater pressure to increase their research activities – through consultancy and directly linking research to economic objectives (Robertson, 1997; Ramsden, 1998).

- Academic staff also face increased job insecurity in this environment. There has been a decline in the proportion of tenured academic staff in Australian universities in the last 10 years from 80% to about 50%, with a corresponding increase in casual and sessional staff employed at universities (Department of Employment, Education and Training, 1996).

- The traditional culture of 'collegiality' (shared decision-making) has also come under threat from mass higher education (Fisher, 1994). The need to make immediate decisions in response to external changes reveals the flaws of such a process.

- The influence of ICT is causing academic staff to challenge existing teaching and learning practices, which means for many staff having to reconceptualise the way they teach (Baldwin, 1998; Ramsden, 1998; Bates, 2000; Fox, 2000; Twomey, 2001).

The overall effect of many of these changes implies a significant work overload for the average academic staff member. Fisher (1994) reported that in a survey of 53 academic staff in higher education institutions, 75% of them identified that work overload was occurring 'always' or 'frequently'. She adds that stress occurs when personal control is low. This is certainly the case with academic staff in a climate of change where they have little personal control and influence over the changes.

Transformation

According to McClenney (1998) innovation is transformative only if institutions can find ways of employing examples of success which can lead to new forms, new structures and new cultures. In higher education this would necessarily involve systems, faculty and functions. She presents the notion that the tools for transformation are will, vision, focus, data (on how and what students are learning) and the strength to push the changes through.

Dolence and Norris (1995) in their book, *Transforming Higher Education,* identify four components which they suggest encapsulate the process of transformation required by higher education:

- Realigning higher education with the Information Age.
- Redesigning higher education to achieve this realigned vision.
- Redefining the roles and responsibilities with a realigned, redesigned higher education system, and
- Reengineering organisational processes to achieve dramatically higher productivity and quality.

According to these authors, one of the major concerns that hinders such a transformation process is the lack of useful models and success stories to lead the way.

Clark (1998) asserts that university transformation has certainly been elevated to the top of the agenda in the university of modern higher education. In his book, *Creating Entrepreneurial Universities: Organisational Pathways of Transformation*, Clark (1998) recounts findings of his research of five universities in Europe which attempted to become more enterprising during the 1980's to early 1990's. Clark argued that for serious change to have occurred within a university, a decade was viewed as a minimum time period for the change to be institutionalised. Dolence & Norris (1995) also support the view that achieving a true transformation in higher education institutions requires 10 years or more. The case study research conducted by Clark (1998) included two visits (one-two weeks in duration) in 1994, 1995 and 1996 where Clark interviewed teaching staff, administrators and students, examined documents, attended meetings and observed the local activities found within the university. He identified five common features of entrepreneurial actions which contributed to the transformation of the universities.

A ‘strengthened steering core’ was seen as one of the common features. This required the development of an integrated administrative core that connects work units to the university’s objectives. The second feature found among the universities was what he termed an ‘expanded developmental periphery’. This referred to the ability of the system to reach across old boundaries to link up with outside organisations and groups to develop units. All of the universities in his case study sample demonstrated a diversified funding base as the third key common feature. He identified that it is crucial whether academic staff within a university accept or reject innovation. If the basic units (staff) of an institution do not adopt a particular innovation then the institution continues to exist as before, which leads to Clark’s fourth key feature – a ‘stimulated academic heartland’. The fifth common feature identified was what he termed an ‘integrated entrepreneurial culture’ that embraces change.

While Dolence & Norris (1995) identified the components required for the transformation process to occur in higher education, Clark (1998) identified the common characteristics of institutions which had already been through the process of transformation.

Organisational Culture of Higher Education

McNaught, Phillips, Rossiter & Winn (1999) have also identified that the impact of funding cuts have caused higher education to question the traditional notion of universities - the notion being that universities were unlike any other organisation. They suggest that just like other organisations, higher education is being forced to restructure and identify innovative ways of operating.

The notion that the culture of an organisation directly impacts the production and effectiveness of an organisation has been around for a very long time (Roethlishberger & Dickson, 1939; Denison, 1990; Cavanagh, 1997; Ramsden, 1998). The beliefs, values and norms shared by the members of an organisation form the culture of the organisation (Gibson, Ivancevich & Donelly, 1985) and these cultures are created and fostered by the leaders and managers over time (Hargreaves & Fullan, 1998; Ramsden, 1998; McNaught et al., 1999).

Hargreaves & Fullan (1998) point to the distinction between the descriptive terms 'restructuring' and 'reculturing'. In their view, restructuring involves the changes which are made to the formal structure of an organisation – management, roles, time frames. They note that restructuring in education alone, has not made any significant impact on improving teaching and learning. They advocate the need to reculture, which involves changing the norms, values, incentives, skills and relationships in an organisation in order to support people to work differently together. The pattern they identified is that once people have invested emotionally in transforming the culture, they then in turn place pressure on existing structures in order for them to change and meet their new needs. They also note that this usually occurs over a time-span of many years.

A specific review of the literature in this area reveals that there are essentially four ways of conceptualising and analysing organisational culture. The first is the *nomothetic* approach which places organisations into certain defined categories. Handy (1976) defined these categories as 'power', 'role', 'task' or 'person'. Berquist (1992) and Bercker (1988) also defined organisational culture in higher education by placing them into categories of 'collegial', 'managerial', 'negotiating', or 'developmental'. The second is the *functionalist* approach which is also a unitary one, where the culture of an organisation plays an important role in the survival and development of the organisation – the members share a common purpose. Schein (1985), Smart and Hamm (1993), and McNay (1995) adopted this functionalist approach in their work with organisations in higher education. In particular, McNay (1995) developed a model to describe university change. He based his model on the degree of 'looseness' or 'tightness' concerning the issues of policy definition and control over implementation – in other words, the degree of control exercised over policy decision making and implementation of policy. These included four types of universities: Type A – the Collegium; Type B – the Bureacracy; Type C – Corporation; Type D – Enterprise.

McNay (1995) notes that all universities draw on some components of each type, however at varying balance. The dominant pattern of change for higher education in the UK is AB to CD, while in Eastern Europe it is from BC to AD. Movement in Australian institutions have appeared to be from A to B to C to D. This has been emphasised in Ramsden's (1998) own research with university Heads of Department where he found that there had been a decrease in the culture of the collegium, an increase in the corporate and enterprise cultures, and a steady or declining bureaucratic culture (Ramsden, 1998). Ramsden (1998) adapted McNay's (1995) model to characterise the main characteristics of each type. Figure 2.2 (found on the following page) represents Ramsden's model (adapted from McNay 1995) to describe university change.

The third approach to conceptualising and analysing organisational culture is the *inductively-derived categorising* approach which is a similar, yet more sophisticated approach to the nomothetic one. In this case organisations are studied first then conclusions are drawn from the main characteristics of the institution. The fourth approach is the *phenomenological* one which views culture as being created uniquely in each social setting which is constantly changing as values and understanding develop causing behavioural changes.

Trowler (1998) in his book, *Academics Responding to Change*, provides an ethnographic case study of a higher education institution where he investigated the academic staff's attitudes towards and the implementation of, the credit framework in the UK. He strongly challenges the above conceptions of organisational culture (nomothetic, functionalist, inductively-derived categorising and phenomenological) viewing organisational culture as encompassing a variety of notions. One such notion is that culture is partly constructed as well as enacted. Individuals within an organisation do not simply adopt the views or attitudes found within the organisation as individuals and groups, they construct the culture of the organisation. Finally, Trowler (1998) sees organisational cultures as essentially open and pluralistic in nature.

With such an approach, Trowler (1998) had basically adopted the theoretical construct developed by Alvesson (1993) where the belief is that large organisations are characterised by a unique multiple cultural configuration – a set of cultures of different levels and kinds, manifested in different ways. For example, individuals may primarily identify mainly with the organisation (university), with a sub-unit (department) of it, or perhaps even with the wider community (their profession). It is important to note that each individual brings with them certain cultural characteristics that relate to social status, gender, ethnic group and so on, making such an institution an open institution accessible to influences outside of the institution itself.

Figure 2.2: Changing University Cultures

Policy control and definition (ends)

Weak/Loose

Control of Implementation (means): Weak/Loose — Strong/Tight

Collegial	*Bureaucratic*
Servant leadership. Leadership as a consensual background activity. Control through consultation, persuasion, consent, permission. Authority derives from professional status. Leaders represent the academic group. Management and leadership, like teaching, is for gifted amateurs and does not require formal preparation.	Managerial leadership. Leadership as formal rule-governed behaviour. Control through systems, administration, transactions, rationality. Authority derives from position. Leaders represent managers more senior in the hierarchy. Management skills are learned through induction and experience.
Entrepreneurial and adaptive leadership. Leadership as guidance, enabling, articulation of vision, support for task achievement. Authority and control derive from successful performance. Leaders represent clients/customers/staff. Leadership and management are professional skills learned through education and reflection on experience.	Planning and crisis-handling leadership. Leadership as command, charisma, transformation, power, strategic positioning. Authority and control derive from mission congruence and political connections. Leaders represent the CEO. Leadership and management are learned through training.
Enterprise	***Corporate***

Strong/Tight

(Ramsden, 1998 p265), derived from McNay (1995).

Alvesson (1993) himself provides a powerful visual image by likening the multiple cultural configuration view of an organisation to a major road where smaller and larger roads feed traffic into it.

> *This vision of cultures within organisations is also a dynamic one in the twin sense that it is itself in constant movement and show how cultural characteristics may be configured in ways which will impede or facilitate change.* *(Trowler, 1998, p 30).*

This conceptual view of organisational culture initially developed by Alvesson (1993) and adopted by Trowler (1998) provides a valuable framework for viewing the dynamic process of culture within universities. However to enhance this framework the notion of universities as learning organisations and learning communities needs to be addressed.

Professional Learning Organisations and Communities

Peter Senge (1990) in his seminal book, *The Fifth Discipline*, highlighted the term "learning organisations" which refers to an organisation where people at all levels work together to strengthen their capacity to achieve and create. This concept has become a primary theme of modern management literature. One of the attributes of Senge's (1990) concept of learning organisations is the idea of line leadership where leadership is distributed through an organisation and where these individuals head up organisational units found within the larger organisation. A key feature of these units is that they allow enough autonomy for change to occur independent of the larger organisation. Other key characteristics of learning organisations according to Senge (1990) are that organisational learning and individual learning are linked, leadership in learning organisations focuses on building shared visions which challenge existing assumptions and link intrinsic goals with extrinsic ones, and that failure signals an opportunity for learning. Senge's (1990) concept of learning organisations is linked more closely to the changes recognised in McNay's (1995) 'entrepreneurial' culture than any of the other cultures identified in McNay's model.

Danahoe (1993) described the culture of a community as the interaction between individuals and groups which leads to the development of common values, beliefs, behaviours, rules, products, signs and symbols which provide ultimately the community with its cohesion. Sergiovanni (1993a) has also contributed significantly to our understanding of the concepts of community building in schools. He described schools as formal organisations which were characterised by rationality, specialisation of knowledge, a hierarchical distribution of power, rules, regulations, and set goals by which achievement was measured. He also suggested that a paradigm shift was required in the ways schools were conceptualised – from an organisational to a community perspective. He suggested that schools needed to be viewed as a community with shared ideas, bonding between people and control being exercised through 'norms, purposes, values, professional socialisation, collegiality and natural interdependence' (Sergiovanni, 1993a, p 7). He adds that community does not evolve passively and among people who interact with each other, but rather when people seek membership in a group based on common meanings they hold about what is important. This bonding transforms a collection of 'I's' into a collective 'we', which over time come to share common sentiments and traditions that are sustaining. In such communities the structure is defined by ideas and relationships while the sources of authority are embedded by these shared ideas. Sergiovanni (1993b) sees professional development in this context as an ongoing commitment on the part of the teachers to practise 'at the edge of their craft'. This entails accepting responsibility for one's own professional development and a commitment to exemplary practice, with the embodiment of caring for the needs of students as if they were your own children.

Michael Fullan, a prolific writer and researcher of educational change and school reform, also advocates the importance of building professional communities. He notes that an organisation's capacity is enhanced when schools are shaped into professional communities (Fullan, 1998). According to him, the three general attributes of professional communities are that teachers pursue a clear shared purpose for all students' learning, that teachers engage in collaborative activity to achieve the purpose, and that teachers take collective responsibility for student learning. In his results from one school restructuring study of 24 elementary, middle and high school environments, Fullan (1998) identified that the existence of a school-wide teacher professional community affected the level of authentic classroom pedagogy and the level of social support for student learning, which in turn affected student performance. He notes that the implication of these results and other similar studies reveal that:

> *if schools want to enhance their organisational capacity to boost student learning, they should work on building professional community that is characterised by shared purpose, collective activity, and collective responsibility among school staff.* *(Fullan, 1998, p 9).*

He claims that successful school restructuring depends on human resources and leadership, with the assistance of certain structural conditions (interdependent work structure, small school size and school authority to act). In his earlier work, Fullan (1992a) also notes that 'problems are our friends' and that learning will not occur without them. This view of problem issues resembles the stance in Senge's (1990) learning organisation. Hargreaves and Fullan (1998) also stress the importance of relationships - any educational reform strategy that improves relationships has a chance of succeeding. For them, normal policies and procedures alone will simply not work.

A framework which attempts to marry Alvesson's (1993) multiple cultural configuration approach, Senge's (1990) learning organisations, Sergiovanni's (1993a) learning communities and Fullan's (1998) professional communities could take the following form. An 'ideal' professional learning community would be a group of people who work collaboratively and collectively towards a shared vision. The leadership of such a community would be distributed and learning is seen as the key, while failure provides an opportunity for learning. An important ingredient is that the members choose to belong to such a community. The evidence would seem to be that such a framework could be effective in attempting to transform higher education.

> *The basic error which many universities have made is to believe that structures are superordinate to cultures. But no structure can be effective unless the culture also 'works'. ... if there is a problem with the culture in an organisation employing large numbers of professionals, then it is a waste of time to tinker with the structure. After the culture is right, then the structure can be improved. The structure is very important. But it is secondary.*
>
> *(Ramsden, 1998, p 262).*

Transforming Curtin University of Technology

Vision: Curtin aspires to be
Australia's world-class University of Technology.

As identified earlier there have been many changes which have impacted on higher education both internationally and within the Australian context. Higher education institutions have been forced to re-examine their organisational structures and existing practices, and to realign these structures and practices to not only meet the needs of Information Age learners, but to do this in more stringent economic times. Curtin University of Technology, as many other universities in Australia, has been faced with such a challenge.

> *The University has taken John Curtin's words "look ever forward" as the University motto. It signifies our continual growth and improvement as we look ever forward to meeting our goals and fulfilling our mission to be Australia's world class University of Technology.* *(Twomey, 2000).*

Curtin University of Technology is a multi-campus university, founded as the Western Australian Institute of Technology (W.A.I.T) in 1967 and gaining university status in 1987. The university is divided into four teaching divisions (the Curtin Business School, the Division of Engineering and Science, the Division of Health Sciences and the Division of Humanities), a Curtin University of Technology Kalgoorlie Campus (WA School of Mines; Vocational, Education and Training Sector), a branch at Muresk (Institute of Agriculture) and more recently a campus in Sarawak, Malaysia. The main campus is located at Bentley, Perth, Western Australia, with other campuses in the metropolitan area of Shenton Park (Therapies), Joondalup (Australian Institute for University Studies) and the Central business District (Graduate School of Business). Each of the divisions are further divided into Schools and Areas.

The structure is supported by the Vice-Chancellory, which comprises the:

- Vice Chancellor
- Office of the Senior Deputy Vice-Chancellor
- Office of the Deputy Vice-Chancellor, Teaching and Learning
- Office of the Deputy Vice-Chancellor, Research and Development
- Office of the Deputy Vice-Chancellor, Curtin International
- Office of the Executive Director, University Administration.

The student enrolment figures for 2000 totaled 28,119 (Curtin University of Technology, 2000e). Full-time students were 14,352, part-time enrolments 11,808, with the remainder 1,959, being external students. The University employs 2,469 full-time staff, where 1,124 have academic status. During 1997 a major restructuring of teaching, research and administration divisions occurred at Curtin University of Technology. One of the major changes was the establishment of the Office of Teaching and Learning, a parallel division to the Research and Development Division.

The Office of Teaching and Learning supports "Curtin's substantial commitment to the tasks of coordination, development and quality improvement in all aspects of teaching and learning" (Curtin University of Technology, 1998c). The University's Library and Information Service, Health Service and Counseling Service are linked by a close partnership to the Office of Teaching and Learning. The Office of Teaching and Learning also established a new branch within the Office called the Centre for Educational Advancement (CEA). The CEA specifically addresses matters relating to distance education, academic staff development and educational media support.

According to the *1998 Annual Report* (Curtin University of Technology, 1998c), through the Office of Teaching and Learning, the University made a major commitment to achieving the objectives of the Teaching and Learning Plan (1997-2000). This is a detailed plan which incorporates Curtin University's Vision, Mission, Values, and Goals. In addition, the plan lists the five objectives which address the University teaching and learning goals.

These objectives are to:

1. *Produce graduates who embody the University's values and are equipped for careers in their chosen fields.*
2. *Satisfy the diverse learning needs within the student body.*
3. *Foster self-directed learning among students.*
4. *Encourage reflective practice by staff.*
5. *Promote, recognise and reward quality teaching and learning.*

(Curtin University of Technology, 1997b)

The report notes that in 1998, the Office of Teaching and Learning administered a Strategic Initiative budget of more than $A700,000, with a further $A200,000 Quality funding from government sources. The Quality funding was spent on improving flexible delivery, use of WebCT, New Media applications, teaching portfolios, teaching accreditation and a variety of other related activities.

Initially the Office of Teaching and Learning included the Library and Information Services, Educational Applications of Computing, Teaching Learning Group and University Counseling and Health Services. Within a short period the Centre of Educational Advancement (CEA) was formed which subsumed the responsibilities of the educational applications of computing and the Teaching and Learning Group. The Computing Centre was disbanded upon the establishment of the CEA and the University Information Systems and Technology (UIST) division. Educational computing staff from the Computing Centre transferred to the CEA, while the Centre's infrastructure component was combined with Management Information Systems to form the new UIST (more recently known as the Information Management Services). This meant that the CEA was responsible for the use of ICT in teaching and learning, while the Information Management Services (IMS) area was to be responsible for the technical infrastructure at the university. Importantly, this restructuring also meant that each division of Curtin University was to be responsible for their own ICT technical support services.

In October 1998, the Planning and Management Committee at Curtin University gave their approval to seek external guidance regarding the Information Technology and Telecommunication (IT&T) service delivery at the University - a major decision which appeared to be in response to the concerns perceived around the University regarding an 'IT Support Crisis' (Winship, 1997; Walton, 1998). This resulted in a comprehensive and lengthy review being conducted with a final report which included specific recommendations. Further detail of the process and outcomes of the IT Review (as it became termed) are discussed in Chapter Nine.

In 1999, the Deputy Vice-Chancellor of the Office of Teaching and Learning Professor Ian Reid, produced a discussion paper titled, *Towards a Flexible, Learner-Centred Environment.* This paper outlined the University's rationale for adopting a more flexible, learner-centred environment with ICT being a chief component in achieving this environment, and importantly reflected his own belief and commitment toward such a movement. The importance of having committed leadership with clear vision is discussed in Chapter Four. The paper further describes the strategies the University has put in place to meet the needs of the Information Age student.

Changing Times Changing Plans

Mission and Values

1. *Curtin is dedicated to the advancement of knowledge and the enrichment of culture. Its particular mission is to convey through everything it does a commitment to the following values:*
2. *the search for innovative applications of technology to educational purposes and other social needs, emphasising continuous improvement;*
3. *the cultivation of responsive and responsible links with the wider community, emphasising service, practical relevance, social justice and ethical behaviour;*
4. *the development of students and staff as citizens of the world, emphasising an international outlook, cultural diversity, and an informed respect for indigenous peoples.*

(Curtin University, Teaching and Learning Plan, 1997a)

The Curtin University of Technology Strategic Plan (1997 – 2000) attempted to reflect and meet the needs of the changing environment (reduced government funding per student, unfunded salary costs, the potential threat from those providing tertiary courses through non-traditional media, and responding to a more market-driven educational environment). The latest Strategic Plan 2000 – 2005 (Curtin University of Technology, 2000b), however, clearly detailed the major changes which have been and will continue to affect Curtin University and hence shape the Strategic Plan. These changes include: Explosion of activities associated with 'borderless education'; Increased emphasis on market forces; Changing industry demands; Changing learning environment; Social changes.

The major difference between the two plans is the manner in which they evolved and developed. It has been articulated in the "Strategic Plan 2000 – 2005" that for the first time this latter plan has applied the Planning Framework based on the work of Kaplan and Norton (1996) utilising the "Balanced Scorecard" methodology. On this basis Curtin University appears to have adopted a more 'entrepreneurial' approach to strategic planning and hence management of the University. This approach utilising the "Balanced Scorecard" method was originally designed to complement an organisation's financial measures and to calculate performance from the perspective of the customers, learning and growth and the internal business processes. It is basically a measurement concept which can be introduced to assess various goals and initiatives, rather than rely on the traditional financial indicators – operating income and sales growth (Kaplan & Norton, 1996).

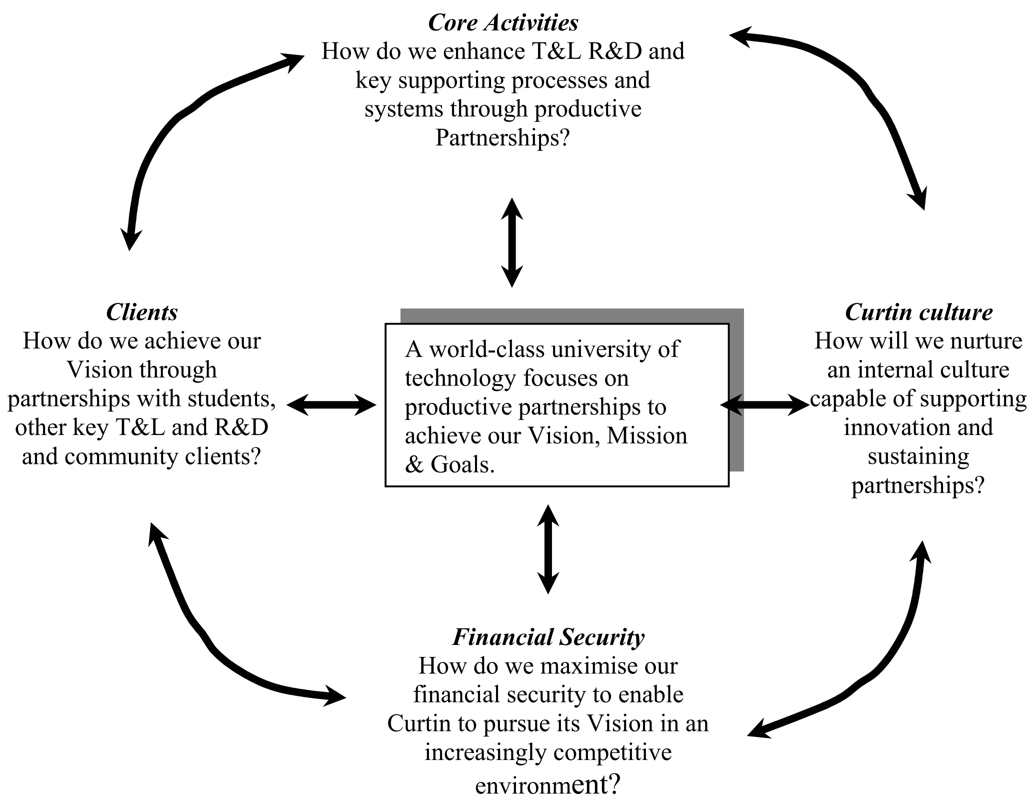
Curtin University has adopted such a process in order to:

> *communicate, manage and evaluate progress toward our Vision, Mission and Goals through the development of strategic objectives and associated indicators, targets and initiatives. Financial and non-financial measures, short and long-term indicators, and quantitative and qualitative measures are used that focus on not only past performance, but drivers for future performance.*
> *(Curtin University of Technology, 2000b, p 10).*

The language also supports the notion of a more 'entrepreneurial' approach adopted by the University. For instance, Figure 2.3 (on the following page) depicts the Planning Framework, where the key focus is on productive partnerships from the viewpoint of staff and organisational culture, clients, core activities and financial security.

Included in these plans is the notion of 'Strategic Templates' (Curtin University of Technology, 2000c) which provide a planning framework for other University-wide plans. The aim has been to rationalise the number of plans that are in circulation (at present about 20). In the future it is proposed that there will be the following plans: Strategic; Teaching and Learning; Research and Development; Internationalisation; Community Relations; Marketing; Ethics, Equity and Social Justice and finally Resources (People Management, Financial, Physical, Information). All Divisional and School level plans will be guided by these key plans.

Figure 2.3: The Planning Framework - Curtin University of Technology Strategic Plan 2000 - 2005



The Strategic Plan (2000 – 2005) is divided into the four key themes (Curtin Culture, Clients, Core Activities, and Financial Security), which in turn have their own strategic objectives. Specific objectives focus on 'growth' (notable new ventures) and on 'productivity' (improving existing practices, processes, services, etc.). For each strategic objective there are associated Key Indicators, Targets, Current Situation, Initiatives, and outlined Plans(s)/Persons Responsible. These key headings are identified in the "Strategic Template". The plan articulates the need for strategic feedback, which has been incorporated into the strategic framework.

This particular plan (Strategic Plan, 2000 – 2005) provides an overview of the strategic objectives for each of the themes (Curtin Culture, Core Activities, Clients and Financial Security), followed by a summary of the key 'performance indicators'. These performance indicators provide a measuring device for the achievements of the strategic objectives. In total there are 10 strategic objectives identified as those which promote new initiatives, termed as 'growth' and 13 strategic objectives which are designed to review, revise and improve existing practices, termed 'productivity'. Unlike the earlier plan (1997 – 2000), the Strategic Plan 2000 – 2005 does not include the specific detail of how the strategic objectives are to be implemented, however accompanying this plan is an important document, the "Key Strategic Priorities 1999 – 2001" (Curtin University of Technology, 2000d) document. This document does identify the key strategic initiatives (initially set in 1999 which were not finalised and were viewed as ongoing), performance indicators, priority strategies, targets, persons responsible and the present status and progress against targets as of May 2000.

In summary, Curtin University of Technology, in its quest to become a 'world class university of technology' and to realign its structure and culture to the needs of the Information Age, has implemented a number of significant initiatives. This began in earnest with the restructuring and the establishment of the Office of Teaching & Learning, a parallel division to the Research and Development Division. A major commitment was made by the University as they employed an outside contractor to conduct a review of the IT&T service delivery (Twomey, 1999) at Curtin University (this will be discussed in greater detail in Chapter Nine). In June 1999 a final report was delivered with a total of 53 recommendations. Since this time Curtin has spent a considerable amount of resources attempting to initiate many of the recommendations.

CHAPTER THREE

Innovation and Change

> *Every change involves choice: between a path to be taken and others to be passed by. Understanding the context, process and consequences of change helps us clarify and question these choices. Which choices we make will ultimately depend on the depth of that understanding but also on the creativity of our strategies, the courage of our convictions, and the direction of our values. ... For if we can come to understand the possible futures of change, we may be more able to take charge of such change in the future.*
>
> *(Hargreaves, 1994, p 19).*

Introduction

This chapter addresses a number of theories of innovation and change and how these concepts guide the present study. The chapter begins by addressing relevant literature concerning the concept and process of change. Innovation diffusion theory is also examined and divided into the elements which sustain this theory: the innovation; communication channels; time; social system; critical mass; innovation in organisations. Various studies that have adopted this theory in their research methodology are also reviewed.

Understanding Change

Marris (1975) argues that a sense of personal loss, anxiety and struggle is involved in all real change and reminds us of the importance of recognising this reaction. Farmer (1990) and Gandolfo (1998) also highlight the importance of understanding the human dimensions of change, while Loucks and Hall (1979) argue that change in individuals is a highly personal experience. Schon (1971) also shared such a view where he depicted real change as "passing through the zones of uncertainty" (p 12). Fisher (1986) links this loss of control over one's environment which change creates, to resulting stress. Marris (1975) suggests that with each new experience an individual initially attempts to place it within their own context by linking it to something familiar - in other words, to construct their own personal meaning. Regardless of whether change is imposed or sought, the meaning of change is rarely understood initially, and ambivalence tends to pervade the transition. An innovation requires a shared meaning if it is to be adopted and assimilated into an organisation (Marris, 1975). This notion of constructing shared meaning necessarily involves others within the same social system. Michael Fullan in

Fullan (1982) and Fullan & Stiegelbauer (1991) argues that this shared understanding is essential if an innovation is to be sustained.

Institutions in the higher education sector (universities, colleges, institutes) have learning as their core function with the nearest organisation which also has learning as a primary focus, being the school system. Thus, it seems natural to initially examine the literature on change in schools where a great deal of research and reform has taken place over the past two decades.

Larry Cuban, who spent many years investigating change in schools with regard to implementing reforms, notes that even though there had been much school reform over the last century – schooling appeared to be pretty much the same as it had always been (1988). He distinguishes between innovations that are 'first-order' changes and those that are 'second-order' changes. First-order changes are those that improve behaviour patterns by making them more efficient and effective. They are considered to be first-order changes in that they do not disturb existing organisational structures or substantially alter the roles of students or teachers. This in turn leads to second-order changes which involve altering the fundamental organisational structures, roles and goals of an organisation. Cuban (1988) also notes that in his view, most of the changes over the century were first-order changes, with second-order changes largely failing.

> *Most reforms foundered on the rocks of flawed implementation. Many were diverted by the quiet but persistent resistance of teachers and administrators who, unconvinced by the unvarnished cheer of reformers, saw minimal gain and much loss in embracing second-order changes boosted by those who were unfamiliar with the classroom workplace.* *(Cuban, 1988, p 343).*

Fullan & Stiegelbauer (1991) suggest that implementation of educational change involves 'change in practice' and the subsequent difficulty in defining and accomplishing change is that educational change is not a single 'entity' - innovation is multidimensional (Joyce & Showers, 1988; Fullan & Stiegelbauer, 1991). Fullan & Stiegelbauer (1991) believe that there are at least three dimensions at stake in implementing an innovation: "1) the possible use of new or revised materials; 2) the possible use of new approaches and 3) the possible alteration of beliefs" (p 37). They note that innovations which do not contain these dimensions are more than likely to lead to insignificant change.

Stoll & Mortimer (1995) attempted to synthesize the research outcomes of several school effectiveness and improvement programs in the United Kingdom in order to identify those factors which needed to be considered when developing school improvement programs. These factors included participatory leadership, shared vision and goals, teamwork, a positive learning environment, emphasis on teaching and learning, high expectations, positive reinforcement, regular monitoring and inquiry, and due attention to pupil rights and responsibilities (Stoll & Mortimer, 1995). Reynolds et al., (1996) also summarised the results of various research projects into 'School Effectiveness' in order to identify the following factors which were identified as making British schools effective: professional leadership by the head; shared vision and goals; a positive learning environment; high quality teaching and learning; high expectations; positive reinforcement; monitoring student progress; student rights and responsibilities and purposeful teaching. The similarities in the results of these two review studies are quite striking.

There is strong evidence that instigating and maintaining long term changes in schools requires changing the attitudes and beliefs of teachers about their professional activity (Dalin, Rolff & Kleekamp, 1993; Fullan, 1993). The beliefs, values and norms shared by the members of an organisation form the culture of the organisation (Gibson, Ivancevich & Donnelly, 1985). Cavanagh (1997) investigated the nature of school culture, the influence of the organisational context and mechanisms for cultural growth in senior secondary schools in Western Australia. His study identified six elements of school culture related to improved educational outcomes for students: professional values; an emphasis on learning; collegiality; collaboration; shared planning; and transformational leadership (Cavanagh, 1997, p 184). Of those interviewed, Cavanagh (1997) found that their school's culture had the capacity to either accommodate or resist externally imposed innovations. In other words, Cavanagh (1997) found that a strong culture has the potential to accommodate or reject specific demands placed on them by external bodies. This is triggered by the presence of mechanisms which facilitate the development of collective attitudes towards the demands. Further, Cavanagh (1997) found that teachers may reject and resist implementing an innovation if the requirements of the innovation are in conflict with the prevailing culture. He also found that cultural change can be induced by internal aspects of a school's culture. This interaction between individuals and groups within the school can therefore influence change in value systems and norms. This theme is repeated in a number of other studies, each echoing the need that in order for a school to develop appropriately, there is a necessity for the teachers themselves to be actively engaged in learning and for the total school community to be operating as a true learning community (Boyd & Hord, 1993; Fullan, 1993; Southworth, 1993).

In the 'Learning Consortium' project concerned with school improvement, Fullan, Bennett & Rolheiser-Bennett (1990) developed a model which had as its centerpiece, the concept of teachers as learners. This concept included the notion of technical repertoire, reflective practice, teachers-as-researchers and meaningful collaboration. They concluded that although these aspects could be considered as separate elements of the 'teachers as learners' metaphor, there was a need for teachers to internalise all four and apply them continuously in their work. These sentiments were also expressed by Ramsden (1998).

> *This learning environment is not created simply by developing individual skills through activities such as teaching workshops and conferences, but by daily attention to the collective and individual attention to the collective and individual responsibility to learn and improve.* *(Ramsden, 1998, p 118).*

Joyce & Showers (1988), Fullan (1992b), and Lieberman (1995) all emphasise the importance of informal support structures and the cultivation of a learning culture.

In the higher education sector, some have argued that it is a misconception that university teaching staff automatically resist change. Due to the nature of their work it could be argued that they actually have a real understanding of change (Ramsden, 1998) - what they do resist is being changed (Senge, 1990). Layer (1995) notes that it is not easy to assimilate change in an environment where academic staff are unfamiliar with being given external directions and have worked in a relatively autonomous manner for many years. He does note however, that to impose change simply increases resistance. Fullan (1998) adds that when you ask someone to change they feel that you are saying 'there is something wrong with what you are doing now'. Ramsden (1998) suggests that leaders underestimating resistance and not making the effort or being aware of the need for shared consent in such an autonomous culture, as indicated by Layer (1995), is what causes much of the ill feeling and resistance of academic staff towards change.

King (1995), Layer (1995), Taylor (1995) and Thorley (1995) in their candid reflections of managing change in their own United Kingdom higher education institutions, identify common key elements in aiding this process in a time of great change. They suggest that when seeking to introduce change - being able to express a vision which individuals can 'buy into' and share ownership is essential. Not only is the vision vital, but it is essential that the manager of change (the leader) is personally convinced of the benefits of the change and that the costs are worth the price. They also identified that one of the most difficult aspects of managing change is being able to effectively manage people especially in times of uncertainty and change. This was seen as crucial as all of these leaders recognised the importance of staff acceptance in the change process. This acceptance is certainly aided by each individual's perception of the benefits of the change.

> *To win the grass roots support we had to present the proposed change as being one of benefit to the students and one that enhances the quality of the student experience. Once the change becomes accepted at this level the battle is won because most of the change is one of the culture, so when it has been accepted by staff on the ground the culture automatically begins to change.*
>
> *(Layer, 1995, p 115).*

Throughout their reflections of their own case study there came through a real sense of appreciation and value of their staff. Taylor (1995) for example, identified that education staff were the institution's "single biggest asset", and King (1995) noted that, "the magic ingredients, however remains the university staff, … those who make things happen with little money and little reward…" (p 49). Certainly, the resistance of people towards change has been long recognised as being a major obstacle to successful organisational change (Thompson, 1967; Firestone, 1987). It is important not to underestimate the difficulties involved in innovation and change (McNaught et al., 1999) – at some stage in the change process people can feel a sense of loss when having to let go of comfortable existing practices to embark on new strategies, this sense of loss Marris (1975) likens to bereavement.

A brief summary of the key findings from relevant literature on the change process includes the following:

- People do not change unless they share a compelling reason to change (Schwahn & Spady, 1998).
- Change is a process not an event (Hall & Loucks, 1978; Fullan & Park, 1981; Fullan & Stiegelbauer, 1991).

- Organisations do not make changes, people do (Farmer, 1990).
- Behaviours change before beliefs and values do (Huberman & Miles, 1984; Fullan, 1985).
- Shared meaning can make significant change a reality (Joyce & Showers, 1988; Rosenholtz, 1989; Fullan & Stiegelbauer, 1991).
- It is better to think big, but start small (Fullan, 1998).
- Integrating bottom-up with top-down implementation strategies is more effective than the other way around (Hopkins, 1992).
- People do not change unless their leaders model that they are serious about the change (Schwahn & Spady, 1998).
- Conflict is a necessary part of change (Lieberman, Darling-Hammond & Zuckerman, 1991).
- Policy cannot always mandate what matters (McLaughlin, 1990).
- It takes a great deal of time to implement change, and a great deal longer before their results are recognisable (King, 1995).
- Faculty development is a campaign, not a battle and that organisational design for change should be built around small success (Gandolfo, 1998).
- Cultural change is more difficult to accomplish than any changes in systems or procedure (Pence, 1992).
- Because faculty performs the focal role in academia, its reaction to any contemplated change is crucial (Kashner, 1990).
- It seems that most people do not discover new understandings until they have delved into something (Fullan, 1992a).

All of these notions rest on the belief that teachers are the key to educational change (Fullan & Stiegelbauer, 1991; Fullan, 1993; Hargreaves, 1994). As noted in the previous chapter, Clark (1998) also identified the importance of individuals in the transformation process - ‘the academic heartland’.

Innovation Diffusion Theory

> *Diffusion is a kind of social change, defined as the process by which alteration occurs in the structure and function of a social system. (Rogers, 1995, p6).*

The sociologist Everett Rogers (1995) is recognised as one of the most prominent researchers in the field of diffusion of innovations theory. He has probed into a range of disciplines and studied the work of a number of professionals within these disciplines in order to gain a greater awareness of what leads to the adoption of an innovation while developing a greater understanding of the overall diffusion process (Adam & Wilson, 1996). His book, *Diffusion of Innovation*, is a synthesis of his work in this field and was first printed in 1962, with the Fourth Edition released in 1995.

Rogers defines diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (1995, p5). An innovation is an idea, practice or object perceived as new, while communication is the process whereby participants create and share information in order to reach a mutual understanding. In other words, "diffusion is a special type of communication concerned with the spread of messages that are perceived as new ideas" (Rogers & Scott, 1997). The four key elements in the diffusion of innovations are: the innovation, communication channels, time, and the social system. The theoretical framework of Rogers' (1995) diffusion of innovation model has been adopted in this present study in order to help analyse the characteristics of adopters and to determine whether the rates of adoption change over a period of time.

Discontinuous innovation has been the source of most of Rogers' (1995) investigations, which included an examination of technological innovations. Specifically about technological innovation, Rogers (1995) notes that it:

> *usually has at least some degree of benefit for its potential adopters. This advantage is not always clear cut, at least not to the intended adopters. They are seldom certain that an innovation represents a superior alternative to the previous practice that it might replace.* *(Rogers, 1995, p 13).*

This notion put forward by Rogers (1995) provides a valuable link to diffusion of innovation theory and the nature of the investigation centred in this research study.

The Innovation

In Rogers' (1995) terms the innovation examined in this present study is "information and communications technology (ICT)", and the relevant diffusion is the degree to which academic staff at Curtin University of Technology have adopted ICT in their teaching and learning. According to Rogers (1995), it is important conceptually to determine the exact boundaries that define a technological innovation.

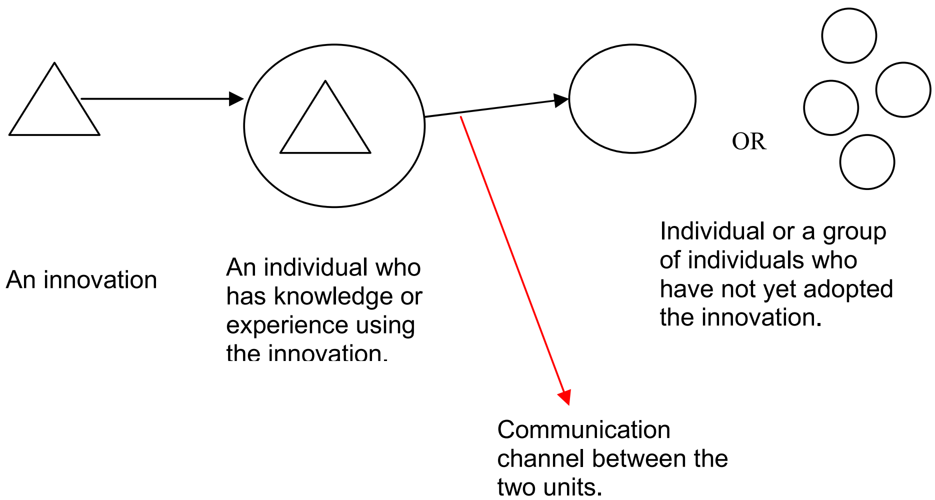
The relatively common term, information and communication technology (ICT) in this investigation includes all types of computer-based software and tools used for teaching and learning and only assumes the existence of the hardware and network infrastructure required to utilise these tools. In other words, utilising PowerPoint slides with a data projector, publishing materials on the World Wide Web for students to access and communicating using electronic mail, would all be defined as using ICT for the purpose of teaching and learning.

According to Rogers (1995), members of a given social system adopt innovations at different rates. He defines five characteristics of innovations which affect this rate of adoption – *relative advantage* (to what extent the new innovation is better than the one it is replacing), *compatibility* (the level to which the innovation is consistent with the needs, culture, and value of the adopters), *complexity* (the degree an innovation is perceived as difficult to understand and use), *trialability* (the degree to which the adopter is able to experiment with the innovation – test run), and *observability* (the level of which the results of an innovation are apparent to others). In other words, innovations that are perceived by members of a social system as having a greater relative advantage, as being compatible with their belief and value system, are not perceived as complex, are able to be effectively trialled, and the value is easily observable - are likely to be adopted more rapidly than other innovations. According to Tornatzky & Klein's (1982) analysis – relative advantage, compatibility and complexity were the only characteristics that were consistently related to adoption and utlisation, while diffusion scholars, according to Rogers (1995), have found relative advantage to be one of the best predictors of an innovation's rate of adoption.

Communication Channels

The exchange which occurs when one individual communicates a new idea to someone else or a group of others, is the core of the diffusion process. The effect of the transfer of information or knowledge from one person to another will depend on the nature of the exchange. The exchanges can be through 'Mass Media' (newspapers, radio, television, internet) or 'Interpersonal' (face-to-face) channels. Mass media channels are certainly a more rapid and efficient way of communicating information about an innovation to a potential audience, however interpersonal channels are a more effective method in persuading an individual or group to adopt an innovation. The researcher has created a visual representation (Figure 3.1) which reflects the schema of this process in its simplest form.

Figure 3.1: Diffusion of Innovation Process



According to Rogers (1995) the personal approach is favoured if the communication channel is between individuals who are homophilous (share common ground – personal and social background). Rogers emphasises that diffusion is a very social process and that:

> *…most people depend mainly upon a subjective evaluation of an innovation that is conveyed to them from other individuals like themselves who have previously adopted the innovation.* *(Rogers, 1995, p18).*

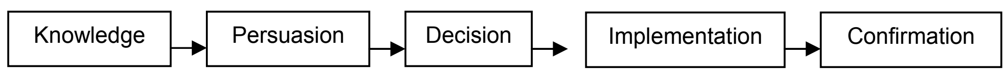
Further, an individual's adoption of an innovation depends to a large extent upon the experience their peers have had with the innovation – "the heart of the diffusion process consists of modeling and imitation by potential adopters of their network partners who have adopted previously" (Rogers, 1995, p18).

With technological innovations it is important to address the concept of interrelatedness. Another key term is technology cluster. A technology cluster consists of one or more identifiable features of technology that are viewed as being closely related. Interrelatedness implies that an adopter's experience with a particular technology innovation influences that individual's perception of a subsequent innovation in the same technology cluster (Rogers, 1995). For example, if an academic staff member has had a negative first experience with a computer application, then all applications subsequently may be viewed in a similar light.

Time

The third key element in the diffusion process is time. The time dimension is involved in the diffusion process in three distinct ways. First, Rogers (1995) asserts that an individual's decision to adopt an innovation is not an instantaneous act. The innovation decision process encompasses the various mental stages the individual passes through, from initially becoming aware of the innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to applying the innovation and finally in confirming this process. Figure 3.2 reflects these steps.

Figure 3.2: The Innovation Process



Such an innovation decision process is basically an information seeking activity in order to decrease the individual's uncertainty about the innovation.

Second, the degree to which a member or members of a social system adopt an innovation relatively earlier than others within the same social system, is defined as innovativeness. Rogers (1995) identifies five adopter categories which reflect relative innovativeness: *innovators; early adopters; early majority; late majority and laggards*. Jacobsen (1998) provides a useful summary of the attributes and characteristics which have been linked to the various categories. Table 3.1 (on the following page) provides a brief outline of the attributes Jacobsen (1998) has identified as being associated with each particular adopter category.

As an example, in his marketing work, Moore (1991) divides technology into three stages. An early market which consists of innovators and early adopters, a mainstream market consisting of early and late majority groups, and a late market which includes the laggards. Moore (1991) identifies the 'chasm' between the early and mainstream markets, which is exacerbated by significant differences between the two groups. For example, the early adopters tended to be visionary, project oriented, risk takers and generally self-sufficient while the mainstream group were pragmatic, process oriented, did not favour risk and usually required significant support. He recognised that from a marketing point of view that these two groups required completely different approaches. Geoghegan (1994) also acknowledged and emphasised this difference when referring to academic staff applying the use of instructional technology. These differences can have a profound affect as the application of technology has the potential to radically alter existing teaching practice.

Table 3.1: General Attributes for Rogers (1995) Adopter Categories

Adopter Categories	General Attributes
Innovators	Pioneers and venturesome Usually part of cliques - others who share their interests. Have career security - or control over resources. Able to understand and apply complex technical knowledge to their field. Able to cope with a high degree of uncertainty - can cope with set backs. Play an important role in the diffusion process as they introduce new ideas into a system.
Early Adopters	Integrated part of the local social system - 'localites'. The greatest degree of opinion leadership - others refer to them for advice. Usually serve as role models and they assist in speeding up the diffusion process as they are not too far ahead of the average individual. Usually respected by peers. Have greater empathy, greater intelligence, a greater ability to deal with abstractions, a more positive attitude toward change and are able to cope with uncertainty and risk better than the later adopters.
Early Majority	Interact frequently with their peers. Seldom hold positions of leadership. The decision process to adopt is usually longer and may be willing to follow but will not lead.
Late Majority	Usually the skeptical one third of the social system. Innovations are approached cautiously. Usually adopt due to economic reasons or peer pressure. They need to be convinced and need to feel that it is safe to adopt.
Laggards	Usually interact with those who have traditional values. Tend to be suspicious of innovations and change agents. Must be sure that a new idea will not fail prior to adopting.

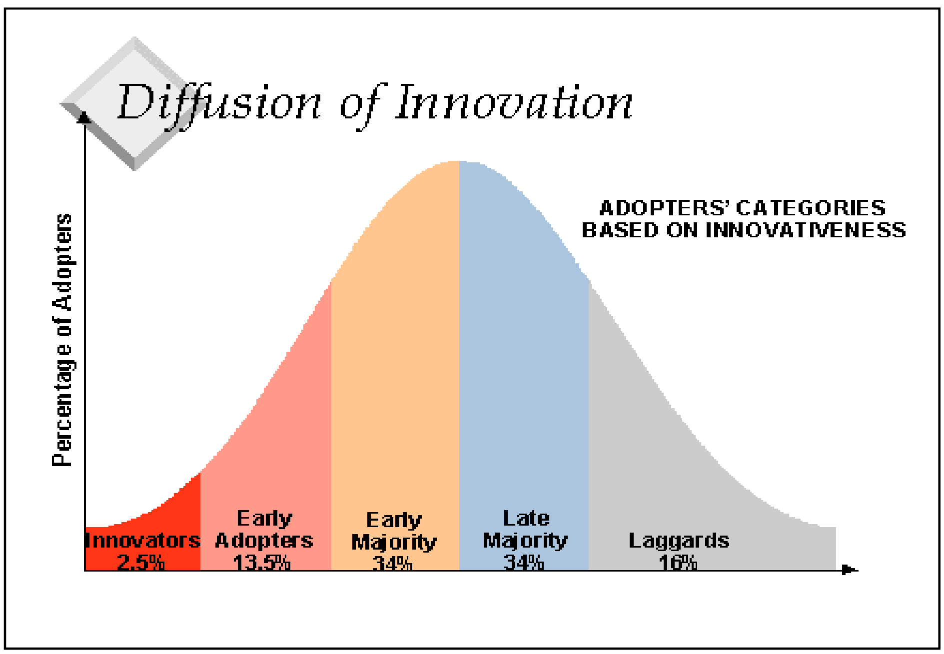
(Jacobsen, 1998).

The third relevant aspect of time is the relative speed at which an innovation is adopted and is referred to as the rate of adoption. This rate of adoption is usually measured as the number of members of a social system that have adopted the innovation in a specific time period.

> *When the number of individuals adopting a new idea is plotted on a cumulative frequency basis over time the resulting distribution is an S-shaped curve. (Rogers, 1995, p23)*

Most innovations have an S-shaped rate of adoption curve, however the slope of the 'S' varies depending on the innovation. For example, some innovations are adopted more rapidly than others. Figure 3.3 outlines the typical rate of adoption as identified by Rogers (1995).

Figure 3.3: Diffusion of Innovation



(*Klopfenstein,1998).*

It is important to note that saturation point has been reached when an innovation has been adopted by most or all of the members of a social system (Geoghegan, 1994).

Social System

The social system is the fourth main element in the diffusion of innovation theory. A social system is defined as a "set of interrelated units that are engaged in joint problem-solving to accomplish a common goal" (Rogers, 1995, p23). An innovation 'diffuses' within the boundary of a social system (Rogers & Scott, 1997). Individuals or groups found within a social system are not identical in their behaviour - a structure (patterned arrangements of units) usually exist. Rogers (1995) notes that such a structure of a social system can facilitate or hinder the diffusion process. The adoption rate or innovativeness of an individual is affected by an individual's characteristics and the nature of the social system of which the individual is a member.

The established behaviour patterns of members within a social system are referred to as norms. These norms provide individuals with standards and rules of behaviour. Similarly to social structure, norms can also impede the diffusion of an innovation. A key term that is related to influence - opinion leadership is the degree to which an individual is able to influence the attitudes or behaviour of members within their social system. Opinion leaders are socially accepted by the members of the social system and reflect the social system's norms. Thus, if the social system is prepared for change, then opinion leaders take on the role of innovators (with the converse also being true). Individuals who fulfil the role of change agents attempt to influence other decisions in the diffusion process. Due to their popularity, opinion leaders are usually seconded by change agents in order to aid in the diffusion process.

There are three main types of innovation decisions which are influenced by the social system: optional innovation decisions (an individual's choice to adopt or reject an innovation, independent of others); collective innovation decisions (consensus amongst members of a social system); and authority innovation decisions (made by a few individuals in positions of high status and power). The consequences of innovations are the changes that occur to an individual or to a social system directly resulting from the adoption or rejection of an innovation.

Critical Mass

> *A crucial concept in understanding the nature of the diffusion process is the critical mass, which occurs at the point at which enough individuals have adopted an innovation that the innovation's further rate of adoption becomes self sustaining.* *(Rogers & Scott, 1997, p6).*

According to Rogers (1995), "critical mass" is the area of the diffusion curve between 10 - 20 percent adoption. This area represents the transition from the early adopter category to the early majority.

When an individual's adoption of an innovation depends on the number of other individuals in their social system who have adopted the innovation, this is called the threshold (Markus, 1987). This threshold for adoption varies for individuals within a system. For example, innovators have a very low threshold (resistance to an innovation) as they adopt the innovation first, whereas late adopters have a high threshold for adoption because their own adoption depends on the number of members in their personal network who have adopted the innovation (Rogers 1995). Critical mass operates at the system level, while threshold operates at the individual level of analysis.

Innovation in Organisations

According to Rogers and Agarwala-Rogers (1976) an organisation is a stable system of individuals who work together to accomplish common goals through a hierarchy of ranks and a division of labour. A predictable organisational structure is obtained through predetermined goals, prescribed roles, authority structure, rules, regulations and informal patterns.

The methods employed in the early research (prior to and during the 1970s) into organisational innovativeness were adopted from models of investigating innovativeness in individuals. This method had various flaws and was often done without much thought to the difference or similarities between individuals and organisations (Eveland, 1979). These studies measured organisational innovativeness by measuring the adoption or rejection of a number of innovations by a selected sample of organisations. This research method was later replaced with research on the innovation process in organisations (Zaltman et al, 1973), where the focus became the implementation (applying the innovation) of the innovation instead of the actual decision to adopt. This type of research has since tended to concentrate on a single innovation in an organisation or organisations.

Van de Ven and Rogers (1988) note that, in the 1980's new communication technologies invigorated the field of innovation in organisations. One of the other main issues which influenced the continual use of this type of research has been the failure of organisations to effectively implement various ICT innovations. The assumption was that understanding this process would provide a better understanding of how to effectively introduce these innovations.

According to Rogers (1995), the innovation process in an organisation involves five sequential stages divided into the two activities of initiation and implementation. Figure 3.4 (on the following page) represents the innovation process in an organisation. These stages of the innovation process in an organisation provides a useful schema for identifying at which stage an innovation has been diffused in an organisation - in the case of this study, the use of ICT in teaching and learning at Curtin University of Technology.

Studies Adopting the Diffusion of Innovation Theory

> *No other field of behaviour science research represents more effort by more scholars in more disciplines in more nations.* *(Rogers, 1995, p xv)*

Engel, Blackwell & Miniard (1993) reflect that "over 3,000 studies and discussions of diffusion processes have been published in at least 12 identifiable disciplines " (1993, p728). In 1995, Rogers asserted that "the total number of diffusion publications approaches 4,000" (1995, p xv). In his major work Rogers (1995) provides an extensive bibliography of researchers who have delved in the field of diffusion of innovations. This diffusion tradition ranges across many fields and disciplines: Anthropology, Agricultural Economics, Communication, Education, Early Sociology, Geography, General Economics, General Sociology, Industrial Engineering, Marketing and Management, Public Health and Medical Sociology, Psychology, Public Administration and Political Science, Rural Sociology, and Statistics.

Figure 3.4: The Innovation Process in an Organisation

Decision

I. INITIATION →

All of the information gathering, conceptualising, and planning for the adoption of an innovation, leading up to the decision to adopt

II. IMPLEMENTATION →

All of the events, actions, and decisions involved in putting an innovation into use.

1	2	3	4	5
AGENDA-SETTING	**MATCHING**	**REDEFINING/ RESTRUCTURING**	**CLARIFYING**	**ROUTINISING**
General organisational problems that may create a perceived need for innovation.	Fitting a problem from the organisation's agenda with an innovation.	The innovation is modified and re-invented to fit the organisation, and organisational structures are altered.	The relationship between the organisation and the innovation is defined more clearly.	The innovation becomes an ongoing element in the organisation's activities, and loses its identity.

(Rogers, 1995, p 392)

As noted earlier, the introduction of the vast array of information and communication technologies (ICTs) into our society has seen the continued use of the "diffusion of innovation" model. These new technologies continue to come at great financial expense to individuals and organisations and in order to increase and speed up the rate of adoption, businesses as well as the education sectors, have attempted to identify factors which contribute to the effective adoption and implementation of these ICTs.

McNaught et al., (1999) adopted a multiple case study design (five Australian universities), involving semi-structured interviews and focus group sessions in order to identify issues that related to the adoption of computer facilitated learning resources. The two key dimensions used to select the sample for the interviews and focus groups were the degree of adoption of a new technology (based on Rogers', 1995) original categories, but modified to three categories only – innovators and early adopters, mainstream and later adopters, and resistors) and the degree of influence an individual may possess in relation to its adoption by others. Eighty one participants were involved in this phase of the data collection.

McNaught et al., (1999) also reported on another relevant aspect of the above study which applied Rogers (1995) categories. Seventy three members of the Australian Society for Computers in Learning in Tertiary Education (ASCILITE) regarded themselves as innovators or early adopters. McNaught et al., (1999) also noted that many of these people had developed significant projects with very little support from their departments or their university. This same group of members perceived that the majority of the staff at their universities only used technology when it was in the mainstream.

Baldwin (1998) also found it useful and appropriate to apply Rogers's (1995) model when considering the impact on academic life. However Baldwin adopted a simplified version (taken from an electronic discussion list – "An Online Experience", 1995) namely, the 'early adopters' and 'mainstream faculty' categories. Geoghegan on this same discussion list ("An Online Experience", 1995) describes characteristics of the two groups regarding their ICT adoption. Table 3.2 refers to the characteristics of the early adopter and mainstream groups.

Table 3.2: Characteristics of Early Adopters and Mainstream Users

Early Adopters	Mainstream Users
• strong technology focus	• problem and process focussed
• visionary	• conservative
• experiments with the technology and takes risks	• Realistic/practical - want proven applications that will enhance their work performance
• favour revolutionary change	• favour evolutionary change
• self sufficient	• typically requires a great deal of technical support

Casey (1994), who studied school councilors, found that innovators tended to be advanced, self-taught power users who were able to author programming languages, while the laggards were considered to be 'technophobes' who avoided computer technology at all costs. He identified the early adopters as being more mainstream than the innovators, demonstrating leadership skills by providing workshops and publications for their colleagues, while having to deal with the slow pace of acceptance and change by the mainstream.

Adam & Wilson (1996) reported on a study which examined the adoption and diffusion of ICT among Australasian educators in higher education. A mail survey was sent to Australian and New Zealand educators who were in the position of making decisions about the adoption of textbooks and other educational resources. A commercial database was employed to identify the sample of 750 (from chemistry, marketing and psychology fields), with a return rate of 19.3%. The survey attempted to identify: the usage of 32 technologies (ranging from mono television monitor to electronic bulletin boards); specific software applications; how the students of the educators currently used ICT; whether the educators would recommend the adoption of certain resources (e.g. Prescribed textbooks as currently published, videotaped interviews, test banks recorded on CD-ROM interactive media).

Adam & Wilson (1996) found that educators in the higher education sector were not using ICT to the fullest advantage in their teaching role. Almost half of the educators were unable to identify how their students were utilising ICT. Their data also revealed that in mid - 1995 the educators were not planning to use ICT resources with their students in the near future. For example, over 75 percent noted that they could not see themselves as recommending the use of CD ROM based textbooks, and over 40 percent felt the same about the World Wide Web. Adam & Wilson (1996) concluded that:

> *Although Australian educators adopted information technology earlier than the broader community, they are not planning to use these technologies in the future in their teaching. While institutions may well be developing open learning and off-campus programs that utilise the converging technologies, individual educators seem to be laggards in their planned adoption of information technologies in the classroom. (Adam & Wilson, 1996, p 8).*

Starweather & Clark (1999) used focus groups and interviews with university staff to identify their attitudes to the computer-based information resources provided by academic libraries. The theory of the diffusion of innovations was also adopted in this process. Starweather & Clark (1999) screened participants in order to establish a level of homogeneity by selecting staff who reflected Rogers' (1995) adopter categories. Six staff (3 innovator/early adopters and 3 laggards) were interviewed and 26 participants were divided into three focus groups (early adopters, early/late majority and laggards). The interviews lasted one hour while the focus groups were 90 minutes in duration. The themes which emerged from the data were: obstacles to use; convenience and portability; relevance to the library; validity of information on the Internet and equitable access; change; with few differences between focus group participants and interviewees. One of Starweather & Clark's (1999) conclusions was that in terms of actually using the electronic databases offered by the library, there were few differences between adopter categories. The perceived differences related more to the lack of "awe" felt by the late majority toward the new technology, rather than a resistance to the adoption of the innovation. In practical terms, this meant that the skills to master a new innovation were only sought when specifically required and really needed.

Starweather & Clark (1999) also identified "lack of time" as the main barrier which hindered the full use of the library electronic resources. Other barriers specifically related to the environment included campus computing difficulties, printing problems, and limited library hours. A perceived lack of information about the electronic resources was also identified by the sample as a significant barrier. Despite these obstacles, the convenience of access to electronic resources contributed to the "wide adoption of the resources across adopter categories represented in this study" (1999, p16). Staff across all adopter categories were concerned about the quality of the material found on the World Wide Web and the lack of critical review of this material by their students. It is clear that the participants in the study were experiencing the effects of the transition period of print to electronic material.

All staff acknowledged the effect and the influence of the pace of technological change in higher education (students, staff, libraries). Starweather & Clark (1999) conclude by noting:

> *Adoption of new technologies by library patrons does not mean that older 'book technologies' will be abandoned. Rather, the viewpoints of the participants in this study suggest that it is not either one or the other but both and all.* *(Starweather & Clark, 1999, p17).*

Many studies in Management Information Systems (MIS) have focused on technology usage as a key independent variable while others were directly concerned with articulating or testing the differences across the stages of the innovation decision process. Karahanna, Straub & Chervany (1999) also in the field of MIS, used questionnaires (one for adoption and one for continued use) in order to identify pre and post adoption views and attitudes of information systems users in a large organisation. Innovation diffusion and attitude theories guided their research. The items of the questionnaire reflected relative advantage, trialability, ease of use, compatibility, result demonstrability, image, visibility, attitude, normative beliefs, subjective norm, voluntariness, and behavioural intention. With a return rate of 28.2% (N=268) the preliminary data suggests that "social norms alone induce initial adoption while sustained usage decisions, when non-mandated, are based solely on attitudinal considerations" (Karahanna, Straub & Chervany, 1999, p15).

Goldenfarb (1995) adopted Rogers' (1983) framework for determining the rate of a adoption to "test if critical success factors in diffusing innovation, identified in the literature and at other universities played key roles in diffusing the Campus Wide Information System (CWIS)" in 10 departments across an Australian university. Initially a steering committee was set up to pilot various options which resulted in the recommendation that each department be responsible for establishing, up dating and maintaining their own server. Two of the contributing factors identified in the study which aided the successful adoption of CWIS were the 'product champion' (lead users who saw the benefits of the innovation and drove the project) and the degree of support from their leaders. The most common success factors identified in the three most successful departments were: having lead users who drove the project; recognition that publishing could be difficult for those staff who had limited IT skills; at the initial stages the product champion was responsible for publishing or the publishing was outsourced until the others were able to acquire the skills; and that department leaders provided long term commitment and support (Goldenfarb, 1995). Support from those in leading positions in the university also contributed to the successful adoption as they were informed early in the project of some early achievements. Collaboration involving all departments through sharing of useful resources also aided the adoption process. The barriers impeding the success of adoption of the innovation identified by Goldenfarb (1995) were mainly that departments relied too heavily on the product champion, they were unable to address the problem of low IT skills, and the perceived low relative advantage of adopting CWIS.

These results regarding the adoption of CWIS at an Australian university lead Goldenfarb (1995) to make the following recommendations: improve the general ICT skill level of academic staff; dedicate an implementation group to each new innovation; create an electronic discussion group for those adopting an innovation; provide generic solutions which can benefit everyone; elicit participation from a variety of sources (library, external relations, academic faculties and students).

The above studies have been selected as a small sample of those studies which have adopted Rogers' (1995) diffusion of innovation model. Their common purpose being to determine the rate of adoption of an innovation and attempt to identify the elements which hinder or aid the adoption, as well as seek to identify the characteristics which may identify certain adopter categories.

CHAPTER FOUR

Technological Change in Teaching and Learning

> *If universities and colleges are successfully to adopt the use of technologies for teaching and learning, much more than minor adjustments in current practice will be required. Indeed, the effective use of technology requires a revolution in thinking about teaching and learning. Part of that revolution necessitates restructuring universities and colleges – that is, changing the way higher education institutions are planned, managed, and organised.*
>
> *(Bates, 2000, p xiii).*

Introduction

Chapter Four identifies the specific impact that technology has had on higher education institutions, the changes that have resulted and how institutions are attempting to manage these changes. This chapter begins with describing the current climate of ICT use in higher education. This section is further divided into an examination of the factors affecting the adoption of ICT at both the institutional level and the individual level. The chapter continues by identifying how ICT has specifically affected the teaching and learning practices of academic teaching staff.

The nature and function of the infrastructure required for ICT at a university is also examined in this chapter covering such issues as: the organisational structures for the use of ICT, strategic planning, and the cost of teaching with technology.

Current Climate of ICT Use

As identified in Chapter Two, there have been a number of factors which have threatened and challenged the existing practices of higher education, not the least being the introduction of new information and communication technologies (ICT). Green (1997) has argued that we are experiencing a profound shift – a transition between the Age of Print to the Age of Digital Electronics, 'from the digital apparatus as the organising context and resource for educational and social practice to the digital electronic apparatus' (Green, 1997, p 2). According to Spender (1998), digital technology, especially online technology, is changing the culture in higher education and causing new pressures on learning outside the control of teachers. She introduces the notion that future academic staff will be 'learning managers', where their role is not to know everything, but to be able to know where to access the most relevant and appropriate information through online technologies. Fox (2000) advocates that 'new technologies will change what we do, our work practices and relations, our jobs and our futures' (p 241). He does not adopt the view that new technologies will enable us to do the same things easily or more effectively, but that technology will change the very nature of what we do and how we do it. Similarly, ICT will fundamentally change how and what students learn (Fox, 2000). Online technology is the largest area of growth in higher education in the last few years (Green, 1998 & 1999). It has been clearly stated by a number of researchers (De Long, 1997; Yetton, 1997; Fox, 2000) that if the various disciplines do not integrate online technologies into their teaching and learning, then they may not be able to catch up for many years.

The literature suggests that some of the main pedagogical and economical forces that have driven the push for universities to adopt and incorporate ICT in teaching and learning include:

Greater information access – The World Wide Web has made it possible for people to access primary sources of information on demand. Mastery of this tool has become essential in order to gain access to an ever growing body of recent and up-to-date knowledge available electronically. The rate of job change has also caused a rethinking of the skills required for lifelong learning, such as skillful use of ICT. The potential is there for these new ICTs to attract a more competitive market, thus making the institution a more financial and viable entity (Deden & Carter, 1996; Bates, 2000; Fox, 2001).

Greater communication facilities – Interaction between academic staff, colleagues and students can be structured and managed through electronic communications to provide greater access and flexibility (Bates, 2000).

The quality of teaching – New technologies have gained much attention from academic staff as they perceive their use will lessen their problems of high work loads, increased student to teacher ratio and use of inexperienced staff to teach (McNaught et al., 1999; Bates, 2000). There is ample evidence that well designed multimedia software can be more effective than traditional classroom methods, where students are able to interact with the software and learn at their own pace. Integrated effectively into the classroom environment, ICTs can facilitate higher order thinking skills (Barron & Ivers, 1996;

Brooks, 1997; Bates, 2000) and 'spawn' new ways of learning (Brick, D'Arbon & Robson, 1998).

ICT skills – Employers are expecting graduates to be computer literate, including the following skills: familiarity with e-mail etiquette and associated communication tools in order to communicate with other professionals; being able to locate appropriate information on the Internet; being able to present information in a variety of formats.

Asynchronous learning – This initiative has enabled institutions to cater for a variety of students by removing the barriers of time and distance. Students who are normally geographically disadvantaged have access to a variety of resources not usually at their disposal (Deden & Carter, 1996; McNaught et al., 1999; Bates, 2000).

Pedagogical improvement and staff renewal – Teaching staff are able to present information using a variety of tools in order to better relate the content to the concrete realities of a given field of study. Innovative hands-on learning experiences are also made possible for the students through computer simulation software. Asynchronous communication technologies are used outside of the classroom to enrich classroom learning through discussion groups, mentoring and coaching (Burg & Thomas, 1998). The challenge of teaching with ICT has led to revitalising teaching practice for academic staff (Mason, 1998; Bates, 2000; McKenzie, 2000).

Cost-effectiveness of higher education – ICT can improve the cost-effectiveness of the operation of higher education in a variety of ways. One way is by its ability to reach different students and in greater numbers. Academic teaching staff can be freed from many routine activities by replacing certain activities with appropriate technology (Deden & Carter, 1996).

As identified in Chapter Three, one well regarded model concerning the diffusion of educational innovations has been based on the work of Rogers (1995). Under this model, for significant change to occur, a 'critical mass' of individuals need to have adopted and implemented a given innovation (Moore, 1991; Green & Gilbert, 1995; Rogers, 1995; Deden, 1998). This 'critical mass' occurs when enough individuals have adopted the innovation so that the innovation's further rate of adoption becomes self-sustaining. The literature suggests that this can be a slow and in many cases, a painful process (Candiotti & Clarke, 1998).

Kenneth Green, the founder and director of the "Campus Computing Project" in the USA for the past 10 years, argued in 1996 that the use of ICT on campuses had reached a 'critical mass' stage even though it was "decidedly low tech". He also believes that ICT "has not radically transformed classrooms or the instructional activities of most staff" (Green, 1996a, p28). Four years later in response to the latest Campus Computing results, Green (2000) notes that even though the survey data continue to reflect growth patterns in the use of ICT in teaching and learning, he feels that American campuses are about to reach a 'plateau'. He sees that:

> *the Web has been a critical catalyst for many staff, offering compelling content and technology that they could bring into their teaching and scholarly activities. But there are some real limits. The number of the staff energised by the Web and willing to invest time and effort to infuse technology into their instructional activities, often absent adequate institutional support and recognition for their effort, may begin to level off, at least for a little while.*
> *(Green, 2000)*.

Gillespie (1998) argues that until recently academic staff have simply employed ICT to support and enhance existing practices. He claims that in recent times we are beginning to see and experience how technology has "really changed how we teach or what is actually taught" (Gillespie, 1998, p 42). Gillespie notes that the learning features available with new technologies represent a blending of the five principles of instructional computing. These principles are concerned with the view of computers as: content to be taught; a support tool for instruction; a personal productivity tool; a means of hypertext and multimedia delivery and a communication device (Gillespie, 1998).

In a similar view to Fox (2000; 2001), Gillespie (1998) notes that these new learning opportunities have caused educators to challenge and move on from the way we traditionally think about employing technology to support teaching and learning. This move opens up an environment that provides a greater amount of learner options with much less teacher direction (Bar & Tagg, 1995).

Gandolfo (1998) notes that even though we know that the current school model is generations old, most higher education faculties see no real problems in continuing to adopt this model. She advocates that:

> *By working in a technologically enhanced environment, guided by sound principles of teaching and learning, we will gradually reveal to ourselves a new paradigm. Traditional structures and pedagogies will evolve, as we see, a new way of doing things because we have already enacted them.*
>
> *(Gandolfo, 1998, p 32).*

Certainly, adopting ICT to enhance and support our existing practices and structures may give us the appearance of improving education without any real and substantial advances in student learning (Gandolfo, 1998). This view is similar to that of McClenney (1998), mentioned in Chapter Two, where she notes that organisations are continually allowing innovations to occur on the periphery of the organisation as this tends to prevent them from contaminating existing core functions. In other words, the existing core functions, behaviours and values of the organisation are often unaffected, resulting in little change.

Universities have been recognised as early adopters of commercial computer applications and the development of ICT in Australia. The Australian Academic Research Network (AARNet) was one of the first academic computer networks in the world and its existence and the skills of its technicians enabled Australia to be an early adopter of Internet technologies and applications. Higher education institutions continue to make major commitments to using new information and communication technologies to improve administration, research, teaching and learning despite experiencing severe resource constraints through lower levels of Government funding.

Within the Australian context, there is real evidence (DETYA, 2000) that ICT applications have not penetrated university teaching at much more than a superficial level, and that the level of expertise and practice is not yet sufficient to ensure that their wider use is considered viable by academic teaching staff for developing and delivering courses. Consequently, a major concern is that Australian universities risk falling behind their peers and competitors (DETYA, 2000).

An Evaluations and Investigations Programme funded by the Department of Education, Training and Youth Affairs (DETYA) entitled 'Developing a Framework for a Useable and Useful Inventory of Computer-facilitated Learning and Support Materials in Australian Universities' is the most recent and relevant research completed in Australia which has similar goals to this particular study. McNaught, Phillips, Rossiter & Winn (1999) investigated the "general issues related to the adoption of computer-facilitated learning (CFL) resources, and specific issues relating to setting up a useful and useable inventory of CFL resources" (p xv).

The information collected in this particular study was obtained through a variety of methods – online surveys of existing practices of 28 Australian universities, a literature survey, and a case study of five universities (project, staff and institutional levels). The particular issues which were explored by this research project which were of interest to this study were the policies, infrastructure and supports found within the institutions which aided or hindered the adoption of CFL by academic teaching staff in their teaching and learning. One of the key findings revealed by the study is that there is a low uptake of CFL in Australian universities.

Hesketh, Gosper, Andrews & Sabaz (1996) also investigated computer mediated communication in the context of Australian university teaching and learning. They concluded that ICT had only superficially penetrated university teaching. They commented that "universities are waiting for IT to infiltrate their teaching; there is a degree of passivity expecting that the inevitable will happen" (pxv). Similar sentiments were also expressed in the Higher Education Action Plan Document (AVCC, 2000), where the comment was made that some universities in Australia fall into the 'waiting' category, while others appear to be more keen to adopt new modes of delivery.

Factors Affecting Adoption at the Institutional Level

With such pedagogical benefits as noted earlier, one must wonder why these new and powerful information and communication technologies have not permeated to any great extent (with few exceptions such as The Open Learning University in the UK and Hong Kong; The University of Illinois; The University of Phoenix; Virginia Tech; University of Central Florida) into the fabric of tertiary education institutions around the globe. This section addresses the various factors which influence the adoption of ICT in higher education institutions as found in the research literature.

Many issues appear to surface at the institutional level, such as fragmented institutional planning (Gilbert, 1995a), where institutions fail to match the technology investment with an investment in people (i.e. adequate training, appropriate incentives) (Ehrmann, 1995; Lan, 1997; Williams, 1997; Alexander, 1998; Bates, 2000). In other institutions plans are seemingly driven by ICT and not by a pedagogical rationale and focus (Deden

& Carter, 1996; Gilbert, 1996b; Brown, Burg & Dominick, 1998). The literature suggests that the lack of models for integrating ICT into teaching and learning (Schofield, 1995; Gilbert, 1996a; Northrup, 1997) and a lack of committed and dedicated leadership (Ehrmann, 1995; Middlehurst, 1995; Lan, 1997) contribute to the lack of effective institutional planning. In more recent times equity issues such as student access to computing facilities have surfaced as a major inhibitor (Flew, 1998; McNaught et al., 1999; Bates, 2000). There also appears to be unrealistic expectations from institutional leaders for immediate results (Gilbert, 1996a; Bates, 2000; Macchiusi & Trinidad, 2000).

Universities are adopting ICT in teaching and learning without having altered to a significant degree existing policies (McNaught, et al., 1999), or in some cases are still attempting to run two separate systems. Lack of institutional level policy regarding recognition and rewards for effectively adopting or developing ICT materials for teaching and learning is another key factor identified by many researchers, in the lack of adoption of ICTs (Rossett, 1991; Martinez & Woods, 1995; Gilbert, 1996a; Baldwin, 1998; McNaught et al., 1999; Bates, 2000).

A basic lack of uniformity in computer hardware and software systems (Brown, Burg & Dominick, 1998) is another factor noted in the literature hindering the adoption of ICT. There also appears to be the assumption that technology will always reduce operating costs and increase productivity (Bigum & Green, 1995; Gilbert & Green, 1995; Bates, 2000; Fox, 2001). Certainly, one of the major concerns on this adoption factor for higher education institutions is the perceived lack of resources and funding (Hammond et al., 1992; Baldwin, 1998). Human resources are stretched to the limit and teaching staff are not only asked to do more, but they are expected to do it differently (Gilbert, 1996a; Northrup & Little, 1996; Bates, 2000).

Factors Affecting Adoption at the Individual Level

Two of the key factors regarding the adoption of innovations concern the nature of change and the perception of the innovation itself. If individuals do not perceive there is value in changing or adopting an innovation, it will simply not occur (Fullan & Stiegelbauer, 1991; Geoghegan, 1995; Layer, 1995; Taylor, 1995; McNaught et al., 1999; Bates, 2000). As with many innovations, even when the technology has been well established, the greatest potential is rarely achieved (Lan, 1997; Candiotti &

Clarke, 1998). In a similar vein, some teachers and institutions are using technology to simply replicate their traditional practice, content and control (Pelgrum, Janssen Reinen & Plomp, 1993; Ehrmann, 1995; Tyack & Cuban, 1995; Alexander, 1995; Barrowy & Laserna, 1997; Kennewell, 1997; Gillespie, 1998; Fox, 2001).

One of the major factors contributing to the lack of adoption of any innovation, is the entrenched attitude of staff in addition to an overall reluctance to change (McNeil, 1990; Geoghegan, 1995; Kennewell, 1997; Underwood et al., 1997; Candiotti & Clarke, 1998; Gandolfo, 1998; Feenberg, 1999). For instance, some academic staff hold the view that technology has little to do with their particular discipline and that instructional methodology is as much a part of the discipline as the content (Wetzel, 1993; Gandolfo, 1998; Neal, 1998).

Di Sieno (1995) takes a slightly different view - focussing on the time and effort required to implement ICT into teaching and learning, with the argument that it provides “too much distraction and yields too little value for the investment” (p 47). Jacobsen (1998) expresses the not uncommon view that computers are still not ‘well designed, fault free, and easy to use’ and the term user - friendliness does not reflect the current technology reality.

One of the key issues that comes through consistently in the literature is that university teachers have rarely been shown how to integrate ICT into their teaching and learning. This also implies that teachers or instructors are not modeling effective use (Schofield, 1995; Gilbert, 1996a; Caverly et al., 1997; Northrup, 1997; McKenzie, 1998; Trinidad, 2001). The Milken Exchange commissioned the International Society for Technology in Education (ISTE, 1999) to survey teacher preparation institutions in order to determine the status of technology use. The 446 respondents who represented 416 institutions in the USA revealed the extent to which teachers were being exposed to technology in their course (classes, field experience and curriculum materials). The report found that in general “teacher training programs do not provide future teachers with the kinds of experiences necessary to prepare them to use technology effectively in the classroom” (ISTE, 1999, p i). More specifically and significantly, they found that most academic staff do not model effective use of ICT skills in teaching.

Other identified factors affecting adoption at a more fundamental level pointed to the lack of: knowledge and skills about ICT for teaching and learning (McNaught et al., 1999); time (Hammond et al., 1992; Baldwin, 1998; Pinheiro, 1998); student acceptance of the new approaches (Pascarella & Terenzini, 1991; McInnis, James & McNaught, 1995; Alexander & McKenzie, 1998; McNaught, et al., 1999); uniform views on teaching and learning (Gandolfo, 1998; McNaught, et al., 1999; Bates, 2000).

Taylor, Lopez & Quadrelli (1996) studied academic views about flexible modes of delivery through a series of case studies at Queensland University of Technology and Griffith University. They found that there was an increasing support for flexible modes of delivery from both educational and professional perspectives. They also identified a number of issues which surfaced in this new teaching environment which they felt needed to be addressed in the future - academic work load, opportunities for academic staff to collaborate and the need to focus on the educational benefits of using ICT in teaching and learning.

Jacobsen (2000) applied Rogers' (1995) theory of the diffusion of innovations and his adopter categories to investigate the differences between those academic staff who readily adopt technology for teaching and learning and those who do not. Her sample was drawn from two large North American universities (N=76) who were surveyed about 'computer use patterns, self-rated expertise, technology adoption patterns, changes to classroom environments, incentives and barriers, and preferred methods for learning', with a further 7 staff participating in a semi-structured face to face interview. She found that over 90% of her respondents use ICT for research and professional tasks, and close to 85% claiming that they used computers in some way for their teaching tasks. She also found that:

> *What appears to be lacking for many staff respondents who have yet to adopt technology for classroom use is a compelling reason to integrate technology, and sufficient evidence about the relative advantages of doing so.*
>
> *(Jacobsen, 1998).*

Jacobsen (1998) reiterates the sentiments of others (Fullan & Stiegelbauer 1991; Geoghegan, 1995; Taylor et al., 1996; McNaught et al., 1999; Bates, 2000) in concluding that if individuals do not see the value or the benefits in changing or adopting an innovation, then it simply will not be adopted.

Fraser & Deane (1998), who had investigated the use of open learning strategies in order to develop life-long learning competencies in undergraduate science students, recognised that both peer and institutional support were critical factors in successfully implementing open learning strategies. They argued for more support (including staff development) for flexible teaching and more evaluation of effective use of flexible learning.

In an electronic discussion titled "An Online Experience", Jane Marcus (1995) provides institutions with a simple algorithm, that attempts to identify the conditions that will encourage and help staff adopt ICT in their teaching and learning [$A = f\{R,PV,C\}$]. This formula states that the (A) adoption of ICT or any innovation, is a function (f) of the available resources (R), perceived value (PV) of the innovation for the individual, and the communication (C) with others who have adopted the innovation. Further, she suggests that this formula can be used as a diagnostic tool for institutions (Marcus, 1995).

Fox (2001) conducted interviews of 75 staff across two Australian higher education institutions and developed a model designed to help educators rethink their adoption of new technology. The model consists of four elements which need to be addressed when making decisions about adopting and reviewing any new technology. The elements identified were: pedagogical opportunities, changed work practices, technology (non) neutrality and last, the unintended consequences of new technology adoption (Fox, 2001).

The first element focuses on thinking about the pedagogical opportunities provided by technology. This refers to using new technology to provide opportunities which could not be possible without the use of technology in contrast to applying technology to simply enhance or make things easier. The second element, focussing on the concept of changed work practices, refers to the potential of new technologies to change existing work practices in higher education such as, 'the way we work, how we work, who we work with and what we work on' (Fox, 2001). Fox (2000 & 2001) goes on to argue that technology itself is neutral, and that educators must attend to the technology itself and critically address the changes brought about by the application of the technology. The final element of Fox's (2001) framework refers to the idea of unintended consequences, which refers to the need to consider the effects of how the technology transforms existing practices, sometimes leaving behind unintended consequences.

The Impact of ICT on Teaching and Learning Practices

> *Technology is gradually transforming higher education and the work of the academic profession.* *(Baldwin, 1998, p 7).*

Electronic communication (E-mail) is perhaps the most widely used of the ICTs in the higher education sector. Academic teaching staff are replacing office contact hours by making themselves available through the use of email and bulletin boards. E-mail facilities enables the instructor to communicate with their students, and students are able to communicate with each other. Class lists may be established with the one message being sent to all of the students in the class – this is similar to the bulletin board where one message is posted for all to see. Listservs can also be created by instructors using E-mail. This allows discussions to occur between the participants who are part of the list. E-mail also enables instructors and students to send files electronically, hence students are able to submit various drafts and final assignments electronically.

Bates (2000) notes that the use of electronic communication for most instructors actually increases their contact with students, which although of real benefit to students, it can cause work overload for instructors (Gilbert, 1996a; Baldwin, 1998; McNaught et al., 1999). In their study, McNaught et al., (1999) noted that the chance to interact more with students was a motivating factor for academic staff in the adoption of Computer Facilitated Learning (CFL). It is important to note that E-mail can only be used by those who have access to a computer which has an active Internet facility.

Teaching staff are using the World Wide Web (WWW) in a variety of ways to complement and enhance their teaching and learning. One way is as a presentational tool in lectures. Lecture notes and other teaching resources are placed on the WWW for students to access, and linking useful web sites to these resources enables students to navigate through relevant resources. Academic staff also employ published classroom resources which are directly linked to the WWW. Computer conferencing software (for example, WebCT, Blackboard) is used to create an online environment which houses a multitude of resources – such as course outlines, listed resources, internal E-mail, bulletin boards, discussion forums, synchronous communication and so on.

Even though creating material for the WWW has become easier than in the past, Bates (2000) as well as McNaught (2000) note that it is still a time-consuming task and requires either increased technical skill and preparation time from an instructor or significant technical support. Gillespie (1998) also shares this view adding that there is little value in simply transferring lecture notes online or using presentation software. He advocates that the real learning involves assisting students to become skilled at searching and accessing information appropriate to their needs, being able to critically evaluate the information, in applying the information to solve problems, and then being able to present the results of their learning experiences. On the other hand, Jacobs (1994) acknowledges that it is a natural progression for individuals to do the same things with a new medium as they did with the old, experiencing perhaps faster or better results. He notes that individuals are only just beginning to move away from this type of thinking and behaviour.

Weigel (2000) also expresses his concern regarding the use of the WWW by many educators. He notes that most Web-based education is little more than 'porting the classroom', transferring the unsuccessful ritual of lecture to the Internet. He claims that higher education institutions are falling into the trap of 'commoditisation' – a process where products or services become standardised so much to the extent that their attributes are roughly the same. In other words, universities are providing standardised instructional units and courses which all resemble each other. Bates (2000) takes a similar stance when referring to universities who adopt only one course authoring system in order to keep the cost to a minimum. He warns that imposing a single system may not only restrict academic freedom, but may result in an undesirable uniform approach to teaching across all disciplines.

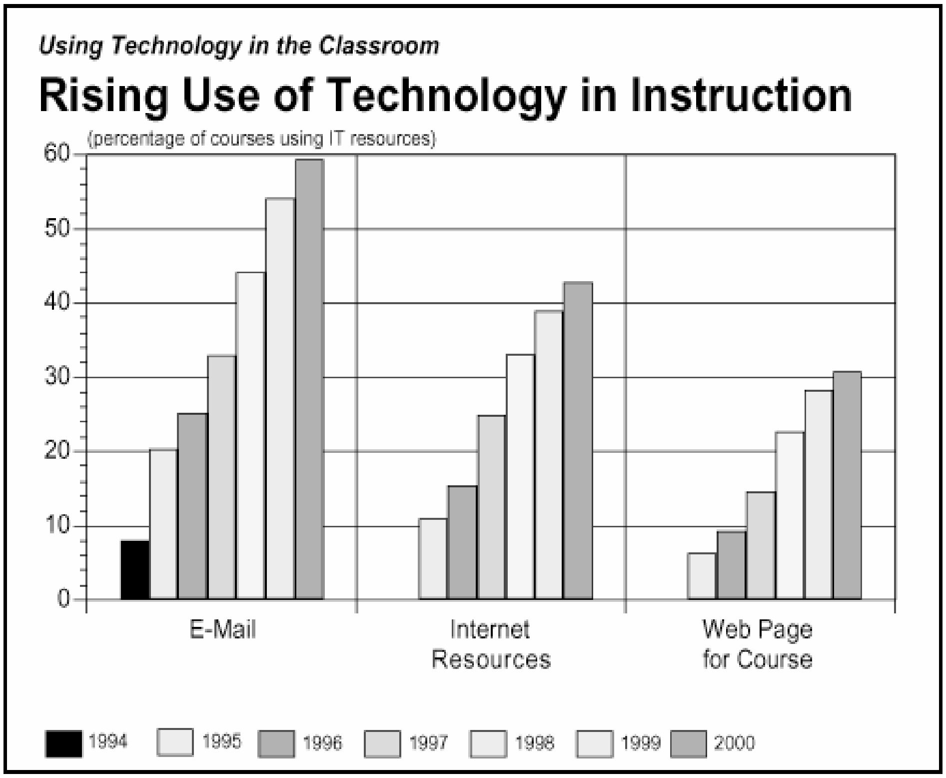
Presentation software is also being widely used to enhance classroom teaching. Compared to preparing a 'chalk and talk' lecture, the preparation of appropriate presentation software requires more time, although it may save time in comparison to the preparation of detailed overhead transparencies. Importantly from a resourcing perspective, in order to use presentation software in a teaching room, certain equipment is required: a computer/laptop and a data projector.

According to Bates (2000) a relatively smaller number of academic staff are applying multimedia software to support their classroom teaching (e.g. simulated science experiments, language laboratories, computer aided design in architecture). There has certainly been an increase in the availability of commercial software across a variety of disciplines which can be integrated into classroom teaching. Due to this increase in available software there has been much investigation into the educational worth and value of software (see Newhouse & Oliver, 1992; Shelley et al., 1999). Regardless of this increase it is still difficult to find appropriate commercial software for higher education and specifically, software that meet the needs of many academic teaching staff. This situation has lead many individual academic staff to develop their own software, which in turn requires a great deal of time and expertise.

At present, videoconferencing is usually employed by university teaching staff to provide access to specific content and human resources for students who would normally be unable to participate. In his earlier work, Bates (1995) identifies the problems associated with such videoconferencing as increased workloads for staff, that it adds overall cost to the system and as a result comes with a high marginal cost for each additional student served.

An investigation conducted in 1994 at the Queensland University of Technology (Pinheiro, 1998) to determine the existing use of ICT in teaching and learning by academic staff revealed that approximately a quarter of the staff had incorporated some measure of ICT into their teaching. Tool-based application packages such as statistics, spreadsheets and word processing were the most widely used. The investigation found that Computer Assisted Learning (CAL) in courses was used by no more than 9% of academic staff members. Electronic mail was not widespread with this group of academic staff, with the disciplines that had applied ICT the most in their teaching and learning being the sciences, business, management, commerce and engineering. More recently, the McNaught et al., (1999) study found that academic staff at Australian universities have not as yet adopted the full range of technology available to them. This study revealed that the majority of academic staff were using E-mail, Web-browsing, basic Web teaching, and software applications such as word processing, presentation software and spreadsheets.

Figure 4.1: ICT Use 1994 – 2000 in the USA.



(Green, 2000).

Figure 4.1 presents a detailed snapshot of the recent results from the Campus Computing Project (Green, 2000) depicting the increase in ICT use from 1994 – 2000, in higher education institutions in the USA.

ICT Infrastructure

In 1996, Kenneth Green identified infrastructure as a critical catalyst for the adoption of ICT in teaching and learning. Establishing the technology infrastructure is usually the first strategy most institutions adopt. As important as it is, Bates (2000) claims that this strategy must necessarily to be closely linked to other strategies in place across the university. ICT infrastructure is made up of the physical elements such as desktop computers, laptops, software, data projectors, servers, networks, telecommunication links, as well as the human support for these resources. Bates (2000) argues that the people who make the physical infrastructure work are more important than the actual physical infrastructure itself. On this very point Gilbert (1996b) warned higher education institutions to prepare for a support service crisis.

He claimed that:

> *as more staff become intrigued with instructional uses of email and presentation tools in the classroom, they begin to ask about more advanced, deeper uses of IT to improve teaching and learning.. (Gilbert, 1996b, p 19).*

Similar sentiments are also echoed by Rogers (1996), Geoghegan (1996) and Green (1998). The Campus Trends report (El-Khawas & Knopp, 1996) identified that most of the institutions in the USA in their survey (N=416) were finding it difficult to keep up with the pace of change. In fact, 36% gave their institutions only 'fair' or 'poor' ratings on their ability to keep up with changes in technology. Green (2000, online) aptly summarises the results of the latest Campus Computing Project, "this year's survey again confirms that the key IT challenges in higher education involve people, not products". Providing adequate user support has been the second most important issue confronting campus officials in the USA over the last five years (Green, 1996, 1997, 1998, 1999, & 2000).

Bates (2000) noted that throughout North American, Australia and the United Kingdom there appears to be an increasing frustration from academic staff at the lack of support they receive at the institutional level. He sees that training academic staff to use the technology is not the answer in this case, as this simply exacerbates the situation by placing more demands on the support structure of the institution, which in many cases clearly cannot be met. His solution is to provide 'comprehensive and systematic technical and professional support' for academic staff. In their key Australian study, McNaught et al., (1999) found the educational design, technical and media production support services that universities currently have are under real strain. Technical and instructional design support is the "straw that may break the back of institutions that really want to use technology for teaching in a major way" (Bates, 2000, p 106).

According to McNaught et al., (1999) another major issue for Australian higher education institutions is the training of ICT staff in order to maintain the complex systems that are currently being developed. They argue that universities need to ensure that opportunities are made for training ICT staff, as well as academic and administrative staff to be able to use these systems. In their study they found that training needs are escalating and signaled that this may well become a critical issue in the near future. Outsourcing in this area is already occurring in the majority of institutions. Attracting and then retaining skilled staff is also of concern, as education sectors compete with commercial organisations (McNaught et al., 1999; Green, 1999 & 2000), where they can earn twice as much as their campus counterparts (Patterson, 2000).

Gilbert (1996b) advocates a more diverse combination of support services including professional development, technical, library, instructional designers and others. On the same point, Bates (2000) advocates four levels of human support required to fully exploit the use of ICT: technology infrastructure support staff (technical support – install, operate, update and maintain networks and equipment); educational technology support staff (staff who support the development and application of educational materials and programs using technology); instructional design staff (staff who provide educational services and expertise, such as instructional design, professional development, project management, to support the use of technology for teaching); and subject experts (those who create content, such as academic staff). It follows that instructional design staff and subject experts are not critical elements of the technology infrastructure, however the evidence is that they are essential for the development and implementation of high-quality technology-based teaching.

In 1996, Acadia University in the USA began an academic initiative to integrate the use of notebook computers into the University's undergraduate curriculum. Along with this initiative was the development of a centralised location to support and develop ways to implement ICT in teaching and learning. The Acadia Institute for Teaching and Learning (AITT) was the primary site for research development and technical support. AITT provided general workshop courses as well as one-on-one meetings, resulting in over 80% of academic staff using Web-based programmes (MacDougall, 1998). The advantages noted with such an approach were varied, the main one being having the one central organisation, enabling less duplication of resources. The AITT was a place where all disciplines could meet and share, which in turn generated ideas and enthusiasm throughout the campus. This also meant that large multidisciplinary projects could be undertaken.

The Queensland University of Technology established a group called Webworkers. This was part of the Teaching, Reflection and Collaboration (TRAC) project, an initiative of the Academic Staff Development Unit. Members of the TRAC project were volunteer teaching staff across all schools and department who wished to improve and reflect on their teaching practices. These members formed a number of collaborative sub groups who explored particular skills and strategies and in turn shared these with others in the university. Webworkers is one such group with 53 members representing 27 different schools. Their ability ranges from those interested in Web design to those who have designed entire courses. The group has representatives from key service areas such as the library, Open Learning, Computer Based Education, Computing Services and Audio Visual Services. Of the strategies employed, face-to-face sessions had proven to be the most productive. Cheryl Gilbert (1996) noted that this initiative and other initiatives by the University had provided much support for those with a genuine interest in ICT for teaching and learning, yet little effort had been made to help those less comfortable with new technologies. She adds that the support services at the University were often stretched thus forcing them to focus on technology users only.

Organisational Structures for the use of ICT

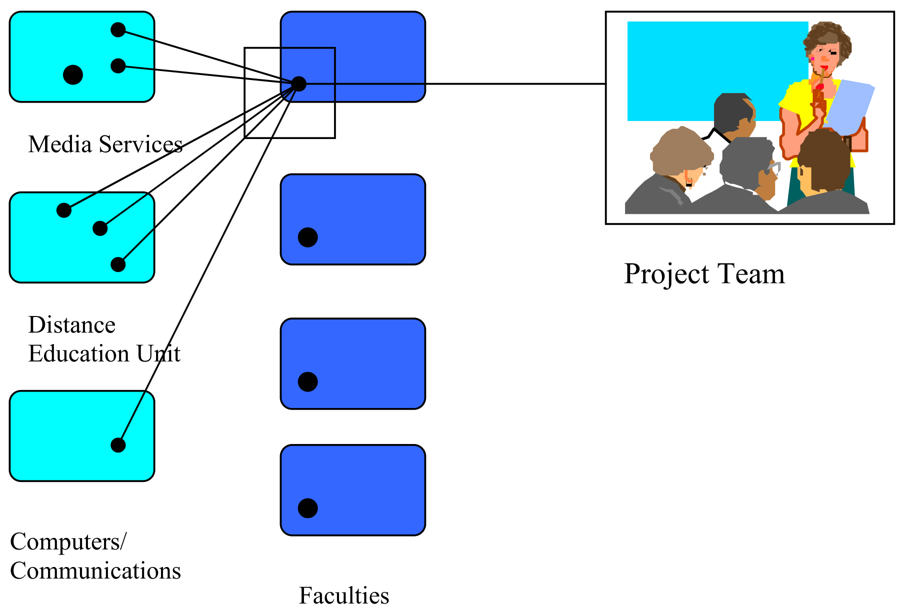
> *When it comes to organisational structures, the challenge is to develop a system that encourages teaching units to be innovative and able to respond quickly to changes in subject matter, student needs, and technology.*
>
> *(Bates, 2000, p 181).*

Bates (2000) notes that it is not uncommon for senior management to 'tinker' with organisational restructuring in order to implement ICT initiatives prior to establishing other strategies, at the same time acknowledging that some fundamental organisational changes are required if new approaches and methods are to be adopted as core activities of the institution. Ramsden (1998) adds that the significance of these structures has only started to be realised.

There is strong anecdotal evidence that a central technology support unit provides a cost effective manner for housing specialist staff with a variety of expertise required for the development and implementation of ICT for teaching and learning by academic staff within a university. Many institutions (California State University – Center for Distributed Learning; University of Alberta – Academic Technologies for Learning; Griffith University – Griffith Flexible Learning Services; Curtin University of Technology – Centre for Educational Advancement) around the world have combined departments (i.e. distance education, professional development, multimedia production, instructional design) to provide such expertise. In Australia, the creation of academic development units consisting of staff with expertise in educational design, curriculum design and teaching strategies are usually responsible or work in conjunction, to support the work relating to developing and using ICT materials (McNaught et al., 1999).

Given that centralised services are more cost effective for most institutions of higher education, the current evidence is that too often these central services have had little impact on the core teaching activities of the institution (Bates, 2000). Bates (2000) admits that the most common model of support structures in higher education is still the use of multiple centers scattered around the institution. He refers to this model as a 'recipe for chaos' and advocates a more coordinated decentralised model. Figure 4.3 outlines a coordinated decentralised model of multimedia design and development suggested by Bates (2000).

Figure 4.2: A Coordinated Decentralised Model



(Bates, 2000, p 186)

This model is based on a large professional center, which offers a range of university services combined with support for people at the local level. ICT would be an important part of the center, however the focus would be on supporting teaching and learning. The funding for such a unit would comprise:

> *approximately 2 percent of the overall teaching budget. The target funding for local or departmental support for instructors would be approximately 3 percent of the overall teaching budget, giving a total of 5 percent of the teaching budget devoted to academic technology support* *(Bates, 2000, p187).*

According to the model advocated by Bates (2000), a small flexible learning unit can be located within each Faculty or large department. Each unit would consist of a technical support person/persons (1:25 academic staff using technology for teaching) and a generalist educational technologist (1:50 academic staff using technology). The technical support personnel would be responsible for helping academic staff to use the technology as well as a variety of other tasks. These could include the technical construction and maintenance of Web sites, the management of software and the servers utilised for teaching and learning, and the general provision of support in the classroom or computer labs. The general educational technologists, who Bates (2000) suggests could be graduates of the department in which they work and who have received some training in instructional design and educational technology, would be responsible for helping "to identify technology-based projects in the department or faculty, provide immediate assistance for small-scale applications, and find appropriate support from the center for larger, more ambitious projects" (Bates, 2000, p 187).

Strategic Planning

> *Campuses are doing more with technology, and they are doing it better than in the past. But the real challenge at most institutions is to improve resources and services given both rising expectations and exploding demand.*
>
> *(Green, 1998, p 1)*

It is most important that effective strategic planning occurs in light of the support imbalance which higher education institutions are currently undergoing, and are likely to continue to undergo, in order to integrate ICT into the teaching and learning culture of institutions.

Rapid advances in the technology and the need to continually upgrade or replace equipment which makes up the physical infrastructure, has put paid to the notion that the physical infrastructure is a once-only investment. Physical infrastructure is usually funded from capital budgets, while recurrent funds are used for the human infrastructure. Unlike physical infrastructure, this means that the cost of support staff directly competes with funds for research and teaching. Bates (2000) notes that consequently, the human infrastructure component is often under-funded and that this is the most common complaint by those in higher education using ICT in their teaching and learning. For every dollar spent on infrastructure somewhere in the order of $10 will need to be spent on support applications. Strategic plans need to reflect realistic needs, such as one technical support person located close to the department to 20 – 30 full time academic staff using technology and at least one instructional designer to every 30 – 50 academic staff. Ramsden (1998) notes that higher education institutions have been more effective in establishing financial and resource management processes to meet environmental changes, than establishing effective processes for the management of people.

Often the first and sometimes the only strategy adopted by universities is to establish a technology infrastructure. The assumption that the latest and greatest advanced technologies will automatically result in innovative teaching and learning applications is still prevalent amongst some higher education institutions. Clearly, the technology infrastructure needs to be guided by the administration, financial, and teaching needs of the university, which in turn is reflected in the technology plan that should be integrated within the overall vision and strategic direction of the institution (Green, 1998b; Bates, 2000). Bates (2000) and McNaught et al., (1999) argue that the teaching and learning requirements of an institution will demand an increasing priority in an institution's technology planning.

In his research, Green (1998) noted that only half of the higher education institutions in the United States had a strategic plan for technology and most of these dealt with physical infrastructure (networks and hardware) at the institutional level. He argues that as important as these plans are, equally important are plans which identify how ICTs are to be used in teaching and learning. Green (2000) found that only 40% of higher education institutions had such a plan.

> *Any department seriously considering the use of technology for teaching and learning really needs to go through some form of planning exercise before it makes any major commitments, especially if it is recognised that technology is not just an add-on but can bring about fundamental changes in teaching. Just drifting into technology for teaching can be a dangerously expensive and ineffective policy.* *(Bates, 2000, p 48)*

In a similar pattern to the American results, McNaught et al., (1999) found in Australia that most academic development units have an existing or draft Teaching and Learning Plan, but it is less frequently aligned with an Information Technology Plan.

Gilbert (1996a), the founder of the Teaching, Learning and Technology Roundtable (TLTR), suggests that establishing a forum, like the TLTR is one way of supporting and promoting a collaborative approach to long lasting, widespread and significant instructional change (Ehrmann, 1995; Gandolfo, 1998). Ewell (1997) adds that this is essential if technology is to be transformative. Interestingly, at a secondary school level, research evidence has seriously questioned the effectiveness of school development planning in influencing classroom level change and improvement in schools (MacGilchrist, 1995; Dellar, 1996).

Hirschhorn & May (2000) explore the notion of a 'campaign' approach to organisational change. They note that this approach is particularly suitable for universities where 'authority is diffuse and windows for change are limited' (p 31). They view the campaign approach as being more flexible and open than the traditional strategic planning model which is usually found in most universities. The process involves various stages: identifying the needs of the institution; developing a strategic theme (based on what you have learnt and where you want to go); involving all of the members of the institution; building the infrastructure.

Costs of Teaching with Technology

Mingle (1995) claims that it is not yet clear whether technology is part of the cost problem in higher education or part of the solution. More colleges and universities are imposing mandatory student IT fees to help cover their rising ICT costs. For example, in 1995 – 28.3% of institutions in the USA imposed such costs, 1997 – 38.5%, while 45.8% did so in 1998 (Green, 1998).

Determining costs for distance education units is relatively simple because each cost is easily identifiable as a separate activity, whereas attempting to establish the costs involved in using technology for regular classroom teaching is difficult as it becomes immersed with other regular costs. Drawing on his experience Bates (2000) has been able to make the following conclusions about the use of technology to supplement regular classroom teaching:

- Costs will inevitably increase if the use of technology for teaching does not contribute to savings in other activities.
- It has proven difficult to demonstrate the relationship between the use of technology to supplement teaching and increased learning performance.

- The largest cost is the time academic staff spend preparing material – such as CD-ROMs, PowerPoint presentations, and Web sites.
- Academic staff require more technical support which in turn costs institutions more money (however in the long run this may be more productive and cost-effective).
- More research and evaluation of using technology to supplement regular classroom teaching is required.

CHAPTER FIVE

Developing a Professional Learning Community

Introduction

This chapter addresses the concept of a professional learning community, where technology can aid in such a development and conversely, where a professional learning community can aid in managing technological change. A professional learning community is a community of people who work collaboratively and collectively towards a shared vision. The leadership of such a community is distributed and learning is seen as the key, while failure provides an opportunity for learning. An important ingredient is that members choose to belong to such a community. This chapter examines the importance of effective leadership as well as those issues involved in changing the culture in higher education institutions. As identified earlier this chapter concludes with an overview of the four literature chapters.

Developing A Professional Learning Community

Bates (2000) in his book, *Managing Technological Change*, and in similar vein Dolence & Norris (1995) and Clark (1998), address the inappropriateness and unsuitability of the current structure of higher education for the effective use of ICT in teaching and learning. Bates (2000) identifies strategies for higher education organisations that are moving to ICT based teaching and learning. The strategies are a result of the experiences of 'many people' who have faced and are facing similar issues in a variety of higher education institutions in the United States, Canada and Australia. Bates concludes that the most difficult challenge for conventional campus based institutions is to "achieve an appropriate balance between face to face and technology based teaching and learning for the different kinds of students it will be serving" (Bates, 2000, p 213).

A number of years earlier, Gilbert (1996a) expressed a similar concern that the single most important question for structuring higher education in the next decade was to determine "which combinations of face-to-face meeting, independent work and telecommunications are best – and for what purposes" (p 14). At the same time Seely, Brown & Duguid (1996) noted that it would be wiser for institutions to structure courses "so each student can divide his or her career between time better spent on campus or in communities and time better spent online. All learners need to experience both" (p12). Green (2000) observes that the future of technology in higher education is "some kind of hybrid learning experience in which technology supplements, not supplants, both the content and the discourse that have been part of the traditional experience of going to college".

It appears that higher education needs to address these issues very thoughtfully and carefully and in turn provide the appropriate support structures to meet these requirements. This chapter also attempts to address issues relating to the support structures that could meet these requirements. To begin with, the literature reveals that effective leadership appears to be one such support structure.

Effective Leadership

The evidence is that strong leadership is essential in developing a professional learning community that will be able to sustain effective technological change.

> *First and foremost, academic leadership must provide the means, assistance and resources which enable academic and support staff to perform well. Leadership is about producing excellence. Second, it must focus on change and innovation, and the harnessing of traditional academic values and strengths to meet new and sometimes strange requirements. Leadership is about change.* *(Ramsden, 1998, p 8).*

Change creates the need for leadership and leaders are, or are perceived to be, initiators and drivers of change (Middlehurst, 1995). It can be argued that strong and effective leadership is needed to cope both with the changes and the choices facing universities and that it is needed at many levels of an institution (Middlehurst 1995). Ramsden (1998) and others (Senge, 1990; Bates, 2000) believe that leadership needs to be dispersed, especially in a learning organisation and that effective leadership is crucial in implementing major changes (Hargreaves & Dawe 1989; Fullan, 1992a; Plomp et al., 1995).

Ramsden (1998) in his book, *Leadership in Higher Education,* takes the view that academic leaders may be the key in helping academic staff deal with such changing times as identified in Chapter Two. He sees that leadership has been underestimated in higher education and that it is the most cost effective strategy for organisations trying to cope through difficult times. He sees that it is their task to energise, revitalise and help academic staff learn through changing times with willingness and passion. He also takes the view that it is this relationship with people - how they relate to each other, which deals with good leadership. Ramsden (1998) believes the skills of good leadership and good university teaching mirror each other:

> *Deep in the heart of effective teaching is an understanding of how students learn; deep at the heart of effective academic leadership is an understanding of how academics work.* *(Ramsden, 1998, p13).*

Cooke (1996) also adopts such a view in her reflections about managing change within her own institution, where she came to realise that the "skills and techniques of teaching and managing students and external clients are just as appropriate for managing staff" (p 146).

The underlying principles of academic leadership according to Ramsden (1998) are varied and involve such dimensions as: a dynamic process; an outcomes-focused agenda, a multi-level operation; the leader's learning; transformation. Burns (1978) had developed earlier the idea of 'transformational leadership' with moralistic overtones where leaders as well as followers espoused higher levels of motivation and virtue. He wanted to distinguish between the more acceptable stance of leadership as an exchange based on rewards and the self interest of followers. Transformational leadership in an educational setting as studied by Leithwood (1992) identifies some of the fundamental goals of such leader – to help people develop and foster a collaborative and professional culture, to encourage and stimulate staff development, and to promote the effective use of collective problem-solving.

Cavanagh (1997), who researched factors affecting high school culture, identified transformational leadership as focusing upon the maintenance and growth of the school culture. He found that transformational leaders support individual teachers and also ensure that organisational pressures do not conflict with the values and social processes which provide the school community with cohesion. Fullan (1992b) proposed that there was a need for school principals to develop collaborative school cultures which are characterised by co-operation, so that staff and not just the principal control the development and implementation of innovations. Values that are shared unite the school community, create the community's vision and provide everyone with a common sense of purpose (Fullan 1992a; Sergiovanni, 1992).

In his seminal book, Bates (2000) noted that strong leadership was a critical factor he had identified in all of the organisations who were successfully employing technology in teaching and learning.

> *Unfortunately, the widespread use of new technologies in an organisation does constitute a major cultural change. Furthermore, for such change to be successful, leadership of the highest quality is required.*
> *(Bates, 2000, p 42)*

Gandolfo (1998) also reiterates the point that leadership is crucial when developing strategies to adopt ICT. A major function of such leadership is to obtain a good balance of pressure and support by placing pressure on staff to adopt ICT for teaching and learning and at the same time provide support to help them adopt (Fullan & Stiegelbauer, 1991; Strudler & Wetzel, 1999).

In the previous chapter it was noted that McNaught et al., (1999) believed that it was acceptable that universities were now viewed as organisations with clients and a management system. Ramsden (1998) claims that it is a fallacy that universities cannot be managed like a business. He suggests that the sheer volume of students and academic staff in higher education has challenged our perception of the academic leader, from that of a head of department as an amateur administrator, managing by general agreement, to one of a trained professional leader. Ramsden (1998) argues that academic staff find it difficult to conceive universities as organisations with necessary management structures because they cannot possibly cope with the thought of being managed. Academic staff need to be made aware that this change has been an essential one in order to maintain and develop larger institutions in a different climate (Ramsden, 1998). In fact, many have recognised a more entrepreneurial approach to management practices in higher education institutions (McNay, 1995; Clark, 1998; Bates, 2000; Fox, 2000). As crucial as effective leadership is in managing educational change, there seems to be very little serious attention given to the training and development of leadership skills in higher education (Middlehurst, 1995; Tan, 1995; Ramsden, 1998).

Visions are about change, representing a picture of the future (Senge, 1990). According to Ramsden (1998) visions are at the heart of leadership. People need both a vision that they believe is worth working toward and the conviction that enough leadership, commitment and effort will enable the vision to be achieved (Gilbert, 1996a). Bates (2000) believes that developing a vision for the use of ICT in teaching and learning is the most important of all strategies. He also believes that the process of visioning should be completed at different levels (institutional, staff and departmental), however he sees that the best place to start is at the departmental level where the actual teaching occurs. Shared visions or goals are usually uncommon in higher education institutions. What usually happens is that a vision is created by a small group and then 'sold' to staff. This process does not evoke any real level of commitment from academic staff (Ramsden, 1998). Along with the importance of effective leadership, the literature appears to indicate that there needs to be a change in the culture if an institution is to be identified as a truly professional learning community and hence adopt the use of ICT in teaching and learning.

Changing the Culture

> *Because of the central role that staff members play in the work of universities and colleges, any change, especially in core activities such as teaching and research, is completely dependent on their support. Presidents may dream visions, and vice presidents may design plans, and deans and department heads may try to implement them, but without the support of staff members nothing will change.*
>
> *(Bates, 2000, p 95).*

Understanding the process of change is a good precursor to making appropriate decisions about how to support technology innovations. There are many lessons one can learn from the work on the dimensions of change outlined in Chapter Three, that can assist higher education institutions encourage and support their academic staff through the process of adopting and implementing ICT in teaching and learning. One of the most important lessons is to address the human dimension of change (Scho, 1971; Marris, 1975; Farmer, 1990; Gandolfo, 1998). Establishing a shared meaning for individuals within a social system is important, while each individual needs to perceive that there are benefits and value in actually changing (Fullan & Stiegelbauer, 1991; Geoghegan, 1995; Layer, 1995; Taylor, 1995; McNaught et al., 1999; Bates, 2000). It is important for institutions to remember that at the heart of any educational change are the staff (Kashner, 1990; Fullan, 1993; Hargreaves, 1994; King, 1995; Trowler, 1998). Clark (1998) referred to this special place where academic staff reside (the department, school) as the 'heartland'.

Institutions will have to undergo a dramatic culture shift if extensive use of ICT is to be adopted by staff (Resmer et al., 1995). The culture of the university and more importantly the culture of the academic staff need to be considered when devising strategies for implementing the use of ICT for teaching and learning (Tallantyre, 1995). The environment profoundly affects academic's 'work processes, morale and productivity' (Ramsden, 1998, p199). McNaught et al., (1999) found that culture emerged as a major theme in their study. This included issues of vision and leadership at an institutional level, attitudes toward CFL and innovation, level of risk taking, allocation of resources, recognition and reward and staff motivation.

According to Bates (2000) the various positions taken up along the change process involve a number of basic human emotions. These include fear, anger, resistance, grieving for the old, cautious adoption of innovation and finally a total belief in the change. It is important that strategies be developed to move staff sensitively through this process. Fear is perhaps the biggest obstacle to change and it leads directly to anger targeted at changes that feed the fear. There are a variety of strategies that can alleviate the fear. These include the: informing of staff that technological change will not cause redundancies and help them understand the benefits; rewarding of innovative use of ICT through promotion criteria; provision of a balanced approach of ICT use; encouragement of a project management model which employs a sharing of the work load (Bates, 2000).

As identified earlier, Fisher (1994) notes that stress occurs when personal control of a situation or action is low. She further identifies that an individual's perceived control is a major factor in responding to stressful situations. A person who perceives that they can take effective action is less likely to experience stress than some one who does not. In other words, daily problems, such as the Internet being very slow, the printer not working, may become stressful if there is a perception that the person has no way of controlling them.

As new technologies are introduced causing new working practices, conditions and responsibilities, teaching staff can experience an increase in stress (Simpson, 1998; Fox, 2001). Clearly, organisations need to put in place strategies which counterbalance the stressful situations that the changing environment brings. Changing the culture in higher education specifically involves examining the research and teaching nexus, the need to develop a team based approach and finally the notion of developing professionals and professional development. These will be examined in the following sections.

The Research and Teaching Nexus

As demonstrated earlier, ICT has indeed made an impact on teaching and learning, however at a much slower pace and intensity compared to the effect ICT has had on the research practice of academic staff. Saltrick (1996) states that:

> *College staff make up one of the most plugged-in professions in their use of technology for research – and one of the most retrograde in their use of technology for teaching. (Saltrick, 1996, p 59).*

The reason for such diversity in practice she argues, is that the capacity for information sharing is enhanced by ICT – a process which is a natural part of research and scholarship, whereas the adoption of ICT for teaching and learning requires major alterations to usual teaching patterns and practices. Lewallen (1998) also found that 100% of the staff surveyed in his study used ICT at home or in their office (E-mail, word-processing and the Internet) but less than one third of them integrated ICT in their teaching, or required their students to use it in their work sessions or assignments.

Historically, in Australian universities the predominant, and in some cases the only real criterion for appointment, promotion or tenure is the recognition of research through grants and publications (Ramsden, 1998; McNaught et al., 1999; Bates, 2000). One of the consequences of this situation has been that academic staff have tended to concentrate on research projects consequently paying little attention to developing technology-based teaching approaches. Boyer (1990) found that well over half of his respondents from research universities in the USA thought that pressure to do research reduced the quality of teaching at their university. An important issue as identified by Bates (2000) is that in research institutions where appointments are made on the basis of research interests and record, there is little exposure to any form of training for teaching. He claims that the industrial model of apprenticeship tends to be followed where new academic staff adopt the teaching approaches of their senior colleagues, who more than likely did not receive any training in teaching methods. Academic staff development offices do provide some academic staff with basic training however this is usually very brief, especially in comparison to those who become qualified school teachers.

McInnis & James (1995) in their study of Australian first year university students found that a high proportion of the national sample disapproved of the quality of some of the key elements of university teaching. Some of these concerns included the inability of academic staff to make subjects interesting, the lack of clear explanations and instructions and the lack of quality feedback. They also found that less than a quarter of the students believed that their lecturers were interested in their progress.

Tobin's (1996) title for her paper, *Couldn't Teach A Dog To Sit*, refers to her experience as a United Kingdom university student. She comments that her university teachers had IQ's that could possibly match Einstein's and had written 'libraries of books', however they just could not teach. Even after countless negative evaluations she always found that the academic staff member was still there the following semester. She also noted that it appeared to be a nationwide problem and not specific to her experience.

Other studies have addressed the level of interest by academic staff in teaching and research, where they found that research was still perceived as more interesting, possessing higher status and more rewarded than teaching. Specifically, there has been a steady increase over the past 20 years in the proportion of staff who say that their main interest is in research, not in teaching (Halsey, 1992; Ramsden et al., 1995). Fisher (1994) also found that when asked, academic staff indicated that they would prefer to spend time in research activity rather than teaching. McNaught et al., (1999) also noted that some staff were not interested or excited about adopting or even supporting ICT as they viewed such behaviour as basically interfering with their research time. On the other hand, in a United States national survey (UCLA Higher Education Research Institute, 1996) of academic staff in higher education, 99% of them considered being a good teacher was essential or very important. Coye (1997) claims that academic staff are interested in teaching, however it is the reward system which is 'skewed' toward research and publishing.

McNaught et al., (1999) noted that even though 'on paper' most universities in their study linked teaching performance with promotion, academic staff still believed that research performance counted more highly than teaching performance. The staff who were interviewed found that there was a conflict between time spent on research which was rewarded and being "expected to spend a great deal of time in learning to use technology in teaching" (McNaught, et al., 1999, p 108). Significantly, their study found that one of the major problems was the lack of recognised national benchmarks for good teaching.

A mail survey was conducted of Curtin University of Technology academic staff (N-310, return rate of 30%) to investigate how academic staff valued teaching and learning and how they perceived it was valued and enhanced across the university (Shortland-Jones & Baker, 2001). A similar study was conducted in 1993, with Curtin University staff, and in order to enable a comparison of the data, the items in the recent study paralleled those identified in the 1993 study. One of the main findings was that the academic staff at Curtin University valued highly both teaching and research, however compared to the 1993 data, there has been a significant rise in the value staff place on research. Shortland-Jones and Baker (2001) found that the staff at Curtin University continue to believe that the 'current institutional values are heavily weighted toward research to the detriment of teaching' (p 1), a similar finding to that of McNaught et al., (1999). There has also been a significant rise in how the staff perceive the University now values teaching, in comparison to the 1993 study (Baker, 1993). In 1993, 70% of the staff identified that 'teaching excellence was not given enough recognition in the promotional process', while in 2001 the response was 58%.

The American Council on Education Issue of Campus Trends (El-Khawas & Knopp, 1996) reported on the results of their annual survey which included respondents from senior administrators representing 403 colleges and universities in the USA. The survey aimed to identify the changes taking place in the academic and administration practices of American higher education institutions. One of the trends identified in the report was that good teaching was viewed as being more important in higher education than it was ten years ago. Half of the institutions in 1996 noted that their most significant program change in the last decade was the increased attention to teaching and learning. More specifically, 83% of the institutions provided awards each year for outstanding teaching, 76% regularly evaluated the performance of their tenured staff and nearly three in ten institutions gave greater importance to good teaching through tenure or promotion criteria. Murdoch University in Western Australia has initiated the strategy of providing funding for academic staff based on their teaching performance.

According to Baker (1993), who conducted the previously noted study at Curtin University of Technology, the lack of reward and recognition, especially for teaching, has been a key factor in academic staff feeling alienated from their universities. The *Recognising and Rewarding Good Teaching in Australian Higher Education* project conducted by Ramsden & Martin (1996) found that good teaching in higher education is often unrecognised, even though universities regularly state otherwise. Academic staff have responded that reward strategies implemented by the university were only meaningful when they were embedded in the existing organisational culture that provided genuine rewards (usually promotion). Ramsden and Martin (1996) also found that those academic staff who were dissatisfied with the existing promotion system were more likely to believe that more effective leadership would improve the quality of teaching. In other words, those in leadership positions were not necessarily recognising or rewarding good teaching. Other studies (Halsey, 1992; Gibbs, 1995) found that academic morale was closely related to inadequate reward and recognition of good teaching.

Batson & Bass (1996) noted that it is easier to reward research over teaching because it involves measuring and evaluating a 'product' as opposed to a 'process'. To address this imbalance between research and teaching, the Dearing Report on Higher Education (1997) in Britain recommended the formation of a national Institute for Teaching and Learning in Higher Education which would act as the professional body for teachers in higher education. Academic staff in universities are required to demonstrate teaching proficiency in order to become a member of the Institute.

Since fewer and fewer academic staff are being rewarded by promotion and increased earnings, Ramsden (1998) suggests that institutions find other ways of rewarding staff. For instance, students respond to grades, and academic staff to reputation (i.e. recognition of peers). According to Gilbert (1996b), Green (1998b), Gandolfo (1998) and Bates (2000) there needs to be some major changes in the way academic staff are trained and rewarded if ICT is to be used for teaching and learning. "There is no point in pouring millions of dollars into infrastructure and computers and multimedia unless the staff reward system is changed" (Bates, 2000, p121).

Even though institutions may wish to see more and better use of ICT in teaching and learning, Green (1998a) found that only one-eighth (12.3%) had formal policies recognising or rewarding the use of ICT, through routine staff review and promotion. Green (1998a) and Tallantyre (1995) suggested that recognition and rewards are essential strategies and yet often ignored by institutions. Green goes on to say:

> *The vast majority of institutions are sending a clear if somewhat punitive message to staff: do more with technology, but learn the skills on your own time and do it in addition to your other professorial responsibilities.*
> *(Green, 1996a, p 2).*

Some departments of higher education institutions (University of British Columbia, Curtin University of Technology) pay academic staff extra remunerations for developing online units. McNaught et al., (1999) noted that recognition and rewards were a major issue for academic staff at Australian universities. They found that those who were developing CFL materials "craved recognition for their extra efforts" (McNaught et al., 1999). Baldwin (1998) notes that staff will remain reluctant to adopt ICT, if sensitive policies are not in place promoting the use of ICT.

One of the main problems facing academic staff in higher education is that developing technology-based teaching is viewed by many as extra work on top of their already busy teaching and research workload (McNaught et al., 1999). Bates (2000) strongly advocates that these tasks should be factored into the workload, indicating that it should replace other tasks. Fisher (1994), based on her research on academic staff in higher education and stress management, suggests that higher education institutions need to enable staff to select their own particular balance of teaching and research, allowing them to operate within their own perceived specialty. Institutions would then be able to employ individuals to fill in any void enabling the department to cope with change without excess social strain.

Baldwin (1998) also questions the value of every academic staff member engaging in teaching, research and service, with institutional policies needing to reflect this concept. Boyer (1990), even though much earlier, expressed a similar sentiment. He noted that it was no longer viable to expect all academic staff to perform exactly the same roles through out their academic life. In essence only a small proportion of academic staff produce most of the research work (Halsey, 1992; Ramsden, 1998). The academic staff involved in the McNaught et al., (1999) study noted that the recognition of teaching on an equal basis as research was a factor which would motivate them to adopt ICT in teaching and learning.

Developing a Team-Based Approach

Providing individual academic staff with small grants has been the most common approach to encourage the use of ICT. These funds are usually used to employ part time help (graduate students) and to purchase equipment. Bates (2000) refers to this approach as the ‘Lone Ranger and Tonto’ approach. The ‘Tonto’ analogy is usually the part-time help who provides the technical help and advice required by the academic staff (Lone Ranger).

The advantages of such a model are that: it provides the opportunity for academic staff to begin using ICT perhaps for the first time as well as improve their skills through practice and experimentation; it creates a greater awareness of the potential of ICT in a particular discipline which could lead to innovative uses; enables the “Tonto’s” of this world to develop and refine their skills; allows individual staff and institutions to avoid having to make long term commitments to the use of ICT (Bates, 2000). Further advantages of this strategy are solely dependent on the collegiality or mentoring system of the institution where the expertise is shared and disseminated to others within the department/school (Baker, 2001).

The disadvantages of adopting the ‘Lone Ranger and Tonto’ funding approach are that there is usually little thought or expertise applied in the design and production of the materials developed, that the materials compare relatively poorly with commercial products, that academic staff end up spending a great deal of time and effort completing the technical work, and that it is a process which would be far more effective if completed by a professional (Ramsden, 1998; McNaught et al., 1999; Bates 2000).

Up until now in Australia, single projects have certainly been the most prominent way of encouraging the use of ICT in teaching and learning. Hayden & Speedy (1995) evaluated the 1993 projects funded by the Committee for the Advancement of University Teaching (CAUT) and noted that few projects described their evaluation techniques and actual measurement of outcomes. Similarly, the following year Alexander, McKenzie & Geissinger (1998) reviewed 104 of the 173 information and communication technology CAUT projects recommending that in the future, ICT projects needed to be developed in a more scholarly and professional manner.

Although the so called "Lone Ranger Projects" appear worthwhile in that they stimulate interest and provide staff development in the use of ICT in teaching and learning, the evidence is that these projects have had very little impact on the regular teaching of the university. A similar observation was made by Smith (1991) in reviewing Canadian universities. He noted that innovation occurred mainly on the periphery, in areas such as continuing studies which was usually funded from outside of the university's overall operating fund. This usually meant that there was little impact of these innovations on the core work of the institution. Tallantyre (1995), in attempting to introduce change in her institution, identified that the problem with single project funding was that the resources and time-scale were often insufficient to do more than introduce superficial change. McNaught et al., (1999) also share a similar view and state that in their view the one-off project model is no longer adequate. Daniel (1997) notes that a laissez faire approach (letting individual staff members or departments do their own thing) is likely to increase costs and cause excessive differentiation for students.

The project management approach, initially adopted by many business organisations and now filtering through to the education sector, usually involves a team of individuals each contributing different skills where the process is managed by a leader or project manager. This management team approach is one way to help guarantee that the resources are used efficiently and that individual team members contribute the necessary skills at the appropriate time. McNaught et al., (1999) found that there was a trend away from one-off projects in Australian universities to collaborative, multi-disciplinary teams within the institutions. Certainly there is evidence that better teaching and research is nurtured in cooperative educational environments that adopt processes that have a high degree of colleague communication and support (Bland & Ruffin, 1992; Kouzes & Posner, 1995; Wright & O'Neil, 1995; Reynolds et al., 1996; Ramsden, 1998).

In his book, *Leadership in Higher Education*, Ramsden (1998) provides a chart which illustrates some of the differences between the three paradigms which represent academic departments - the traditional, the managerial and the team approach. Table 5.1 reflects the organisational paradigms for academic departments in higher education according to Ramsden (1998).

Table 5.1: Organisational Paradigms for Academic Departments

Traditional	***Managerial***	***A Team***
Conservative and inflexible	Bureaucratic and rule following	Flexible and experimental
Non-interventionist leadership; management by exception	Personal leadership; authority resides in rank; compliance expected	Leader as creative coordinator, varying leadership roles determined by congruence of problem and expertise
Decision making by debate and individual power (academic freedom)	Decision making by rule application or imposition (control over academics predominant)	Decision making by compromise and appeal to common needs, including fairness and equity (freedom and control in creative tension)
Discussion	Requirement	Dialogue and discussion
Rhetoric of respect for all points of view	Emphasis on one right way	Emphasis on testing ideas against demonstrated outcomes
Conflict in adversarial atmosphere; may be productive	Conflict restricted; seen as destructive	Conflict viewed as positive and comparatively comfortable
Goals vague or unspecified	Short term operational goals, reliance on algorithms	Long term fluid visions based on broad principles of problem-solving
Slow learning and adaptation	Reactive, possibly impeded learning and adaptation	Rapid learning adaptation

(Ramsden, 1998, p 164)

Ramsden (1998) advocates the importance of working collectively and notes that more can be achieved if academic departments "work in teams that continually learn" (p 163). The traits outlined by Ramsden (1998) of academic departments working in teams mirrors those identified in the concept of a professional learning community.

Developing Professionals and Professional Development

> *What is and will be needed in higher education institutions of the 21st century is a model of professional development which not only focuses on and facilitates individual learning and the improvement of quality of individual teaching, research, and so on, but one which supports and facilitates organisational learning and development at the same time.* *(Marshal, 1998, p 5).*

In any learning situation, learners undergo some type of change and it is important to understand the nature of such change. Research on innovation has been able to contribute elements of change theory which can be applied to professional development programs (Hall & Loucks, 1978; Butler, 1992). The ultimate goal of professional development is to change the culture of learning for both adults and students so that engagement and betterment is a way of life (Fullan & Stiegelbauer, 1991).

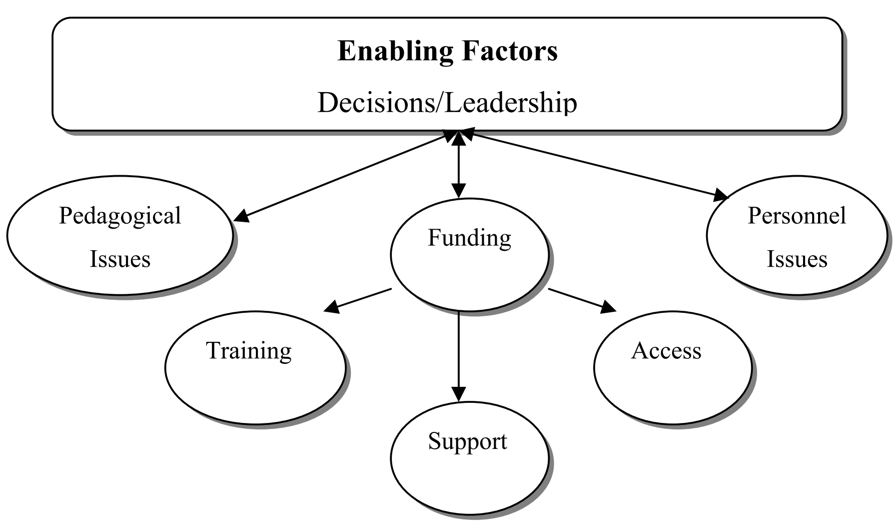
In a survey of campus information technology strategies in the United States, Green (1998) found that assisting academic staff to integrate technology into their teaching was the 'single most important information technology issue confronting their organisation'. In fact it had been the top issue for 1996 – 1999 and still remains a major issue. In response to this concern, the American Productivity & Quality Center (APQC) in conjunction with the State Higher Education Executive Officers Association, sought to identify best practices in staff instructional development in the use of ICT in teaching and learning. A survey was sent to 70 higher education institutions and several for-profit organisations in the United States, where 48 participant organisations selected five educational institutions, one business corporation and one government agency as best practice partners. A final report was issued based on site visits and survey data returned by 35 higher education institutions and 7 for profit organisations (APQC, 1999).

The results of the final report indicated that the institution's overall approach to the use of technology for teaching strongly influenced the staff instructional development practice (APQC, 1999). The evidence was that staff development practices were more effective if the use of technology for teaching was part of the institution's culture, along with established supportive strategies. These strategies included: a strategic plan where the use of technology for teaching was a strong feature; extensive investment in technology infrastructure; support from senior leadership; support, in various ways, for staff members who wanted to use technology for teaching; and support for students by providing computer access, Internet accounts and financial support. The report concludes that each of these strategies may have a positive affect on the staff development program, however a combination of all of them appears to result in an institutional culture that is 'totally immersed' in using technology for teaching and learning.

Another common feature of all of the best practice institutions identified in this study was that teaching and learning was the focus, not the technology itself. In contrast most staff development programs begin with computer literacy skills (technology) prior to embarking on teaching with technology. All of the best practice partners used a team approach to developing technology-based courses (APQC, 1999). Most of the best practice institutions had at least one centralised staff development centre with support staff for teaching and learning with technology, with many also having established a separate centre for flexible online learning. These institutions called upon other organisational units for expertise as well to support staff development initiatives in using ICT in teaching and learning. This was important as staff usually found within these staff development centres (highly skilled in teaching and learning) lacked specific expertise when it came to teaching and learning with technology. The APQC study (1999) also revealed that 'show and tell' demonstrations of useful technology-based teaching from successful peers was an effective way of teaching others.

Strudler & Wetzel (1999) investigated four pre-service teacher education sites, the same sites that were selected for a previous study of programs thought to have exemplary approaches to integrating ICT and carried out by Mergendoller, Johnston, Rockman & Willis (1994). Through multiple sources and measures Strudler & Wetzel (1999) attempted to identify "the important pieces of the puzzle that make up current technology integration efforts at these sites?" (p2). They found that there was a 'complex web of enabling factors' that promoted and supported student learning opportunities with ICT. The need for strong, committed leadership was one of the key factors that surfaced from all four institutions. Figure 5.1 depicts the enabling factors identified by Strudler & Wetzel (1999) which formed part of their model of preparation of pre-service teachers to use technology.

Figure 5.1: Enabling Factors which Influence Student Learning Opportunities



(Strudler & Wetzel, 1999)

Based on the investigations of the four exemplary preservice teacher training institutions, the following are some of Strudler & Wetzel's (1999) recommendations that specifically relate to professional development:

- *Hire staff who are knowledgeable about technology in their fields and prepared to use it in their teaching.*
- *Provide a range of professional development opportunities such as students working with staff, workshops, one-on-one learning opportunities, and incentives and rewards for obtaining new technology and pedagogy skills.*
- *Hire curriculum integration specialists who are located in the college. This is an important component in providing a combination of centralised and distributed, content-specific training and support for staff.*
- *Plan professional development to help staff become independent technology users.*
- *Provide ample computer access and projection facilities in teaching classrooms.*

(Strudler & Wetzel, 1999, p 16)

According to Marshal (1998), a professional development model which facilitates on-going, critical reflective practice and that is integrated into all aspects of the core business of the institution, is the only way to overcome the problems of individuals developing their knowledge and skills while the existing organisational structure and practice remains the same. This has been the problem identified with past professional development programs where individuals obtain new skills and wish to employ new practices, then to return to their existing environment to find policies, structures, culture and values in conflict with their newly acquired information (Pink, 1989; Smyth, 1991; Fullan, 1992b). Marshal (1998) suggests adopting Senge's (1990) concept of learning organisations and relates these concepts to professional development. He argues that organisations themselves do not learn, but it is the individuals within the organisation who learn. In order to facilitate organisational learning, policies and procedures need to be developed and implemented to support individual development. However there is a view that one of the important elements of these procedures and policies is that they are 'guided, informed, facilitated, and supported by the developing strategies, structures, and environment of the institutions of which they are a part' (Marshal, 1998, p6). In turn, the organisation should be able to 'tap into' the developing knowledge and skills of its staff.

According to Marshal (1998) effective professional development policies and practices in learning organisations need to facilitate, nurture and develop Senge's disciplines of:

systems thinking, personal mastery, working with mental models, building shared vision, and team learning. Marshal (1998) provides a useful conceptual framework for professional development in higher education institutions for the 21st century which is outlined in Table 5.2.

Table 5.2: Conceptual Framework for Professional Development

<table>
<tr><th rowspan="2">Area: of organisational activity.</th><th colspan="4">Key Areas of Individual Learning</th></tr>
<tr><th colspan="2">Professional Practice</th><th rowspan="2">Leadership & Management</th><th rowspan="2">Generic</th></tr>
<tr><th></th><th>Functional</th><th>Scholarship & Inquiry</th></tr>
<tr><td>Teaching</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Research</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Community outreach</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Leadership & Management (Executive, senior, middle, program, project).</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Administrative support Administrators in schools departments, offices, and other academic/support units.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Specialist support (Librarians, system designers, computer programmers, laboratory technicians).</td><td></td><td></td><td></td><td></td></tr>
</table>

(Marshal, 1998)

With respect to this model, Marshal (1998) argues that professional development activities for higher education institutions should have three common characteristics. They should:

- Support the strategic initiatives and priorities of the institution.
- Cater for individuals in the three key learning areas (professional practice, leadership and management, and generic).
- Encourage and support the five essential disciplines of a learning organisation.

In similar vein Di Sieno (1995) argues that for the most effective integration of ICT into teaching practice, academic staff need to take on the behaviour of a close-knit, integrated community. Such a view of integrated communities certainly replaces the usual practices of 'lone ranger' or 'independent entrepreneur' academic models, with a more interdependent and supportive one.

Similarly, Lieberman (1995) notes that if teachers are to really change the way they work they must be 'involved in learning about, developing and using new ideas with their students' (p 595). She states that this can be achieved in various ways such as building new roles (coach, leader, researcher), creating new structures (groups, teams), working on new tasks, and by developing and nurturing a culture that promotes professional learning - and that this professional learning is ongoing.

Christopher Day, in his recent book*, Developing Teachers: the Challenges of Lifelong Learning,* maintains that the:

> *provision of time and opportunity as well as the dispositions and abilities of teachers to learn from and with one another inside the workplace and from others outside the school are key factors in continuing professional development.* *(Day, 1999, p 20)*

Jacobs (1994) produced an interesting case study which examines the effects of technological change on Arizona's Maricopa County Community College District and assesses the changes and progress since initiating major strategic initiatives in 1986. This longitudinal research project identified the importance of the continual learning process required by individuals if they are to adopt ICT effectively in their teaching. He notes that the nature of technology is that it is continually changing and developing and if technology use is to be part of our daily routine a continual learning process will need to become a characteristic of our professional culture. He notes that a new learning paradigm is required.

In the past 'training' has involved providing the skills to the greatest number of people on the most popular tools, and not addressing the variety of ways in which individuals learn. "In training us for the present, it fails to train us for the future" (Jacobs, 1994, p 31). He advocates that professional development units need to promote and expand their resources for learning, such as reading manuals, online tutorials, engaging in listservs, as well as developing projects using unfamiliar tools. Learning needs to be part of an individual's working week, particularly when continual learning is supported by the institution and rewarded. Ramsden (1998) also expressed these kinds of views, suggesting that leaders identify 'champions' with the specific task of building teams and promoting continuing professional development.

McNaught et al., (1999) alert us to the time these processes take - "the time to undergo professional development is a problem" (p 128). The argument is that this needs to be recognised as part of the academic workload. Other recommendations regarding professional development involved the suggestion that a collegial atmosphere of support be developed rather than a training regime. Baldwin (1998) simply notes that academic staff need access to training, time to learn and practice with the technology, with adequate support when required. Di Sieno (1995) adds that the opportunity for collaboration needs to be provided where those who are using ICT share their knowledge and experience with those who are just beginning.

The majority of reluctant users are basically looking for one-to-one assistance, which McNaught et al., (1999) simply say is not practical or viable. They suggest that perhaps small support groups at the department or school level might be an effective compromise, but even this is expensive. Gandolfo (1998) also suggests working in small groups, however for a different reason. Accordingly, Gandolfo (1998) suggests that the best approach to academic staff development with individuals who are autonomous and not easily persuaded to change their familiar routines, is to work with small groups. She notes that small groups have the potential to eventually create a ripple affect throughout an organisation.

The strong evidence is that professional development should not stand alone (ISTE, 1999), and should be integrated with other strategies that support the use of ICT in teaching and learning on a just-in-time basis (McNaught, et al., 1999; McKenzie, 2000) within a project team approach (Ramsden, 1998; Bates, 2000). Bates (2000) concludes that professional development really is the last stage in a broader change process.

It is relevant to address some of the research conducted in the school sector as schools are also primarily concerned with teaching and learning as are higher education institutions. For instance, Caverly et al., (1997) identified an innovative professional development model which has at its roots a social constructivist approach where teachers learn how to integrate ICT from an instructionally strong 'first generation' of teachers. The teachers then practise what they have learned, passing on their expertise to a second generation of teachers, who then pass it on to a third. This process begins with a technology "boot camp", which involves teachers attending a three week technology institute where instructors show them how to use and support ICT in thematic units. Over the next year these teachers are supported by the instructor through visits, meet monthly with other first generation teachers, and are released one day a month from regular duties in order to further develop their teaching programs. This whole process enables the teachers to practise independently with support provided. After a year the first generation teachers attend a second summer technology institute and with the help of a facilitator each teacher mentors two second generation teachers. Caverly et al., (1997) notes that it is important to allow the teachers time to practise, with one year being an appropriate minimum length of time for this process.

A two year study looking at what constitutes high quality professional development in schools conducted by the National Education Association in the US (Renji, 1998) found that at the heart of the program was the goal of improving student learning. They claim that high quality professional development provides teachers with adequate time for inquiry, reflection, and mentoring and that these activities should be part of the teacher's normal working environment. The professional development process also needs to be 'rigorous, sustained and adequate for the long-term change of practice'. Importantly, adult learning principles need to be applied. The study also identified the importance of acquiring a balance between individual and school priorities, activities which use new technologies and finally, programs which are site-based.

McKenzie (1998) also advocates the need to apply andragogical principles when it comes to professional development for teachers. In particular, the provision of activities which are in tune with an individual's interests, needs, and developmental readiness. McKenzie (2000) in his book, *How Teachers Learn Technology Best*, identifies a variety of strategies which can provide opportunities for effective professional development. He notes that if schools expect to see a solid return on technology investments, they must foster (and fund) cultures intent on continuous learning and change, and that this can be achieved by providing the necessary 'just-in-time' support.

To date in Australia, 80% of government spending on technology in schools has been on hardware and networking services, 15% on professional development and 5% on software/online content (Trinitas, 2000). The Australian K – 12 school sector, is one of the most hardware and network rich school environments in the world, however professional development is an area largely in need (Parker, 2000). A study (MCEETYA, 2000) involving a survey of 1258 school teachers in Australia revealed that they indicated that their ICT skills were generally based on what they had picked up themselves and that they were generally less able than their students.

In 1997, $20 million was injected into the Western Australian (WA) education system in order to provide a computer and Internet connection to every WA school. A teacher from each school participated in the *Internet in the Curriculum Train the Trainer* inservice program, where they in turn trained staff within their own school. Twenty three schools were designated 'Technology Focus Schools' while 100 innovative teachers with ICT based projects were funded. Each school and individual were required to disseminate useful information regarding best practice in adopting ICT (Trinidad, 2001).

In 1998, a further $100 million was allocated to schools so that each school would reach the ratio of one computer to five students (secondary schools) and one computer to ten students (primary schools), by 2002. In order to receive these funds the schools were required to submit a 5 year technology plan that included professional development of staff. Schools were provided with resources and support to guide them through this process. In spite of all this funding and support for useful ICT plans, Trinidad (2001) notes that annual audits of teacher competencies have shown that WA teachers have not yet reached the 'mainstream' (early majority & late majority – 68% of the population) of adoption of ICT into classrooms. She argues that it takes time for individuals to develop a vision of what can be done with ICT. She advocates that this vision can only be achieved through personal use of ICT and further developed with appropriate professional development that provides models of best practice.

In similar vein, at the higher education level, The Milken Exchange commissioned a report entitled, *Will New Teachers be Prepared to Teach in a Digital Age?* The National Survey on Information Technology in Teacher Education (ISTE, 1999) conducted the study and found that even though ICTs were available in K-12 classrooms, most student teachers did not utilise them during their field experience. The report also indicated that technology infrastructure in schools had increased faster than the integration of ICT into teaching. The study also found that the ICT skills of academic staff in higher education institutions were comparable with their students. These results were different from those of the study of school teachers (MCEETYA, 2000) which found that they were less competent in using ICT than their students. One of the key findings of the ISTE study, which has strong implications for professional development of teachers, is that there was no link identified between formal stand-alone ICT coursework and technology skills which integrate ICT into teaching (ISTE, 1999). The report recommended that:

> *To increase the technology proficiency of new teachers in K-12 classrooms, training institutions should increase the level of technology integration in their own academic programs. (ISTE, 1999, p 3).*

The ISTE (1999) study emphasises the need to encourage academic staff to model and integrate technology in their own teaching and learning, and for institutions to provide professional development incentives outside of the academic reward system. The study also argues that organisations ought to provide a model for change by identifying, studying, and disseminating examples of effective technology integration that reflect the current trends, as the study found that student technology skills and patterns tended to mirror the technologies they were exposed to in their own training.

Wright and O'Neil (1995) surveyed academic staff in higher education institutions across many nations in order to investigate factors which would contribute to improved teaching. They found that the academic staff in the UK rated professional development workshops as the third most likely practice that would improve their teaching, after recognition of teaching in promotion decisions, and leaders encouraging the importance of teaching responsibilities. Professional development workshops were ranked the fifth most likely practice to improve teaching in Canada, thirteenth in the USA and fourteenth in Australasia. In the overall survey data, professional development workshops ranked seventh out of a list of thirty six practices.

Rust (1996), a member of the Oxford Centre for Staff and Learning Development (OCSLD) in the UK, (a key provider of staff and educational development training in higher education) investigated whether OCSLD workshops lead to changes in the practice of those who participated, and whether these changes had a positive affect. He used qualitative and quantitative data collection methods which resulted in the following conclusion:

> *On the basis of this evidence it would seem justified both to use workshops as a tool of change and to use end-of-workshop evaluations as an indicator of impact.* *(Rust, 1996, p 79).*

Butler (1992) suggests that follow-up components to staff development programs are crucial in providing support and assistance in the actual implementation and application of the new knowledge/skills. In Fullan's (1982) early work he advocates that a number of sequential sessions, where individuals have time in between sessions to practise new concepts and ideas (with some access to help) are much more effective than the most stimulating stand-alone workshop.

Professional Development Best Practices in Higher Education Institutions

> *One of the biggest challenges is coming up with a plan for staff development and curriculum innovation, one which offers the right rewards and incentives, doesn't waste the staff's time on glitz, and results in better teaching and more learning.* *(Burg & Thomas, 1998, p 24).*

Collège Boréal (Sudbury, Canada) – All of the instructors at Collège Boréal use technology in their teaching and learning. The College provides a variety of innovative strategies to support staff in the development and use of technology-based teaching:

- Young staff members have been trained in the use of educational technology and those technical skills required for use of technology in teaching, operating out of a central educational technology unit called 'La Cuisine'. Each support staff works specifically in a discipline with up to 20 academic staff.

- Staff are able to work with their support person on Thursdays between 8 – 11 am as the College does not run any classes during this time, specifically for this reason. Academic staff are able to contact staff via a beeper system at any time so that minor problems are usually resolved immediately. The support staff return to their normal teaching after one or two years, having accumulated a large wealth of experience in the use of technology for teaching.

- Specialists (multimedia designers and instructional designers) are also housed in this central educational technology unit, 'La Cuisine'.

Virginia Polytechnic Institute and State University (Blacksburg, Virginia, USA) has been identified as one of the higher education best practice partners in the APGC study, discussed earlier in this chapter. The incentive of a new desktop computer was used for staff at Virginia Polytechnic to attend a training program specifically aimed at using technology for teaching (Meszaros, 2001). The Staff Development Institute at Virginia Polytechnic applies a problem-based approach to training where a small group of academic staff work with an instructor to prepare a specific lesson involving some aspect of technology. This enables specific skills to be taught as well as addressing teaching issues which may arise. This program had been strongly supported by the Vice President of Information Systems who made funds available and the then Provost (Dr Peggy Meszaros). In total 96% of all staff have gone through a staff development program with 50% in 1999, having gone through a second program. The cycle now occurs once every three years, not four as it was initially planned.

The University of Central Florida (Orlando) has established an interesting mentor program for novice online instructors. Academic staff termed 'Web Vets' who have already completed teaching online courses, mentor the novice adopters. The College Boreal also applies a similar mentor program to the University of Central Florida. Young staff members are trained in technical and instructional skills and then designated as 'coaches' for other staff located within other colleges. One of the professional development strategies adopted by Wake Forest University to help staff utilise ICT in their teaching and learning was to assign them Student Technical Advisers (STARS). The students worked in partnership with individual staff members in order to implement specific ideas for computer enhanced instruction. Along with this initiative was the ambition to equip all students with IBM Thinkpads. With this initiative they found that it was essential to standardise equipment in order to provide adequate technical support, training, sharing of knowledge, and effective communication (Brown et al., 1998).

On the Australian scene, The Royal Melbourne Institute of Technology University has established a mentoring system where Learning Technology Mentors are trained in online tools, and are provided with support in educational design and the skills involved with mentoring. These mentors are located within each department and are given one day release time to be involved in online development projects and provide support for other colleagues in their department.

Overview

This overview extracts from the detailed material presented in Chapters Two – Five, those key issues, concepts, ideas and models which informed the nature and direction of the present study.

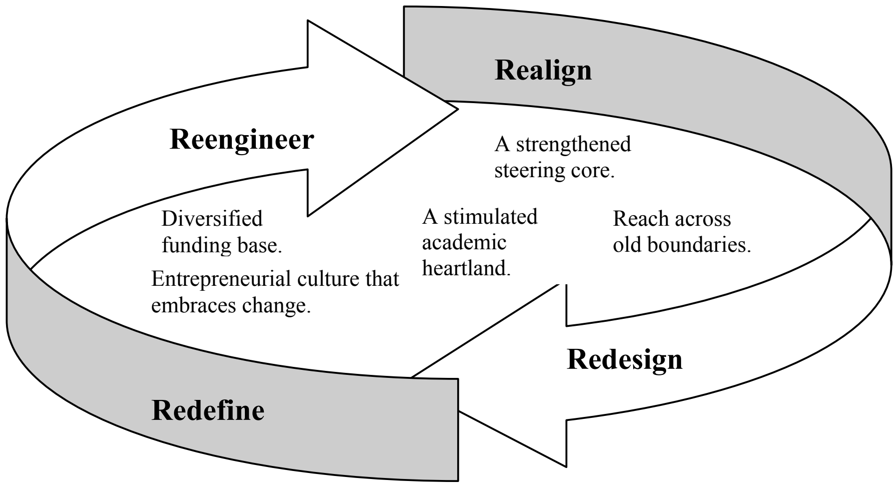
The literature review began with an examination of the driving forces, both global and national, which have been identified as affecting the ways in which Australian universities need to move into the 21st century. Amongst a number of potentially relevant factors, five stood out as being particularly salient to this study. These were: a larger and more diversified student group seeking entry to the university system; less financial support from Governments at all levels; an increase in the expectations of what universities can achieve (ranging from specialised occupations to lifelong learning); the massive increase in the knowledge base and finally, the growth in the use of ICT to access this knowledge.

The impact of these forces on Australian teaching staff and their teaching practices has been profound. Not the least of these effects has been the change to the working pattern of Australian university teachers. More students, greater diversity of student groups, the need to explore alternative delivery modes, expanded work roles into the realms of marketing, quality assurance, administration, community service and the embracing of ICT, have all put intense pressure and scrutiny on the working lives of university teachers. The overall effect of increasing workloads and the need to teach in a variety of modes has meant that teaching staff are having to reconceptualise their whole approach to teaching and learning. Changing pedagogical approaches with the necessary accompanying accountability processes have placed real pressure on individuals.

Within the Australian context the evidence is that these changes have caused individual institutions to become much more enterprising and self-sufficient. Two sources stood out as encapsulating the nature of the transformation processes required by contemporary universities. Although written from different perspectives, the work of Dolence & Norris (1995) and Clark (1998) provided a framework which was to prove important in informing crucial aspects of this study.

An overview of the transformation process in higher education as conceptualized by Dolence and Norris's (1995) 'components' model combined with Clark's (1998) 'characteristics' notion gives rise to the following sequence of common concepts (Figure 5.2).

Figure 5.2: Transforming Higher Education



This view of the transformation process has the advantage of providing generic features along with specific strategies (e.g to develop a strengthened steering core). At the centre of this model and perhaps the most crucial element which Clark (1998) has managed to identify and capture, is the notion of a "stimulated academic heartland".

This notion that the culture of an organisation directly impacts the effectiveness of an organisation is an underlying thread of many of the interpretations found in the detailed literature review section concerning the transformation of higher education - in particular the important distinction between the terms "restructuring" and "reculturing". An important pattern identified by key researchers (Cuban, 1988; Fullan, 1992b) working in the area of cultural change in education was that once people have invested emotionally in transforming the culture, they then in turn place pressure on existing structures in order for them to change and meet their new needs.

The proposition that large organisations such as universities, can be characterised by a unique multiple-cultural configuration provides another valuable framework for viewing the dynamic process of culture within universities. Under this perspective, derived in particular from the early work of Alvesson (1993) and more recently Trowler (1998), individuals can identify with various units – the wider community (profession), the organisation (university), and a working sub-unit (department). An important related notion where leadership is distributed throughout an organisation (Senge, 1990), allows for enough autonomy for change to occur independent of the larger organisation. The crucial concept that organisational learning and individual learning are linked is another thread identified throughout the literature in Chapter Two on systemic university change.

On the issue of the growth in ICT use and its role in accessing the burgeoning knowledge base, whether this is transforming higher education or whether higher education needs to change to meet the needs of the Information Age society, remains to be seen. What is clear from the literature is that these global forces have and are affecting teaching staff at the individual level, and that existing practices and structures need to be challenged if learning is still to be of the highest priority.

In summary, Chapter Two provides a description of the volatile environment in which higher education now operates and identifies the factors which are influencing the transformation of existing practices and structures. In an attempt to investigate this transformation process, Chapter Three continues this thread by examining in detail the literature on innovation and educational change, as the concept of transformation ultimately involves an understanding of the change process and the subsequent adoption of new practices requires theoretical understanding of innovation theory.

The common ground throughout the extensive literature on innovation and change appears to be the notion that change is a very personal experience which necessarily involves a degree of uncertainty and anxiety. One of the most salient views, as argued by Marris (1975), suggests that individuals construct their own personal meaning by linking each new experience within their own context. The conflict is that in an organisation such as a university, a shared meaning of an innovation is essential if it is to be adopted, assimilated and sustained (Marris, 1975; Fullan, 1982; Fullan & Stiegelbauer, 1991).

Examining the literature on school reform provides valuable insights into further understanding change, especially as schools are the closest institutions to universities which have in common learning as their core function. Table 5.3 is an overview of common attributes identified in relevant studies of school education systems as discussed in Chapter Three, contrasting them with those studies (last column) specifically relating to implementing change in higher education systems.

Table 5.3: Common Attributes

Common Attributes	Stoll & Mortimer (1995)	Reynolds et al., (1996)	Cavanagh (1997)	King (1995), Layer (1995), Taylor (1995) and Thorley (1995)
Leadership	participatory leadership	professional leadership	transformational leadership	leader convinced of the benefits of the change
Shared Vision	shared vision and goals	shared vision and goals	shared planning	share ownership of a vision
Collaboration	teamwork		collegiality, collaboration	effectively managing people-staff acceptance of the change
Teaching & Learning Focus	emphasis on teaching and learning	high quality teaching and learning	an emphasis on learning	
Environment	a positive learning environment	a positive learning environment		
Expectations	high expectations	high expectations		
Rewards	positive reinforcement	positive reinforcement		showing appreciation and value of staff
Monitoring	regular monitoring and inquiry	monitoring student progress		
Values	due attention to pupil rights and responsibilities	student rights and responsibilities and purposeful teaching	professional values	

From this comparative review it appears that the elements which will most readily assist in implementing second order change, as identified by Cuban (1988), are the variables of high quality leadership, shared vision, meaningful collaboration, in-built incentive schemes, keeping a focus on teaching and learning and finally, valuing and ensuring the rights of students. There is also strong evidence that instigating and maintaining such long term changes in educational systems requires changing the attitudes and beliefs of teachers about many aspects of their professional life. This theme is repeated in a number of the studies examined in detail in Chapter Three, echoing the need that in order for an educational setting to develop appropriately, there is a necessity for the teachers themselves to be actively engaged in reflecting about their own teaching environment and the nature and direction of their subsequent learning. In contrast in the higher education sector, many writers refer to the argument that it is not easy to assimilate change in an environment where academic staff are traditionally unfamiliar with being given external directions and have worked in a relatively autonomous manner for many years.

Important key findings about the change process derived from the detailed literature review in Chapter Three include the following assertions: individuals do not change unless they share a compelling reason to change; organisations do not make changes, people do; behaviours change before beliefs and values do; shared meaning can make significant change a reality; people do not change unless their leaders model that they are serious about the change; conflict is a necessary part of change; cultural change is more difficult to accomplish than any changes in systems or procedure; it takes a great deal of time to implement change, and a great deal longer before their results are recognisable

Literature on innovation diffusion theory was examined in detail in Chapter Three as this thesis is primarily about the adoption of an innovation – Information and Communications Technology (ICT). This examination of theories about diffusion of innovations was a valuable exercise because it explains the nature of innovations and the various processes of adoption that can follow. It also enables the processes of innovation diffusion and organisational response to be evaluated against established criteria. Importantly, Tornatzky & Klein's (1982) analysis found that the concepts of relative advantage, compatibility and complexity, were the only characteristics that were consistently related to adoption and utlisation, while the diffusion scholars, according to Rogers (1995), found the concepts of relative advantage to be one of the best predictors of an innovation's rate of adoption. Engel, Blackwell & Miniard (1993) reflect that over 3,000 studies and discussions of diffusion processes have been published in at least 12 identifiable disciplines. As a consequence of this review, the theoretical underpinnings of Rogers' (1995) diffusion of innovation process were adopted in this present study in order to provide a reliable and valid framework for the researcher to identify the users, analyse the characteristics of adopters and to determine whether the rates of adoption changed over a period of time.

A summary of some of the key diffusion studies utilizing Rogers' (1995) Diffusion of Innovations Theory together with their links to the present study, are included in Appendix E.1.

In order to apply innovation-diffusion theory to the implementation and adoption of ICT in higher education it was essential to review the larger picture of the nature and role of technological change within university systems. This was addressed in Chapter Four of this thesis, Technological Change in Teaching and Learning, and in addition to providing a picture of the current climate of technological change, examined in some detail the impact that ICT has made on teaching practices. From a detailed examination of the literature in this area, the evidence is that the main pedagogical and economical forces that have encouraged universities to adopt ICT in teaching and learning have been identified as being: increased information access, wider range of communication facilities, higher levels in the quality of teaching, greater flexibility in delivery, and more cost effectiveness of the technology. Regardless of these forces it appears that Australian universities have been slow in the uptake of ICT in teaching and learning. This has been supported by the results of Australian studies conducted by McNaught et al., (1999) and Hesketh et al., (1996) as well as the National documents, *Learning for the knowledge society: An education and training action plan for the information economy* (DETYA, 2000) and *Higher education action plan for the information economy: The way forward* (AVVC, 2000).

On the other hand, a number of factors have been suggested as contributing to the lack of adoption of ICT at both the institutional and individual level. At the institutional level the literature revealed that one of the main factors is the lack of appropriate planning whereby the investment in technology does not necessarily match the investment in human infrastructure with the result that planning is often driven by the technology itself and not from a pedagogical rationale. The nature of university policies is also a contributing factor, whereby policies do not seem to reflect changing teaching practices or provide the necessary incentives or reward structures that could encourage the adoption of ICT. In addition, one of the key factors often noted is the overall lack of resources and funding available to higher educational institutions which consequently affects the levels of funding that institutions are prepared to spend on this area.

As noted earlier in this overview, the adoption of ICT (the innovation) at an individual level is strongly influenced by the very nature of change itself – for instance, the perceived value of the actual change and an individual's attitude toward the change. The earlier review chapters presented evidence that there is a widely held view that technology is still not particularly "user-friendly" and that the implementation of ICT into teaching and learning involves a great deal of time and effort.

A common thread in much of the literature was that most individuals had not been shown how to integrate ICT effectively into their teaching and learning. A lack of appropriate modeling and professional development were often cited as acknowledged concerns. In addition, other studies argued that institutional factors involving the nature and role of the institution's ICT infrastructure, were of vital importance. ICT infrastructure in this sense involves not only the physical elements of hardware and software, but also the human support for these resources. A detailed comparison (authors, focus, methodology, key findings, links to this thesis) of significant studies on the adoption of ICT in higher education institutions which have implications for this particular study can be found as Appendix E.2.

The final thread of this overview addresses once again the perceived unsuitability of the current structure of higher education to come to grips with the role and implementation of ICT in teaching and learning. Universities are facing the challenge of identifying what role ICT can and will play in the future of higher education and how to implement the appropriate strategies which will meet these needs. Of particular importance is the question of what balance should there be with respect to face-to-face and online teaching and learning as identified by Gilbert (1996a), Seely, Brown & Duguid (1996), and Green (2000). The key to meeting these challenges seems to be to develop an ethos associated with what can be best described as a "professional learning community". This concept of developing a professional learning community is based on the work of Senge (1990) where he refers to the characteristics of "learning organisations", on the school-based work of Sergiovanni (1993a) who referred to "learning communities", and from Fullan's (1998) work on building "professional communities". This concept can be seen as one which has the following crucial elements: leadership distributed across all sectors, people working collaboratively and collectively towards a shared vision where learning is the focal point, and where the members choose to belong to the community.

The claim that a dramatic culture shift in institutions needs to occur if extensive use of ICT is to be adopted by academic staff, is an important one (Resmer et al.,1995). More specifically, the existing culture in higher education institutions needs to change by re-examining the research and teaching nexus. Even though there is evidence that this is currently changing, the literature still indicates that research is often valued and promoted to the detriment of teaching within Australian universities. Another related factor is that ICT tends to be more widely spread in the research field than in teaching and learning. Clearly the methods of ICT can readily assist in the gathering, analysis and sharing of the information whereas the adoption of ICT for teaching and learning requires major alterations to usual teaching practices (Saltrick, 1996). The existing culture also needs to reflect some kind of learning community approach by developing and promoting team-based strategies. This approach can involve a group of individuals each contributing different skills where the actual process is managed by a leader or project manager. Such an approach appears to be strongly supported by the current literature (Ramsden, 1998; McNaught et al., 1999; Bates, 2000). There was ample evidence identified in Chapter 5 that a major key to developing an effective learning community was by developing professionalism through what can be termed “enlightened professional development”. Ultimately the goal of such professional development is to change the culture of learning for both adults and students (Fullan & Stiegelbauer, 1991).

The issue of helping academic staff integrate ICT into their teaching and learning has clearly been a key concern outlined in the literature about higher education institutions on both a national and international level. To this end this study focused on the use of ICT in teaching and learning by the teaching staff within an Australian tertiary institution, and on the mechanisms by which the University has implemented such a significant innovation. Thus the key research questions that guided this study were as follows: How are Curtin University teaching staff utilising ICT in their teaching and learning?; What is the relationship between the ICT behaviour of a University’s teaching staff and the strategies used to implement the University’s ICT strategic planning initiatives?; What is an appropriate model for future implementation of ICT into teaching and learning at an Australian University?

CHAPTER SIX

Research Methodology

Introduction

As described in Chapter One, one of the main purposes of this study was to develop an effective model and associated strategies for implementing information and communication technology (ICT) into teaching and learning by teaching staff at a tertiary institution. This model was to be derived empirically from data collected across the University as well as from practical and theoretical bases from the literature. The study combined qualitative (interview and case study techniques) and quantitative (questionnaire, content analysis & Likert-type instruments) methods. The overriding methodology is best described as a case study approach, where Curtin University is defined as the case.

The chapter begins by outlining the arguments that underpin an approach combining qualitative and quantitative data collection, followed by a description of the research design. The various phases, procedures and instruments used in this study are also identified. The five phases are described in detail under the following headings: Phase One: Literature Review and Document Analysis; Phase Two: The Survey; Phase Three: Case Study participants; Phase Four: Curtin University Initiatives; and Phase Five: Analysis of the Total Data Set.

The approach taken to the triangulation of the data collection is identified in this chapter, while data management and analysis issues follow. The appropriate protocols for data storage and ethics are dealt with and the specific problems encountered during this study are noted. Finally, a summary of the chapter is presented at the end of this chapter.

Research Approach

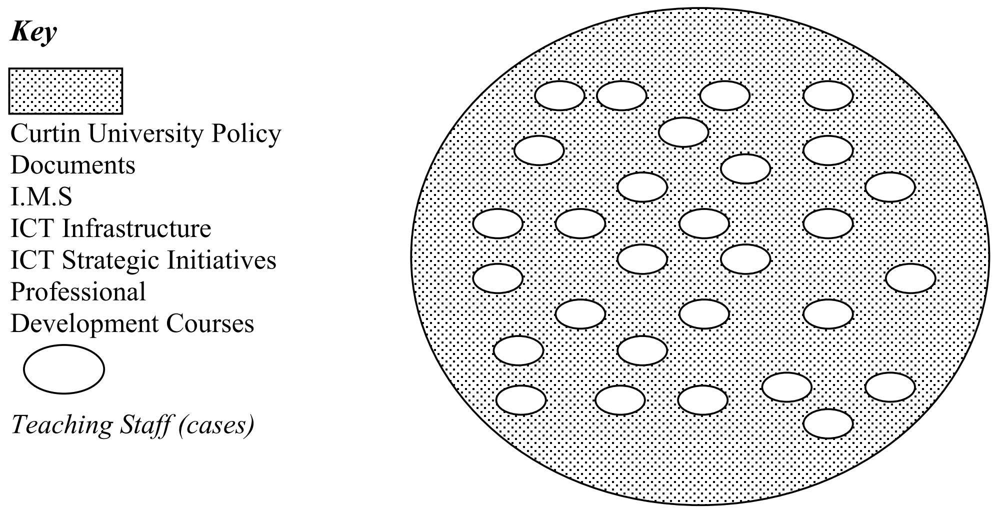
Erickson (1986) categorised ‘ethnographic’, ‘qualitative’, ‘participant observational’, ‘case study’, ‘phenomenological’, and ‘constructivist’ research designs as all belonging to what he termed ‘interpretative’ approaches.

> *Qualitative research is an umbrella concept covering several forms of inquiry that help us understand and explain the meaning of social phenomena with as little disruption of the natural setting as possible.* *(Merriam, 1998, p5).*

Specifically then, interpretative (or qualitative) research focuses on a specific social setting or phenomena. As noted by Erickson (1986), and by others such as Patton (1990) and Denzin & Lincoln (1994), within the interpretive approach there are many methods - however they all share the same philosophical assumption, which is that reality is constructed by individuals interacting with their social worlds (Merriam, 1998). In other words, qualitative researchers are concerned with how individuals make sense of their world and their experiences.

In the present study, this interpretative approach was carried out using a case study approach, with Curtin University of Technology as the case. Within the case (Curtin University), particular teaching staff have also been identified. These are termed, 'embedded' case studies (Yin, 1994). This description refers to a case which involves more than one unit of analysis - such as the individual teaching staff (units of analysis) within Curtin University (the case). Figure 6.1 provides a schematic view of this approach. The shaded area in this figure represents the University – within this region the researcher has identified dimensions which were specifically investigated (i.e. Curtin University policy documents, Management Information Services, Professional Development courses, ICT Strategic Initiatives, and ICT Infrastructure). The white ellipses represent the 32 case study participants.

Figure 6.1: The Case – Curtin University of Technology



This study has adopted the definitions given by Yin (1994) and Miles & Huberman (1994) of a case study.

> *A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident.* *(Yin, 1994, p13).*

> *A phenomenon of some sort occurring in a bounded system.*
> *(Miles & Huberman, 1994, p25).*

A case study conducted by an observer, seemed to be an appropriate method of describing and revealing what happens in the dynamic social environment of a tertiary institution, rather than more traditional and controlled quantitative approaches. With such an approach the assumption is made that the findings of this study are not only pertinent to Curtin University of Technology but also to other tertiary institutions in Australia with a similar profile (Borg & Gall, 1989; Cohen & Manion, 1994).

Research Design

The researcher believes in the need to select those research strategies which will be the most effective in probing and hence understanding the key issues in question (Gorenberg, 1983; Goodwin & Goodwin, 1984; Firestone, 1987; Guba, 1990). Hence, the research design of this study has involved both qualitative and quantitative components. Certainly good research practice obligates the researcher to attempt some measure of triangulation (i.e. to use multiple methods, data sources and researchers) in order to enhance the validity of any research findings (Mathison, 1988). The diagram on the following page (Figure 6.2) provides a summary of the research design and specific phases.

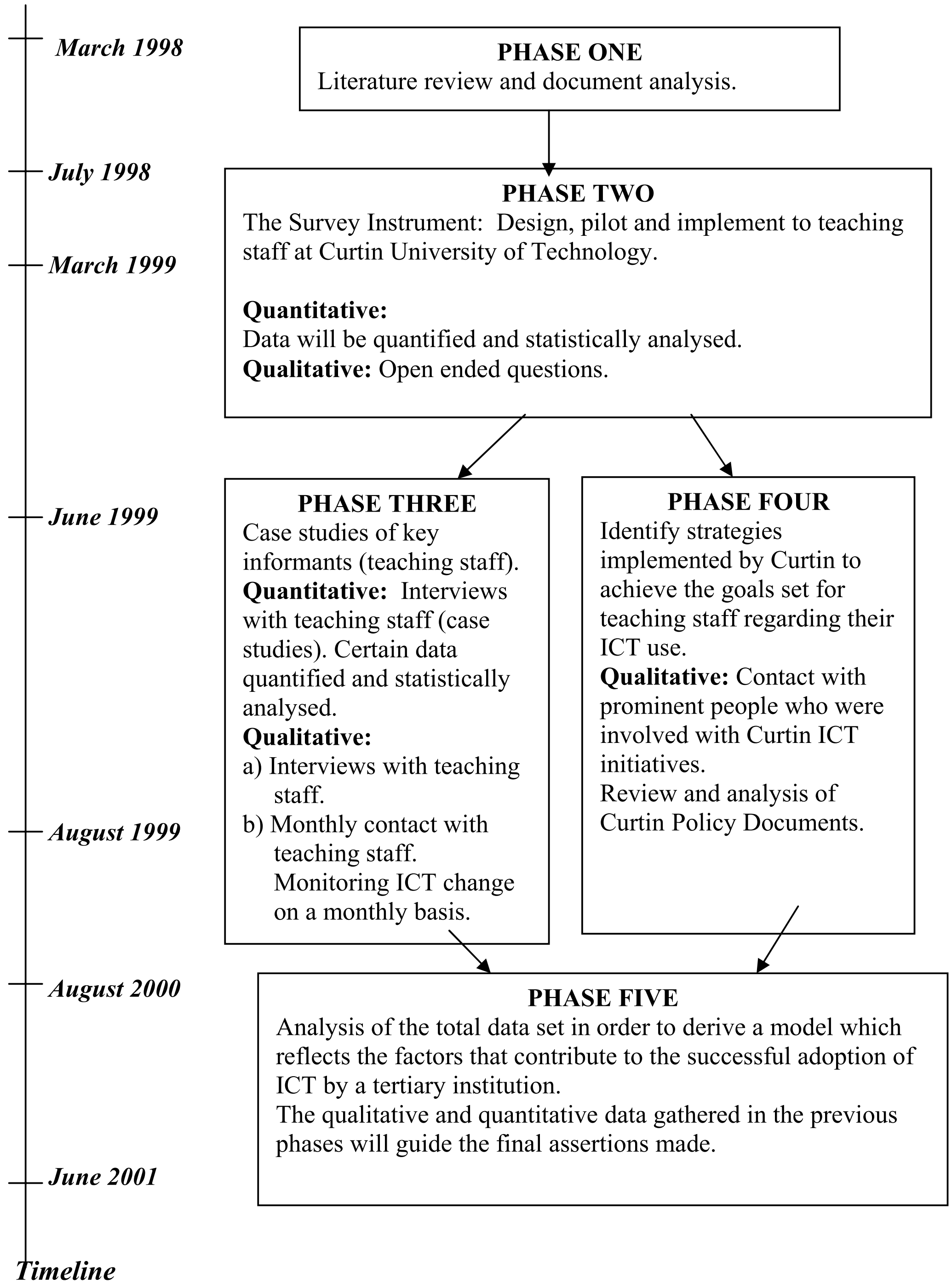
Design Phases and Procedures

The study was divided into five distinct phases. The outline of each phase provides a detailed account of the process and approach the researcher applied to the specific task.

Phase One: Literature Review and Document Analysis

Appropriate and relevant scholarly electronic databases were searched applying the following individual key words in various combinations: Higher Education/ Tertiary Institutions, Faculty, Information and Communication Technology Use, Adoption of Technology, Technology Uptake, Models for Technology Uptake, Adoption of Innovations, Change in Higher Education, Information Age, and Impact of Technology in Higher Education.

Figure 6.2: Research Design & Strategies



A number of major writers/researchers (Everette Rogers, Larry Cuban, Michael Fullan, Kenneth Green, Peter Senge) were identified from this large amount of literature which helped guide the literature search further. Chapters two, three, four and five examines this literature in detail. Detailed examination of theories of change and the issues that surfaced regarding the adoption of information and communication technology in higher education provided the researcher with the basis for the initial instrument design.

Relevant Curtin University of Technology strategic plans and policy documents were also analysed with respect to the issues that were brought forward in the literature review. The findings from these analyses were also incorporated into the initial survey instrument. It is important to note that in such an area as information and communication technology (ICT) where change is so rapid, a constant review of relevant literature was necessary throughout the entire research period.

Phase Two: The Survey

This phase involved the design, development and validation of an instrument, the Curtin University Information Technology Survey (CUIT survey) – an instrument specifically designed to establish baseline data about teaching staff at Curtin University with regards to the use of ICT in their teaching and learning. Table 6.1 (on the following page) outlines the survey dimensions. Appendix A.1 contains a copy of the full instrument. The survey is also available on the WWW through URL: http://www.iinet.net.au/~humbert/survey.html.

As the researcher aimed to measure change over a period of time, it was important that existing practice and related benchmarks be identified. The survey was therefore designed to identify individual and group profiles of information and communication technology attitude, awareness and uptake, and from this information a stratified sample was selected for in-depth case study utilising these individual profiles, which were based on Rogers' (1995) classification of innovation uptake categories (laggards, late majority, early majority, early adopters and innovators).

There have been a number of useful instruments developed to measure competent use of computers in teaching, and attitudes and beliefs about computers, however, as ICT is not just about computers, the researcher needed to examine these instruments with a view to adapting some aspects of them to the special needs of this broader study. Instruments developed by Trinidad & Macchiusi (1996), Trinidad (1998), Thornton (1995), and Green (1992) which have been widely used by tertiary institutions, were carefully scrutinised. An important characteristic sought in the design of this survey was that it be perfectly clear, require little effort to complete and be able to be completed online. The question format consisted of checklists, multiple choice responses, several Likert-type scales, and a number of open-ended questions.

Table 6.1: CUIT Survey Dimensions

Scale	Attributes
DEMOGRAPHICS	• Name (optional) • Age • Gender • School/Department • Current Position • Main Teaching Subjects • Years at the University • Employment Status • Modes of Teaching Used
TECHNOLOGY ACCESS	• Computer Use • Internet Access/Use • Email Access/Use
TRAINING	• IT Training • Awareness of Curtin professional development Courses
IT IN TEACHING & LEARNING	• Level of IT Use • Software Used • (teaching preparation/ • during teaching sessions/students) • Attitude Scales – IT Issues
POLICY FRAMEWORK	• Curtin University IT Strategic Plan • School/Department IT Plan
IT GOALS	• Personal Goals • How can Curtin University Help?
FOLLOW-UP INTERVIEW	• Yes/No

Pilot Study

The instrument was piloted in two distinct ways. First, as part of the design and validation of the Curtin University Information Technology Survey (CUIT survey), a pilot version of the instrument was sent to ten Curtin University academic staff who were experienced in tertiary teaching and were known to be significantly involved in using ICT in their teaching and learning. This proved to be an invaluable exercise prior to the pilot study as they made some pertinent suggestions which called for some modifications.

Second, a follow-up pilot study initiative involved a sample of teaching staff from three tertiary institutions in Western Australia (University of Western Australia, Edith Cowan University, Murdoch University), as well as a small sample of Curtin University staff who had recently retired. In order to test that the instrument was suitable for a large range of teaching staff it was important that the sample reflected a variety of disciplines and that their ICT use ranged from low to high. This pilot study sample comprised 30, with a return rate of 80%. The responses from this pilot sample were coded and analysed. These results dictated a number of minor modifications to the instrument. See Appendix A.2 for the pilot instrument.

Administering the Survey

A master list was obtained from Department of Human Resources (DHR) which included all staff at Curtin University of Technology with a substantive appointment at the academic level. From this master list, a subsample of academic staff actively involved in teaching positions emerged (n=715). This culling process was carried out by E-mail and telephone exchanges to determine their level of teaching. The CUIT survey in its revised form was administered to all full-time academic teaching staff at Curtin University of Technology during the period of March – May 1999.

The researcher placed a high level of importance on following all appropriate protocols prior to approaching staff at the University to complete the survey. This involved seeking formal permission and support from the Vice Chancellor of the Office of Teaching and Learning (Professor Ian Reid, see Appendix B.1) and the Heads of all Curtin University's Schools/Departments. It was also felt that obtaining such support would encourage staff to complete the survey, yielding a higher return rate. Professor Reid acknowledged the importance of the study and demonstrated his support by providing a personal letter (Appendix B.2) which was then used to accompany the researcher's letter to the various Heads of Schools/Departments within the University, informing them of the proposed study and the intention of the researcher to contact their full-time teaching staff (see Appendix B.3).

A covering letter (Appendix B.4) addressed to all teaching staff identified in the DHR profile was sent with the survey. The covering letter offered all staff the option of completing a written version or an electronic version (via the WWW) of the instrument. The placement of the survey on a Web site was considered to be the preferred option as emailing the survey as an attachment to the sample would not have been an effective option due to the variety of hardware and software utilised by staff across the University at that time.

The instrument was administered during a non-teaching period in order to yield a higher return rate (Week Free in Semester One, 1999). As noted in the literature (Borg & Gall, 1989; Cohen & Manion, 1995), the initial response rate is always the greatest (N=270, see Table 6.2). The first follow-up was via E-mail correspondence to all academic staff. In order to follow correct E-mail etiquette, permission was sought through the academic list moderator (stationed in the Computing Centre) to send the message to all teaching staff. This message was to remind them of the importance of the survey and thanked them for completing it if they had already done so. As most people had placed their name on the survey (this was optional) the second follow-up reminder took the form of a personally addressed letter (Appendix B.5) with another copy of the survey. Table 6.2 represents the response profile.

Table 6.2: Response Profile

Date	***Action***	***No of Survey Returned***
29th March, 99	Covering letter, hardcopy of CUIT survey sent to all full-time teaching staff (N=715). Optional Web based survey given.	270
28th April, 99	Email sent to all academic staff – reminding staff to complete the CUIT survey.	21
17th May, 99	Covering letter personally addressed to those who didn't return the survey (with their name on it) as well as a hardcopy of the CUIT survey.	93
31st May, 99	Return Rate: 54%	384

The following two phases (Phase 2 - Case Study Participants and Phase 3 -Curtin University Initiatives) were linked and occurred concurrently.

Phase Three: Case Study Participants

This phase was divided into three distinct stages which occupied a period of 16 months. The rationale of such a division was to maintain a systematic approach and to closely monitor the outcomes of each stage. In essence, each stage heavily influenced and dictated the data collection strategies adopted in the following stage.

Stage One: Identification of Interview Subsample

Included in the CUIT survey was a question asking respondents if they would be interested in a follow up interview. This required a simple √ to a yes or no box and those who responded yes were asked to leave their name and contact details. Over one third of the survey sample agreed to participate in a follow up interview. A separate database was created with this group of respondents.

As Curtin University is made up of 36 Schools (each School is divided into various Departments) located within various Divisions it was decided that a totally random sample of this large group was not appropriate for the goals of this particular study. A process of *stratified sampling* was applied generating a subsample representative of the whole population in terms of certain criteria. The specific criteria used involved stratification based on:

- *Division:* Curtin Business School, Engineering and Science, Health Sciences, Humanities, School of Mines (Kalgoorlie), and Muresk Institute of Agriculture.

- *School/Department:* Curtin University is made up of many micro systems called Schools and Departments. Each of these operating by their own value system, culture, attitudes, experiences and specific context, but also under the umbrella of the larger social system, the University itself. In order to try and grasp some understanding of such an eclectic organisation it was important to try and obtain representatives from as many of these different groups as viably possible.

- *Level of ICT Integration Rating:* This criteria is linked to the theoretical framework of Rogers' (1995) innovation uptake model discussed in detail in Chapter Three. He identified five categories of innovation uptake from high level through to low level – innovators, early adopters, early majority, late majority and laggards. It was considered important in this study to identify interview participants who reflected these different sub-groups. This was determined mainly by examination of the responses to question 16 of the CUIT survey and consolidated by questions 17, and 18-28 (Appendix A.1).

The process of sampling for case analysis was carried out once the database was sorted into Division, School/Department and ICT Integration. Ten people were selected from each of the Divisions of Humanities, Health, School of Business and Science & Engineering. The ten represented two people from each level of the five ICT ratings (very low – very high). Proportional representation dictated that only five were selected from the School of Mines (Kalgoorlie) and Muresk campuses, with one representative from each ICT uptake levels.

The total number of participants selected for this phase of the study was 50. Monitoring a group of this size would be a mammoth task if all of the participants agreed to an interview and then continued to participate in the longitudinal phase of the study (case study sample). However it was recognised by the researcher that this number would most likely reduce to a smaller sample. For this reason it was decided very early in this stage that alternative participants would not be selected to replace dropouts from the original selection of 50. It was hoped that there would eventually be at least five, representatives from each of the divisions, where each division had one representative from each level of ICT integration (very low – very high).

Stage Two: Conduct Interviews

A semi structured interview schedule (Appendix A.3) was designed to allow the researcher to gain a deeper awareness of the ICT culture of each participant. In the words of Patton (1990, p 278) the purpose of an interview was to explore what is "in and on someone else's mind" regarding their behaviour, view, attitude and feelings toward ICT use in teaching and learning.

In an important decision, the interview schedule was carefully linked to the individual responses from the survey database which allowed the researcher to personalise each individual interview. This enabled the researcher to clarify and consolidate certain survey responses made by the respondent. This technique is supported by Stake (1994).

> *It is not uncommon in research for all respondents to be surveyed, with a few then selected for case study. It is often important to ask some questions in case study interviews to confirm what is asked in the survey.* *(Stake, 1994, p 65)*

The following key issues were addressed in the interview:

- ICT use in teaching & learning;
- ICT use (personal/professional/students);
- training;
- attitude toward ICT use;
- ICT facilities (personal/professional/students);
- ICT concerns; and
- personal ICT goals.

The interview schedule was piloted with 5 university academic teaching staff who had previously completed the CUIT survey, but were not included in the case study selection. This exercise resulted in a number of changes regarding the clarity of certain questions and the length of the interview itself.

It has been well documented that "face-to-face interviewing" is both time consuming and personally draining (Borg & Gall, 1989; Cohen & Manion, 1994). In this study, the interviews, although time consuming, did not become a significant problem - what did become an issue was attempting to schedule interviews over a relatively short period of time with 50 busy professionals. Due to the time lapse between the survey and the subsequent interview (3 months) it was important to notify the participants through a letter of the researcher's intentions (Appendix B.6). The letter thanked them for completing the survey and gently reminded them that they had agreed to an interview. The letter also reminded them about the purpose of the study and informed them that the researcher would telephone them within a week to schedule an appointment. This approach made the initial telephone contact not unexpected. They were prepared for the call and were given time to adjust to the thought of an interview. The mail-out was also useful because three of the letters were returned, indicating these respondents were no longer at the University. The remaining 47 participants were contacted, with 37 agreeing to an interview. Of the 10 dropouts, five of the participants were going on leave, and the remaining five did not respond to the telephone or email messages left for them.

All of the 37 interviews were conducted by the researcher over a period of five weeks. The interviews ranged from 30 – 45 minutes. The researcher was aware of the busy schedules of the participants and made sure that the interview did not impinge on too much of their time. The participants were given the option of viewing the interview schedule prior to the interview. Approximately one third of them chose to do so. An important part of the interview protocol was that prior to the commencement of the interview each participant was asked to give their consent for the interview in writing (see Appendix B.7). Permission was also sought for the tape recording of the interview. Using the tape recorder enabled the researcher to keep constant eye contact with the respondent and observe their body language. Developing an atmosphere that fosters trust and ease is of utmost importance not just for the interview to be worthwhile, but especially if there was the need to continue contact with the participant – as was in this case in the longitudinal phase of the study. This interview was seen by the researcher as the start of the ongoing data collection for the next phase – monitoring case studies on a monthly basis over two semesters.

At the end of each interview the researcher thanked the participant and informed each one of them about the next stage of the research. Each interviewee was then asked whether they would be prepared to participate in the following stage which involved monitoring individual ICT changes which occurred over a 12 month period, on a monthly basis. For this purpose a special electronic tracking proforma was designed to record responses on their ICT use (Appendix A.4 provides a copy of the proforma). This proforma, called the TracIT report, was presented to the interviewees and explained with examples (see Appendix A.5). It was acknowledged that this would be a major commitment by the participants as this phase would last 12 months. In support of Stake (1994) who notes that 'people are generally cooperative' – 32 of the 37 participants agreed to be part of the longitudinal study.

> *People are generally cooperative, often pleased to have their story known, happy to help someone do their job, although not optimistic that the research will be of benefit to them…Some fieldworkers like to offer something in exchange for the favours.* *(Stake, 1994, 59).*

Of the five that declined, one was retiring from the University, three were leaving the University and one responded that he could not for-see that there would be any changes in his ICT use. The researcher felt that some incentive was warranted and agreed to return the information they supplied over the year, as part of their own ICT portfolio. Having the participants review the information was also another way of validating the data.

Stage Three: Tracking Change – Case Study Participants

The TracIT report was used as a guide to help the case study participants focus on specific ICT issues (Appendix A.4). Table 6.3 provides an example of the TracIT report proforma.

Table 6.3: Sample TracIT Report Headings

August 1999 - Change in ICT Use				
Teaching	**Students**	**Training**	**ICT Support**	**ICT Facilities**

The headings of the TracIT report were: Teaching; Students; Training; ICT Support and ICT Facilities. As time progressed the case study participants ventured outside these boundaries and used the headings simply as a reminder or focal point. It is important to note that individual profiles (reflecting ICT use, access, attitude and views of ICT in teaching and learning) of the case study participants had previously been established through the survey and the interview data, however the TracIT report was used to identify changes which occurred over the subsequent 12 month period. This longitudinal data collection period allowed the researcher to note changes in the behaviour and attitudes of specific individuals and most importantly, to explore the origins of these changes.

Feedback from some participants indicated that the specific focus and simplicity of this form strongly influenced the decision of the participants to continue their participation in the study. This form was automatically E-mailed to each of the participants (as an E-mail attachment initially) at the end of each month. Four of the participants chose to complete hardcopies of the form. By the third month the participants who were using the E-mail attachment were given the option to simply type their comments in the text of the E-mail message (See Appendix A.6). This became a more favourable option. The participants were advised to simply return the E-mail if they could not identify any changes over the past month. On a number of occasions where participants were away at the end of a particular month they simply identified any changes in the following month's TracIT report, noting in which month the changes had occurred.

Phase Four: Curtin University Initiatives

This phase involved the identification of the strategies implemented by Curtin University of Technology which claimed to support and encourage the use of ICT by academic staff in their teaching and learning. For example, strategies such as the professional development of staff, incentives for staff to adopt ICT, support structures, and ICT infrastructure. These initiatives were identified by the following methods:

1. Extensive examination (content analysis) of relevant Curtin University policy documents.
2. Regular monitoring of Curtin University's electronic information dissemination systems, Curtin Web Page, Enews, Learning Matters, staff academic E-mail list.
3. Contact with key Curtin University personnel involved in ICT initiatives (i.e. Information Management Services, Centre of Educational Advancement, Office of Teaching & Learning).

As mentioned earlier, phases three and four occurred virtually simultaneously. The case study participants were monitored closely via the monthly TracIT reports to ascertain the extent to which the strategies implemented by Curtin University had filtered through to the teaching staff.

Phase Five: Analysis of the Total Data Set

A detailed description of the management and analysis of the data obtained from each instrument is provided in the section following the next section on triangulation. Importantly, data consolidation and analysis was ongoing throughout the data collection period as well as in phase five. The qualitative and quantitative data was analysed in relation to the specific research questions as well as any issues which had evolved beyond these research questions .

Triangulation and Validity

> *In our search for accuracy and alternative explanations, we need discipline, we need protocols which do not depend on mere intuition and good intention to 'get it right'. In qualitative research, those protocols come under the name 'triangulation'.* *(Stake, 1994, p 107)*

Stake (1994) identifies the following triangulation protocols: data source; investigator; theory; methodological; and member checking. Similarly Denzin (1970) designated the terms: time, space, combined levels, theoretical, investigator and methodological triangulation.

In this study the researcher attempted to use the following triangulation protocols:
Time Triangulation: The longitudinal design of this study attempted to take into consideration the factors of change and process.
Combined Levels of Triangulation: Utilising more than one level of analysis (individual level, interactive level and the level of collectives).
Methodological Triangulation: Adoption of a variety of methods (survey, interview, document analysis and ongoing data collection through the TracIT) to examine the same phenomenon.
Member Checking: A call upon the case study respondents to review the material for accuracy.

Yin (1994) refers to these triangulation protocols as 'tactics'. These tactics (multiple sources of evidence, chain of evidence and review by key informants) are employed to increase construct validity. Construct validity refers to 'establishing correct operational measures for the concepts being studied' (Yin, 1994, p 36). Due to the amount of resources required, especially time, only mainstream data in this present study was triangulated.

One of the main criticisms of qualitative research designs is the general threat to external validity inherent in the approach, in particular the degree to which the findings can be generalisable to the population from which the participants were drawn. According to Borg & Gall (1989) the degree to which the sample is representative of the population from which the sample was drawn is called 'population validity'. They claim that randomly chosen case studies from the target population leads to bias because of the unique characteristics of the cases chosen. In the case of this research project a process of stratified sampling was applied which generated a subsample which was representative of the whole population in terms of certain criteria. Applying this criteria provided the researcher with an even balance and spread of subjects, which was representative of the whole population, thus making the findings more generalisable.

Another threat to external validity is the effect the experimenter has on the data collected - in other words, the biases or the expectations of the observer can lead to distortions of the data. It has been well documented that interviews are highly subjective and are more subject to such biases than are most of the methods used by quantitative researchers. It is also important to acknowledge the very real existence in this study of the Hawthorne Effect - "any situation in which the experimental conditions are such that the mere fact that the subject is aware of participating in an experiment, is aware of the hypothesis, or is receiving special attention, tends to improve performance" (Borg & Gall, 1989, p189). The fact that the participants were involved in this particular study which focussed on their personal ICT use and working environment, could have made a contribution to the actual changes which subsequently occurred. In order to counter such an effect in this particular study, the researcher went to great lengths to identify the changes which occurred and the origins of these changes, for each individual case study participant.

Internal validity is the degree to which the results can be skewed by outside variables, other than those identified in the study. Borg & Gall (1989) identify the main elements which seriously threaten internal validity in qualitative research as history, maturation, experimental mortality and instrumentation. Those which are pertinent to this particular study are maturation and experimental mortality. Maturation refers to changes which occur during the study and experimental mortality refers to the loss of participants during the length of the study (Borg & Gall, 1989). The researcher was unable to control either of these events, however regarding the maturation effect, the use of three different types of data collection techniques at different points in time, certainly helped identify those external variables which would impact on the actual results. The loss of subjects did occur over the course of the study which obviously impacted on the final balance of the case study participants. However, given that the original selection was 50 staff, with 37 being interviewed and 32 of this cohort, participating in the final phase, the final sample was clearly adequate. Table 6.4 shows the balance of integration level for each of the sample selected for the initial case study sample.

Table 6.4: Original Case Study Selection

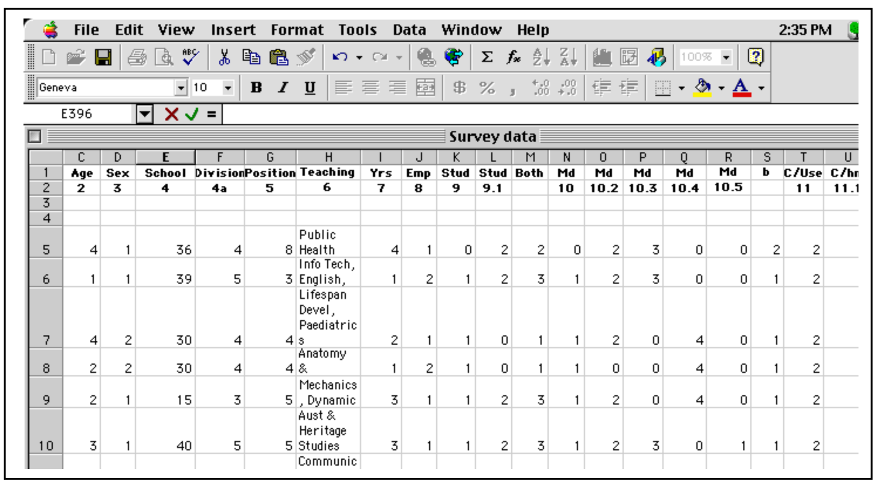
Sample	Very Low	Low	Medium	High	Very High
50 originally selected	10	10	10	10	10
37 interviewed	5	8	7	9	8
32 final case study sample	5	8	7	5	7

Data Management & Analysis

Reid's (1992) three phases of data management (data preparation, data identification, and data manipulation) provide an appropriate scaffold for the processes adopted for this study.

Data Preparation in this case involved entering the coded survey responses into the spreadsheet program Excel, transcribing the interviews, formatting the monthly TracIT reports into one document representing individual profiles and entering notes from documents, observations and interaction with key informants. The process of *data identification* refers to dividing text into meaningful and easily locatable sections of information. Yin (1994) calls this the '*case study database'*. The software program Microsoft Excel was used to store and code the data generated from the CUIT survey. Figure 6.3 provides a screen capture of a small window of the coded data for the CUIT survey. Each question was identified by the number in the top row and was allocated one column, while each respondent was identified by a number on the left hand column, and their individual data was contained in one row.

Figure 6.3: Sample of the Coded CUIT Survey Data

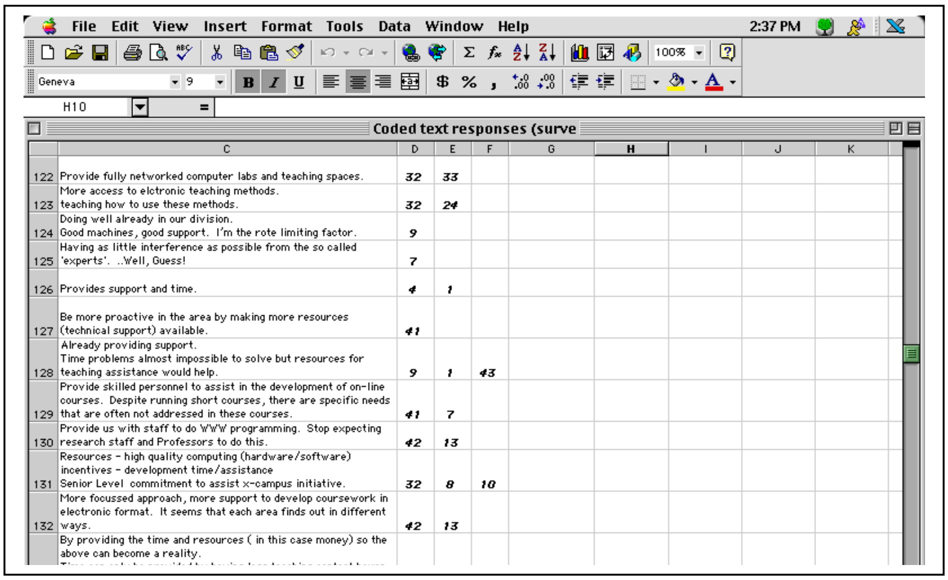


	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	Age	Sex	School	Division	Position	Teaching	Yrs	Emp	Stud	Stud	Both	Md	Md	Md	Md	Md	b	C/Use	C/hr
2	2	3	4	4a	5	6	7	8	9	9.1		10	10.2	10.3	10.4	10.5		11	11.1
3																			
4																			
5	4	1	36	4	8	Public Health	4	1	0	2	2	0	2	3	0	0	2	2	
6	1	1	39	5	3	Info Tech, English,	1	2	1	2	3	1	2	3	0	0	1	2	
7	4	2	30	4	4	Lifespan Devel, Paediatrics	2	1	1	0	1	1	2	0	4	0	1	2	
8	2	2	30	4	4	Anatomy &	1	2	1	0	1	1	0	0	4	0	1	2	
9	2	1	15	3	5	Mechanics, Dynamic	3	1	1	2	3	1	2	0	4	0	1	2	
10	3	1	40	5	5	Aust & Heritage Studies	3	1	1	2	3	1	2	3	0	1	1	2	
						Communic													

The majority of the fields were number fields with the exception of a small number of text fields. The coding structure for the CUIT survey is located in Appendix C.1.

Data manipulation consisted of putting the quantitative data through the usual rigors of analysis relevant to the research questions. Due to the sheer amount of information collected, the open-ended questions in the CUIT survey required some form of quantification. However, in order to maximise the benefits of the qualitative data, the overall flavour of the data was preserved as much as possible. The responses to each question were transferred to tables using Microsoft Word (Version 98). Key words and phrases were used as descriptors to establish themes which emerged from the data. The statements were then coded accordingly. The software applications MS Word and MS Excel were used in this process, Word to store the large amount of text and then Excel to code the data. Figure 6.4 provides a screen capture of the coded data. As the screen capture indicates that some of the responses contained a number of additional issues which were then coded accordingly.

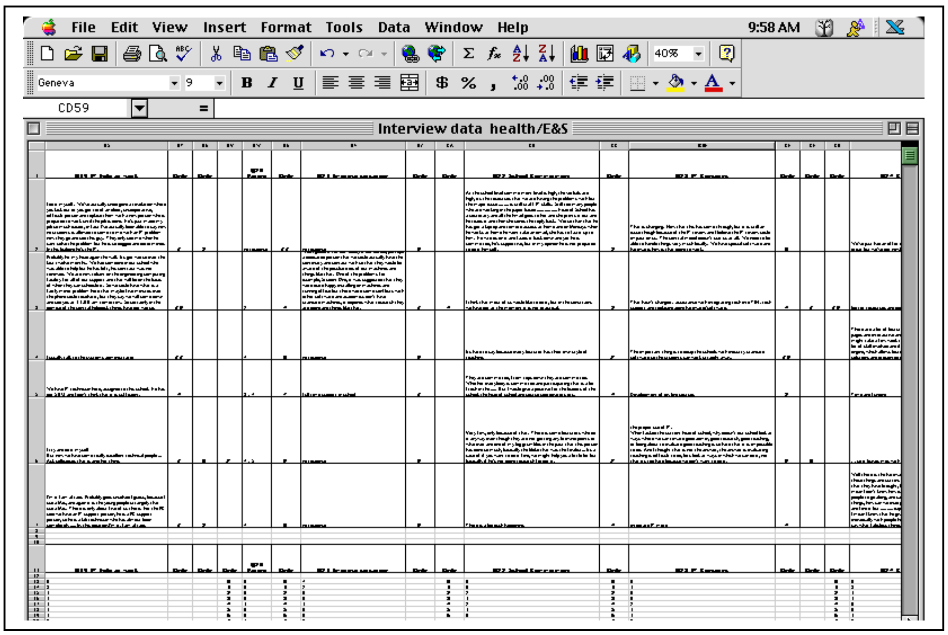
Figure 6.4: Sample of the Coded Text CUIT Survey Data



Data manipulation of the qualitative data in this study involved sorting, rearranging, retrieving and continual searching the data set. Verbatim transcripts of each interview provided the most appropriate database for analysis. In order to validate the written transcriptions, the researcher and a colleague listened to each tape together while reading the transcript. Errors were corrected and sentences were completed. This exercise allowed the researcher to identify any nuances in the respondent's speech – elements which are unidentifiable in the written form. The exact tape position for each question was also noted in case there was a need to review certain aspects of the interview.

The themes and issues which emerged from the interview data were able to be quantified fairly simply as the majority of the themes and issues which surfaced were similar (data identification). A database (using Excel) evolved which included numerical codes and the statement/s the code was linked to. This enabled the researcher to obtain a larger picture of the overall data, as well as be sensitive to the qualitative data (See Appendix C.2 for the coding structure which evolved from the interview data). Figure 6.5 provides a screen capture of the text from the interview and the respective codes.

Figure 6.5: Sample of the Coded Interview Data

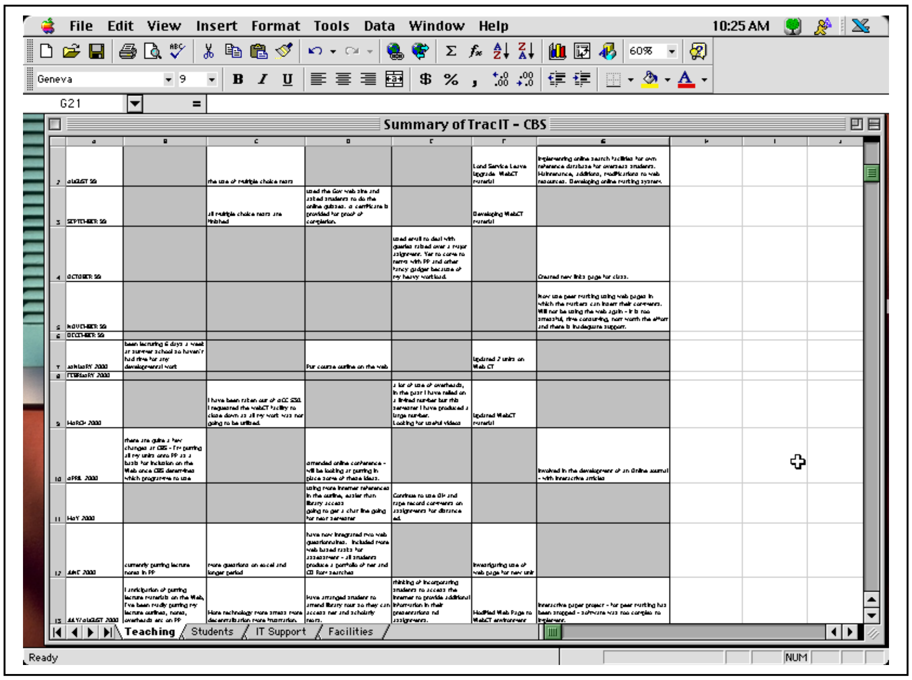


The data from the monthly TracIT reports were collated in a number of ways.

- Individual Case Study - A twelve month overview for each individual case study regarding their ICT use and environment (See Appendix D.1 for an example).
- Focus Areas - The comments made for each month on the TracIT Report were summarised and divided into comments which reflected 'real change' in the individual's usual pattern of ICT use and those comments which simply reflected their existing pattern of use. If the comments obtained elements of each category (real change and existing pattern of behaviour) the comments reflecting 'real change' subsumed the others. In this instance the importance of identifying real change and attempting to trace the origins of these changes outweighed the importance of descriptions of existing patterns of behaviour or environment. In other words 'real change' was seen as a behaviour which had not been identified

either in the CUIT survey or the interview data. These comments were placed into a database relating to each focus area (teaching, students, training, ICT support, and ICT facilities). Appendix D.2 provides an example.

Figure 6.6: Sample of the Coded TracIT Reports Reflecting Real Change.



The purpose for manipulating the data in this way was to respond to the focus of the research questions as well as to establish a micro and macro view of the changes which occurred over the 12 month period.

A synthesis of the data from the instruments (CUIT survey, Interview, TracIT) over the 16 month period (total duration of the study) enabled the researcher to develop a descriptive portrait for each individual case study participant which reflected their ICT regime. See Appendix D.3 for an individual profile - please note that certain information has been omitted to ensure anonymity. These individual profiles became invaluable as they enabled the researcher to:

- identify similar attributes found in other case study individuals in the same level of integration.
- compare the attributes of individual case study participants with the whole case study sample in order to assign them a 'university rating' which reflected the level of ICT use in their teaching & learning. The rating each person assigned themselves

in the CUIT survey depended on their perception of the relative ICT use of their colleagues within their School/Department, whereas the 'university rating' compared the whole case study sample from across the University.

An important strategy to note is that the analysis was a continuous process that was adopted throughout the data collection phases of the study. The importance of such a strategy was identified by Merriam (1998).

> *A rich and meaningful analysis of the data will not be possible if analysis is begun after all data are collected (Merriam, 1998, p177).*

Data Storage

All original data will be kept secure for at least five years by both the researcher and the Faculty of Education, Curtin University of Technology. These data were in the form of hardcopies of documentation as well as electronic sources, stored on computer disks. The data will be clearly labeled for easy access.

Ethical issues

Throughout the study, all precautions were taken to ensure that the research was conducted in a professional and ethical manner. The Deputy Vice Chancellor of the Office of Teaching and Learning Division and Head of the Centre for Educational Advancement were fully informed about the nature and progress of the study. Permission was sought from appropriate bodies to view any policy documents which were beneficial to this study. Anonymity of participants was ensured by following a standard set of protocols for dealing with sensitive professional information. Each teaching staff member approached was asked to participate on a voluntary basis to become a case study participant and asked to give written permission of their participation. All of the interviewed participants were asked to validate interview transcripts and summaries for accuracy.

Problems Encountered

Due to the length of the study it was inevitable that some of the case study participants would not be able to participate with the full length of the data collection period (12 months). Two of the 32 case study participants dropped out of the study after 6 months – one going on long service leave.

> *I'm afraid I will be on long service leave during first semester so will not have anything to report. In fact I don't anticipate any changes to the responses I have been giving you recently - at least not in the foreseeable future.*
> *(ID27:July2000).*

The other left the University to take up a position overseas.

Even though the facility of electronic mail is efficient and immediate, sending 32 emails at the end of each month was time consuming. Creating an electronic list was not an option (which is what would normally happen with a group) as the researcher placed a great deal of importance on the personal touch. An email list is generic and would not allow the researcher to address each participant individually by name. This personal touch appeared to be very important for the participant's monthly response.

Another issue which was time consuming was having to send reminders to the participants who had not returned their TracIT report. If the participant did not have any changes to note they were asked to simply return the email. This was important otherwise the researcher was not aware if there had been any changes or not in the month under review.

Summary

This chapter identifies the research methodology adopted for this particular study. A combination of qualitative and quantitative methods were employed, however the predominant methodology is best described as a case study approach, where Curtin University of Technology is defined as the case.

The research design involved five key phases which were: Literature review and document analysis; the survey; case study participants; Curtin University initiatives; and finally the analysis of the total data set. The need for triangulation is identified as well as the particular triangulation protocols followed by the researcher in this study were identified. These protocols involved time triangulation, combined levels of triangulation, methodological triangulation and finally, member checking.

Reid's (1992) phases of data management provided a useful scaffold for this particular study. The data were prepared, identified, and manipulated with the aid of Microsoft Word and Excel. A synthesis of all of the data (CUIT survey, interviews, TracIT reports) enabled the researcher to develop individual profiles which became invaluable in responding to the initial research questions as well as identifying the changes which occurred over the 16 month period and examining the origins of these changes.

Throughout the study the researcher followed the appropriate protocols regarding data storage and ethical behaviour. One of the main problems in such a lengthy study was that some of the case study participants could not participate in the longitudinal phase of the study.

CHAPTER SEVEN

Research Question One: Results

How are Curtin University teaching staff utilising ICT in their teaching and learning?

Introduction

This longitudinal study has drawn upon qualitative and quantitative data to present a comprehensive profile of the teaching staff at one tertiary institution (Curtin University of Technology) with respect to their involvement in utilising Information and Communication Technology (ICT) in their teaching and learning. This chapter presents the data collected in the study which bears on the first research question, as restated above. These data were obtained through the Curtin University Information Technology survey (CUIT survey), the Interview Schedule, and the TracIT Report (Appendices A.1, A.3, and A.4 respectively).

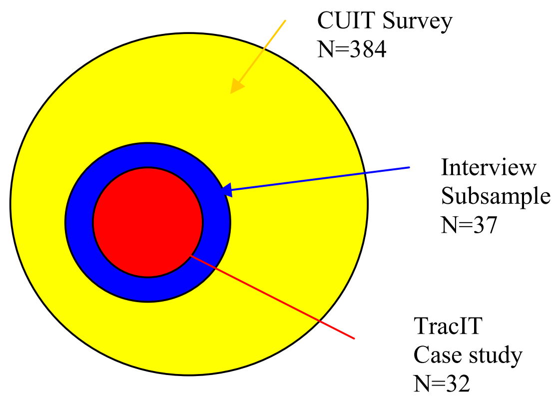
This chapter has been divided into two main sections. The first section outlines how the teaching staff at Curtin University are utilising ICT by providing detail about the background of the samples, the teaching mode, the ICT training experience, the existing facilities at the University, the patterns of ICT use and how ICT is used in teaching and learning.

The second section of this chapter focuses on data relating to the barriers identified by the teaching staff at Curtin University regarding their adoption of ICT. This particular section examines staff support, attitudes toward the use of ICT, and ICT facilities. It is important to state at this stage, that this particular results chapter does not include a final summary.

How Teaching Staff Utilise ICT

This section presents the data obtained from those instruments used to examine the use of ICT by Curtin University teaching staff. It also attempts to provide background information of the sample and subsample used in the study and describes the teaching staff's working environment. Figure 7.1 depicts the relationship between each of the samples and the corresponding instrument.

Figure 7.1: Sample Population Used for the Study



Background Information

As outlined in Chapter Six, a questionnaire described as the Curtin University Information Technology survey (CUIT survey), was sent to all full time staff who were actively teaching in semester one, 1999 at Curtin University of Technology (N=715), with a return rate of 54%. The survey was made available in hardcopy as well as electronic form via the Internet at (http//:www.iinet.net.au/~humbert/survey.html). The responses represented teaching staff from all main Divisions of the University (Engineering and Science, Health Science, Humanities, Curtin Business School, Kalgoorlie and the Muresk Campus).

Chapter Six outlined the method of selection for the interview subsample in detail, including the factors which contributed to the final 37 interviews being conducted. By linking individual interviews with the database which stored the overall survey information, the researcher was able to personalise each interview enabling the researcher to confirm and clarify some of the specific issues raised with each individual (see Appendix A.3). As discussed earlier, the main purpose of the interview was to gain a deeper awareness of the respondents' ICT culture.

The TracIT reporting mechanism, also described in Chapter Six, followed in sequence from the individual interviews and was used by 32 cases (5 of the 37 who were interviewed chose not to participate in this ongoing phase), over the 12 month period, August 1999 – August 2000. The purpose of this reporting mechanism was to identify changes which had occurred over the 12 month period regarding their use of ICT. At the end of each month, the participants were asked to identify any ICT changes which had taken place, with specific focus on the areas of teaching, students, training, ICT support and ICT facilities. Appendix D.4 contains a sample TracIT report, appropriately disguised to ensure anonymity.

Table 7.1 provides the background information of the Curtin University of Technology population (provided by University Planning), CUIT survey sample, the interview subsample and the case study participants, according to the data derived from the CUIT survey.

Table 7.1: Background Information of the Respondents

Background Information		Curtin University Population March 1999	CUIT survey Sample (N=384) %	Interview Subsample (N=37) %	Case Study Sample (N=32) %
Gender	Male	64	60.4	70.3	68.8
	Females	36	39.6	29.7	31.3
Age	20 - 29	6	3.1	8.1	6.3
	30 - 39	27	25.0	21.6	21.9
	40 - 49	34	33.9	35.1	31.3
	50 - 59	28	32.3	24.3	28.1
	60 - over	5	5.5	10.8	12.5
	No response		0.3	0.0	0.0
Years at the University	0 – 5 years		41.7	48.6	46.9
	6 – 10 years		24.7	24.3	25.0
	11 – 15 yeas		15.4	10.8	9.4
	16 - over		18.0	16.2	18.8
	No response		0.3	0.0	0.0
Employment Status	Tenured		61.5	64.9	65.6
	Contract		32.2	32.4	31.3
	No response		6.3	2.7	3.1
Position	Senior Research Fellow		4.7	0.0	0.0
	Associate Lecturer	14	7.3	2.7	0.0
	Lecturer	43	50.8	62.2	65.6
	Senior Lecturer	23	19.8	29.7	28.1
	Assoc/Prof & Professor	19	15.1	5.4	6.2
	No Response		2.3	0.0	0.0
Teaching Responsibilities	Undergraduates		35.2	31.1	34.4
	Postgraduates		9.6	2.7	3.1
	Undergraduates & Post		53.4	62.2	62.5
	No Response		1.8	0.0	0.0
Division	Curtin Business School	20	16.9	24.3	21.9
	Engineering & Science	24	15.9	13.5	15.6
	Health Science	25	24.7	27.0	28.1
	Humanities	25	26.8	24.3	25.0
	Kalgoorlie/Muresk	6	13.0	10.8	9.4
	No Response		2.6	0.0	0.0

An overall examination of Table 7.1 reveals that a typical profile of the CUIT survey respondents were: male; between the ages of 40 – 59; had been working at the University between 0 – 5 years; had obtained tenured employment; and occupied positions at lecturer level. The Humanities and Health Divisions had the highest representation, followed by the Business School and the Engineering and Science Divisions. Kalgoorlie and Muresk campuses had the smallest representation in the sample. Table 7.1 also reveals that the majority of the interview subsample reflected a similar profile to that which characterised the overall CUIT survey sample.

Common Teaching Mode

Identifying which teaching mode staff employed in their teaching was an important issue addressed in the CUIT survey, the individual interviews and the TracIT reports. The respondents were asked to identify which teaching mode/s they utilised in their teaching. The results indicated that 86.7% of the respondents utilised a lecture and tutorial (workshop or laboratory) mode. The tutorial (workshop or laboratory) as the sole teaching mode was adopted by 10.2% of the survey respondents, while 2.1% of the sample relied solely on the lecture mode. A further 0.5% taught only in the external and distance mode, while 0.3% of the sample utilised an online structure. In addition, 4.7% of the total sample of staff employed Web-based units in their teaching. Table 7.2 identifies the teaching modes adopted by the total survey sample and the interview subsample, according to the CUIT survey data.

Table 7.2: Teaching Mode Utilised According to the CUIT survey

Mode Of Teaching	CUIT survey % N=384	Interview Subsample % N=37
Lecture and Tutorial (Workshop or Laboratory)	86.7	91.9
Tutorial (Workshop or Laboratory)	10.2	5.4
Lecture	2.1	2.7
External & Distance	0.5	0.0
Online	0.3	0.0
Web-based units within the above structures.	4.7	8.1

As indicated in Table 7.2, within the overall CUIT survey data, the interview subsample reflected similar teaching mode patterns to the larger sample with 91.9% employing the lecture and tutorial (workshop or laboratory) mode, 5.4% teaching in a tutorial, workshop, or laboratory environment, and 2.7% utilising the lecture mode solely. In addition, a total of 8.1% of the interview subsample employed Web-based material in their teaching according to their CUIT survey data.

An important outcome of a comparison between the interview subsample CUIT survey data and the actual interview data (conducted some three months later) was that the number of respondents using Web-based materials in their teaching and learning had dramatically increased from 8.1% to 32.4%. According to this interview data the individuals who had adopted Web-based materials fell into two distinct groups. The first group were those who had created course material specifically designed for the WebCT environment. The use of WebCT ranged from delivering course material, providing online quizzes for the students and applying the bulletin board or chat functions. The second group identified were those who had utilised a variety of software packages to create and convert their resources into Web pages for Internet access. All of the respondents who were in the second group used the Internet simply to deliver the course material. Of the 32.2% who applied Web-based material to their units, 67% used the Internet/WebCT as a vehicle to deliver course material. The remainder adopted various interactive features of the WebCT environment such as, internal E-mail, quizzes, bulletin boards and chat rooms.

A further 13 months from the time the interviews were conducted, the TracIT reporting system revealed a further increase in the number of case study respondents who were using Web-based material to 54%.

ICT Training

Section III of the CUIT survey asked the respondents to identify the nature of any ICT training in which they had participated. The following general categories were offered: none/self taught, general courses, specific software courses, interventions relating to integrating technology into teaching and learning, and other. The total sample were given the opportunity of selecting more than one of these options, when appropriate. Table 7.3 outlines a summary of their responses.

The data in Table 7.3 reveals that very few (1.8%) of the CUIT survey population had undergone any formal information technology training. In fact it clearly demonstrates that the majority (61.7%) of them are self-taught and have none or very little training (Code 1 + 2).

Table 7.3: Information Technology Training Participation (CUIT survey)

Code	Responses	N=384 %
1	Self Taught	40.6
2	Self Taught + (General or Specific Software or Integrating Technology)	21.1
3	Self Taught + General + Specific Software + Integrating Technology	4.9
4	Self Taught + General + Specific Software	2.9
5	Integrating Technology	0.5
6	Integrating Technology + (Specific Software or General Courses)	1.6
7	Integrating Technology + General + Specific Software Courses	2.3
8	Specific Software Courses Only	10.7
9	General Courses Only	7.3
10	General + Specific Software Courses	5.7
11	Others - Formal Training	1.8

During the interviews those who had previously answered on the CUIT survey that they had received some training (either general, specific software, or some intervention relating to integrating into teaching and learning) were asked *"When and what was the last training session you attended?"*. Some of the respondents mentioned that they had attended more than one training session. WebCT appeared to be the most prominent course topic indicated by 27% respondents. A total of 43.2% of the respondents identified a variety of specific software courses they had attended, including courses relating to *Microsoft Word, PowerPoint, Student One, Endnote, Windows,* the *Internet* and *E-mail.* However it is important to note that, of those who did attend training sessions, only three of them noted that they had incorporated in their work what they had specifically learned in that training.

Those respondents who had not undergone any training were asked how they had taught themselves to use ICT. The most common response made by the respondents in this category (46%) was that they *"worked things out themselves"*. "Support from other people" and turning to "books/manuals" were the other two main factors (21.6%).

Existing Facilities

Prior to establishing how teaching staff were using ICT in their teaching and learning it was important to determine their accessibility to certain hardware equipment. The overall CUIT survey data revealed that 97.9% of the sample used a computer at work, with a slightly smaller number (91.9%) who used a computer at home. A large majority of the teaching staff had access to E-mail (97.4%) and the Internet (96.6%) at work, however access to these facilities was not as high at home – 63.8% had E-mail access at home, while 64.8% had Internet access at home.

Question 14 *(Describe your ICT facilities at home)* of the Interview Schedule revealed that 78.4% of the sample had access to 'standard equipment' at home, standard being defined as – a computer, a printer and internet access. It was interesting to note that 10.8% had set up their own computer network at home – in other words, they had installed more than one computer at home and had access to the necessary skills to network them. The overall CUIT survey data established that all of the interview subsample used the computer at work and all of them had Internet and Email access. The subsequent interviews revealed that this was at the time of the interview true of all of the respondents excluding one, who did not at that time have a computer at work (Q14:ID181).

Patterns of ICT Use

Section II of the initial CUIT survey dealt with the issues of access (computer, Internet and E-mail) as well as the frequency of their use (frequently, sometimes or rarely). Table 7.4 identifies existing patterns of ICT use at home and at work, as derived from the survey data.

Table 7.4: Percentage of ICT Use (CUIT survey)

Percentage of Computer Use	***Work***		***Home***	
	Frequently	95.2	Frequently	73.9
	Sometimes	3.7	Sometimes	22.1
	Rarely	0.5	Rarely	4.0
	No Response	0.5	No Response	0.0
Percentage of E-mail Use	***Work***		***Home***	
	Frequently	92.5	Frequently	46.9
	Sometimes	4.0	Sometimes	28.2
	Rarely	0.5	Rarely	22.4
	No Response	2.9	No Response	2.4
Percentage of Internet Use	***Work***		***Home***	
	Frequently	63.9	Frequently	42.6
	Sometimes	28.0	Sometimes	35.7
	Rarely	5.1	Rarely	19.7
	No Response	3.0	No Response	2.0

Not surprisingly, a comparison of this data indicates that the computer, along with the specific use of the Internet and Email, is used to a far greater extent in the work environment as opposed to home.

Integration of ICT into Teaching and Learning

Question 16 in the CUIT survey linked directly to the theoretical framework adopted by Rogers (1995) in his work about the diffusion of innovations. This question was a crucial one in that it not only provided a picture of the teaching staff's level of integration of ICT into their teaching and learning, but the levels were also used to select the interview subsample. Question 16 asked the respondents to rate the degree to which they had integrated ICT into their own teaching and learning practices, based on Rogers' (1995) adoption of innovation categories. This self-rating exercise was intended to gauge their integration status compared to their perceptions of the standards of their colleagues within their own School/Department - in other words, they were required to rate themselves against their colleagues. The rating sought was on a five point scale, ranging from very low to very high. Figure 7.2 represents this rating data.

Figure 7.2: Individual Rating within School/Department (CUIT survey N = 384)

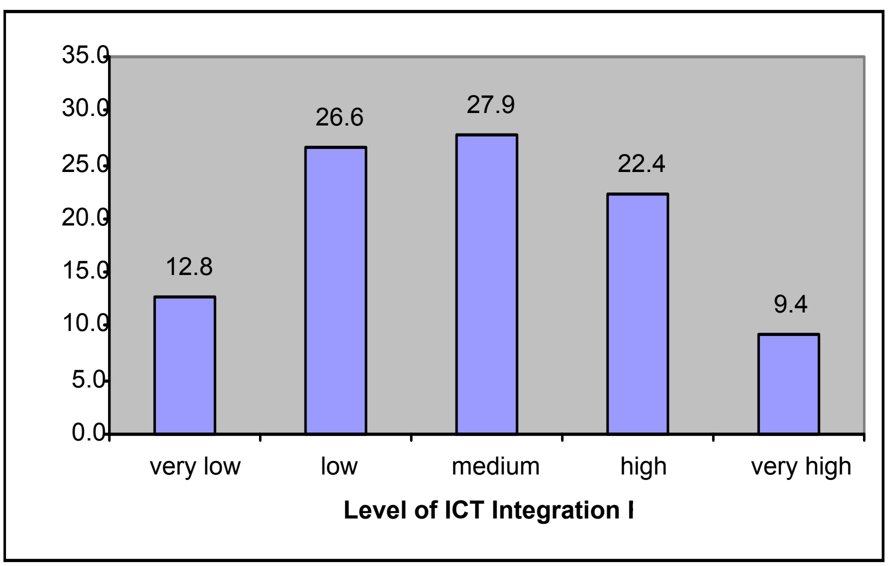


Figure 7.2 indicates that 9.4% of the respondents considered themselves to have integrated IT into their teaching and learning to a 'very high' degree compared to their work colleagues in their own School/Department. The majority (54.5%) of the

respondents rated themselves in the middle range (either low or medium) – a similar pattern of innovation uptake was identified by Rogers (1995).

The researcher identified early in the design stage that this particular question would be a difficult one for the researcher to validate, due to it being a self-assessment of the respondents behaviour compared to their perceptions of other colleagues within their School/Department. However it was considered to be important for the respondents to have some benchmark on which to make a comparison. This question was also a crucial question because this information was to be used to help identify the interview sample in the follow-up phase of the data collection.

In order to validate these self-ratings and determine an accurate and more detailed account of the respondent's ICT use, other questions in the CUIT survey were designed to confirm this selection. For example (Q17), the respondents were asked to indicate *the type of software they used to prepare for their teaching, the type of software they used during their teaching and the type of software they expected their students to use while taking their unit/s.* The respondents were presented with a similar table to Table 7.5 and were asked to place a tick (✔) in the appropriate column. Table 7.5 identifies the types of software nominated and the percentage of the sample who utilised the software in the three specific areas – to prepare for teaching, during teaching sessions and software they expected their students to use.

Table 7.5: Type of Software and Their Uses (CUIT survey)

Types of Software	To prepare for teaching	During teaching sessions	Expect students to use
Word-processing	95.1	18.8	74.2
Spreadsheet	50.8	12.5	32.3
Database	11.2	2.6	6.5
Statistics	18.8	6.5	16.7
Communication - email	67.7	10.2	45.1
Communication - video conferencing	6.5	3.6	2.3
Web Browsers	73.7	15.4	51.3
Internet Tools	21.9	7.0	14.1
Presentation software	56.0	34.4	23.7
Desktop Publishing	10.7	3.6	3.9
Compilers	6.0	2.1	5.5
CDROM's	34.4	10.2	19.3
Courseware	4.4	3.1	3.1
FTP	14.3	2.9	6.3
Other	9.4	7.0	8.3

The more prominent software adopted in each of the three areas is identified by the shaded cells. Word-processing software was certainly the most prominent software being used by staff to prepare for their teaching (95.1%) as well as the most important software that they expected their students to use (74.2%). The Internet appears to be widely accepted, evidenced by the high frequency of use at work (61.7%) and the fact that 73.7% of the teaching staff surveyed utilised Web Browsers in order to prepare for their teaching. Even though a large majority used Web Browsers, only half (51.3%) expected their students to use the Internet.

The other main software applications that teaching staff used to prepare for their teaching were Communication software - Email (67.7%), Presentation software (56%) and Spreadsheets (50.8%). The top five software applications used to prepare for teaching were also the top five expected to be used by the students: Word-processing, Web Browsers, Communication, Presentation, and Spreadsheets. The data demonstrated that there is not a significant percentage of teaching staff utilising any of the software during their actual teaching sessions. The only software that is used more during the teaching sessions (34.4%) than the software the teaching staff expect their students to use (23.7%) is Presentation Software, otherwise all of the other software is used a great deal less during actual teaching sessions. In other words, if one compares the figures for the categories "*during teaching sessions*" and "*expect students to use*", only a small sample of teaching staff are modelling the use of particular software applications. The top five software applications teaching staff utilised "*during their teaching*" sessions were: Presentation software (34.4%), Word-processing (18.8%); Web Browsers (15.4%); Spreadsheet (12.5%); Communication (10.2%).

As noted earlier in this chapter, this specific question (Q17) in the CUIT survey was also used to confirm the individual ratings the respondents had assigned themselves. Those who had given themselves a very low rating tended to be those who had not selected any or very few software applications, and those at the other end of the scale tended to be those staff who had selected a large variety of software in all of the three categories.

The confirmation of these self assessments was further tested in greater detail through the interviews and the monthly TracIT data with the interview subsample. In each interview the respondents were asked to provide examples of how they used the software they had identified in the CUIT survey in their own teaching and learning. Close examination of their responses revealed that 29 out of the 32 respondents confirmed the software they were using and the software they expected their students to use by providing examples – 90.6% accuracy in comparison to their original survey responses.

Question 12 for the Interview subsample *(From your observation do many of your colleagues in this School/Department utilise ICT in their teaching?)* forced the respondents to make a judgement about the ICT use of their work colleagues, enabling the researcher to compare each individual's ICT rating with those of the rest of the School/Department. Table 7.6 represents the six response categories which were derived from answers to this question.

Table 7.6: Colleagues using ICT (Interview)

Responses	**Sample N=37 (%)**
Yes	45.9
No	13.5
A Minority	21.6
I Don't Know	10.8
It Varies	5.4
Other	2.7

Nearly half of the respondents (45.9%) observed that the majority of their colleagues were using ICT in their teaching & learning. It was also interesting to note that 10.8% of the respondents did not know whether their colleagues were using ICT or not in their teaching. For example one stated "*Actually we haven't discussed it in depth with others" (Q12:ID217).* The key issue here is whether the respondents were able to make a judgement on the ICT use of the majority of their work colleagues and the figures indicate that 89.2% were able to make such a judgement. It was hoped that being able to detect this behaviour (even though subjective) would enable the respondent to make a more accurate self-rating.

As noted earlier in Chapter Six, the initial interview subsample that was selected represented an even spread of the levels of integration (2 from each level in each Division), with Table 7.7 showing the level of integration the actual interview subsample assigned themselves in the CUIT survey.

Table 7.7: Level of Integration Distribution (N=37)

Level of Integration	Sample Distribution %
Very Low	13.5
Low	21.6
Medium	18.9
High	24.3
Very High	21.6

Table 7.7 indicates that 13.5% of the interview sample rated themselves at a very low level with respect to their integration of IT into their teaching and learning, compared to colleagues in their School/Department. At the other end of the scale, some 21.6% of the interview sample rated themselves at the highest level compared to others within their School/Department.

The distribution for the interview subsample reflects similar distributions to the larger sample in the survey in three of the categories - however it differs in the other two. The two that differed were the medium and the very high categories. The survey distribution for the medium level of ICT integration was 27.9%, with 9.4% in the very high category. The interview subsample figures were 18.9% for the medium level of ICT integration and 21.6% in the very high level. As noted earlier this uneven spread was beyond the control of the researcher. Table 7.8 clearly identifies the level of ICT integration distribution for each sample according to the CUIT survey data.

Table 7.8: Sample Distribution for the Level of Integration (CUIT survey)

Level of Integration	CUIT survey sample (N=384) %	Interview subsample (N=37) %
Very Low	12.8	13.5
Low	26.6	21.6
Medium	27.9	18.9
High	22.4	24.3
Very High	9.4	21.6

It is important to identify the distribution of the level of ICT integration of each sample as this study attempts to identify the changes which occur over a certain period of time.

Factors Affecting the Adoption of ICT

The following sections attempt to identify those factors which may have had some influence in the uptake of ICT in teaching & learning by the teaching staff at Curtin University of Technology.

Staff Support

The CUIT survey attempted to identify factors which had hindered an individual's adoption of ICT in teaching and learning through a five point Likert-type scale, where the respondents could *Strongly Disagree, Disagree, Neutral, Agree or Strongly Agree* with the statements provided. The initial key probe generating each comment was "*I'd be likely to use technology more in my teaching if I"*. Table 7.9 identifies the factors (time, technical support, up-to-date information, training, collaboration with colleagues) relating to the issue of support for staff to adopt ICT.

Table 7.9: Support Issues (CUIT survey N=384)

I'd be likely to use technology more in my teaching if I:	*Strongly Disagree* %	*Disagree* %	*Neutral* %	*Agree* %	*Strongly Agree* %
Q. 27 Had more time to learn about using technology effectively.	3.6	3.6	13.0	31.0	43.2
Q. 24 Got more technical support.	3.4	7.3	23.2	32.0	29.7
Q. 21 Had up-to-date information on best usage in my area.	4.7	9.9	21.4	36.7	22.1
Q. 20 Received more technology training.	6.5	10.4	27.1	31.0	20.8
Q. 18 Could collaborate on using IT with colleagues who teach in my area.	6.5	12.0	38.3	26.8	8.9

These data clearly indicate that time is a major factor affecting the adoption of ICT with this group of respondents. A total of 74.2% of the respondents Agreed/Strongly Agreed that they would be more likely to use technology in their teaching if they had more time to learn about ICT. Technical support was also another contributing factor, where a total of 61.7% of the respondents Agreed/Strongly Agreed that they would use more ICT if they had more technical support. Having up-to-date information on best usage in their teaching area was also identified as an issue by 58.8% (Agree/Strongly Agree). More technology training was an issue for just over half of the respondents (51%). Being able to collaborate with colleagues on using ICT in their teaching area was an important issue for 35.7% of the survey sample (Agreed/Strongly Agreed).

In a similar way to the manner in which the CUIT survey was implemented, elements of the Interview Schedule were designed to identify those factors which contributed to the up-take of ICT by individuals. Specifically, question 19 of the Interview Schedule asked the respondents to identify what specific actions they carry out when they need ICT help at work. According to the responses, there appears to be a variety of strategies for staff support in place within the different Divisions/Schools/Departments of the University. Table 7.10 lists the strategies mentioned in the interviews by the subsample. It should be noted that in response to this question, some of the respondents identified more than one strategy.

Table 7.10: Individual IT Strategies (Interviews)

Responses	**No of Times Mention ed**	**(N=37) %**
IT Help Desk (Division)	17	45.9
IT Officer/s – Full Time (School/Department)	13	35.1
Ask a Colleague	10	27.0
Solve the Problem Myself	8	21.6
Computer Systems/Network Administrator	4	10.8
Web CT Help Desk	3	8.1
IT Officer – Part Time (School/Department)	2	5.4
Other	2	5.4

The interview probe question which followed Question 19, asked them to rate the effectiveness of this process, on a scale of 1 – 5, where 1 was ineffective and 5 was extremely effective. Table 7.11 reveals the ratings the interview subsample assigned their particular IT support process.

Table 7.11: The Effectiveness of the ICT Support Strategy (Interviews)

Rating	**% (N=37)**	
1 (Ineffective)	5.4	Dissatisfied
2	5.4	
3	10.8	
3 – 4	5.4	
4	29.7	Majority
4 – 5	18.9	
5	13.5	
Varies 1 – 4	5.4	
Unable to Rate	5.4	

According to the data in Table 7.11, the majority of the staff (62.1%) nominated a rating range of 4 – 5, indicating that they were fairly satisfied with the IT support process adopted within their Division/School/Department. It would appear that only 10.8% (rating 1 – 3) were dissatisfied with this process, while 10.8% appeared neutral. This figure is not consistent with earlier figures from the overall survey data (Q24, Table 8) where 61.7% Agreed/Strongly Agreed that technical support was a real issue in ICT uptake in their teaching and learning. The researcher (who conducted each of these interviews) observed that this question seemed to make those who were interviewed appear somewhat uncomfortable - the discrepancy in the figures may well be traced to the loyalty the respondents felt for their own ICT support people. In fact, comments made throughout the interviews and subsequent TracIT reports, revealed numerous examples of sympathy and empathy the respondents felt for their IT support people. Table 7.12 outlines some of these comments. The ID number noted is the individual's identification number which was issued on receipt of their CUIT survey form. The * symbol is used within the text to protect anonymity of the case study or their respective Department/School.

Table 7.12: Empathy for ICT Support Staff

ID & Source	Comment
ID255 Interview:Q 19	*It is difficult to go all over the whole building helping each person and I don't think that he wants to start that precedent because then people will call him first without trying themselves. The only time I call him right away is when my PC is down, then I will call him because I can't do a thing about that.*
ID97 Interview:Q19	*He's always hard to find, but very useful if you get hold of him.*
ID253 Interview:Q20	*Sometimes there are time delays and if I want something done I want it done now. But then I'm one of sixty people and I probably don't have any more rights than anybody else, but we all think that we are the only one that is busy.*
ID317 Interview:Q19	*He works long hours, on weekends and so on, but he's been over powered by all the work, overburdened and the others in the group are taking a different point of view and I find that because of him being overburdened he cannot cope with all the work*
ID181 TracIT:Aug 99	*We have a technician who is rushed off his feet.*
ID375 TracIT:Jan2000	*IT Support: they try but I think they are overwhelmed by the amount of work - If you are pushing the technology then it gets worse and there is insufficient support.*
ID337 TracIT:June2000	*Our IT person in the School of **** is really too busy. He has hardly any time to support individual lecturers. I have noticed it clearly the last few weeks when I tried to familiarise myself with a new Laptop computer.*
ID94 TracIT:July 2000 Interview:Q20	*We have one IT school support person. Busy with staff and students so does not have much time for individual support.* *He's either back on the phone or nab him in the passageway, poor man.*

The issues regarding staff support also surfaced in responses made in question 37, which naturally followed from the question 36. Question 36 asked whether they had any personal goals regarding the integration of ICT into their teaching, and if so what were they. This information assisted the researcher in identifying whether ICT was likely to feature in their future aspirations and hence be part of their work culture. Sixty-four percent of the respondents in the survey asserted that they did have personal ICT goals and were able to state them. There were a variety of responses - from very specific goals such as identifying a particular software package they wanted to use - to more general goals, such as to "*use technology more effectively as a teaching tool*" (ID88).

Table 7.13 reveals the categories which were derived from these responses (64% of the total survey sample) with specific examples of each. From the total survey sample, 243 responded to this question, with some of the respondents identifying more than one personal goal.

Table 7.13: Personal IT Goals (CUIT survey)

Personal Goals	**Times Noted**	**N=243 %**	**Examples**
Develop high quality online material	54	22.2	*Provide high quality and flexible content via on line delivery. ID:4*
Integrate technology throughout my units	32	13.2	*Better integrate IT into my teaching, though I'm working on it. ID:180*
Use PowerPoint to enhance lectures	24	9.9	*Use of PowerPoint where appropriate to enhance the quality of my lecture materials. ID:49*
Use technology appropriately and effectively with students	23	9.5	*To effectively use such tools to enhance my teaching and student learning. ID:266* *To ensure that IT supports course content, rather than using it just for its own sake. ID:291*
Web CT	22	9.1	*To get my units up on Web CT. ID:29* *Develop external unit via CD ROM and Web CT. ID:43*
Access to appropriate equipment	19	7.8	*Would be interested in using IT more if suitable equipment were available. ID:187*
Develop/Improve appropriate skills	18	7.4	*To become more skilful in the use of current software. ID:160*
Develop/use CAL software	14	5.8	*I would like to use computer assisted learning for courses based on number crunching so that students can get immediate feedback and attempt as many questions as they with to. ID:382*
Time	13	5.3	*Find more time to develop Web CT courses. ID:54* *More Time to explore options. ID:21*
Develop ICT skills /concepts in Students	9	3.7	*Have students more computer literate and less dependent on didactic teaching. ID:163*
Encourage/help others to become involved with IT	8	3.3	*To help other colleagues get involved in IT. ID:100* *100% integration – and try to get colleagues moving this way. ID:228*
Provide relevant experiences to the world	7	2.9	*To enable students to use the tools they will be expected to use as professionals. ID:25*

Table 7.13: Personal IT Goals (CUIT survey) (cont'd)

Personal Goals	Times Noted	N=243 %	Examples
Use Spreadsheets/Databases	6	2.5	*Develop an electronic database of images to facilitate student recognition of human tissue. ID:305*
Attend more training	5	2.1	*To attend/receive computer training – as from a generation where we did not have computers at school or Uni. ID:6*
Remain/Keep Up to date	5	2.1	*Kept up-to date with current technology and its application in schools/universities/business/ domestic. ID:19*
Access appropriate information on the net	5	2.1	*Accessing Web sites of important manufacturers from where latest developments can be kept track of. ID:10*
Technical Support	5	2.1	*I did have but have become disillusioned with the lack of support. The Uni now expects staff to do all of their own programming in their own time. ID:210*
Funding	4	1.6	*Requests for funding have been unsuccessful. ID:382*
Other	6	2.5	*Reduce the quantity of paper to be taken on the bus to mark assignments. ID:286*

Question 36 was included, not only to determine personal aspirations concerning ICT, but also to determine how Curtin University could help them achieve these goals (Q37). Such a question links directly to the issues of staff support. Table 7.14 presents the range of issues that were raised.

Table 7.14: Achieving Personal IT Goals (CUIT survey)

Survey Responses	Examples	% of individuals identifying issue
Resources	Funds Equipment	47.8
Support	Technical People On Line	42.4
Time	Time Release Time for Training Reduced Teaching Load	40.0
Training	Staff Development In House Training Free Courses	20.4
Policies and Planning	Commitment Incentives	16.0

Similarly to other questions in the Interview Schedule, question 24 was linked to each individual's survey data outlined in Table 7.14 in order to encourage further clarification. Table 7.15 identifies the responses made by the interview subsample, noting again that some respondents identified more than one issue.

Table 7.15: Achieving Personal IT Goals (Interviews)

Interview Responses	Times Noted	N=37 %	Examples
Provide Time	12	32.4	*Time release (ID:252)* *Yes time release that sort of thing. Bring in a part-time teacher, something to take over a certain module and therefore I have some spare time to do the courses. (ID:214)*
Provide Training	12	32.4	*But if somebody came along and really divided it into that. Even if it was half a day for a while, I would. I would put in the effort because I can see it has advantages to me. (ID:237)*
Provide ICT Expertise	9	24.3	*I think it would be wonderful to pay someone to go ahead and do it. I think in the long term it would be cost effective if someone had the skills instead of us battling to try and learn to do it whilst we are doing it (ID:253)*
Ensure Long Term Planning & Commitment	8	21.6	*Its about longer term commitments. The crucial problem is if you want to start developing good IT based teaching and learning you need teams that can persist over three or four years. (ID:211)*
Provide Recognition	8	21.6	*We have put it up for a proposition for some of the RPI money to develop a shell that could be used by everyone and it just gets pooh-hoohed up at the division level. Nobody gives a dam. (ID:283)*
Provide Adequate Equipment	5	13.5	*Better resources and equipment (ID:25)* *Computer data displayers in lecture rooms. (ID:92)*
Resources and Support are in Place	3	8.1	*I think that the support is there certainly within our school (ID:229)*
Establish Appropriate Policies	3	8.1	*To ask me to pay for my own training I think is just ridiculous. (ID:245)*
Other	4	10.8	*We've just had an offer of some older, but still useful, computers. It would be great but we've got nowhere to put them. That is an issue. (ID:218)*

Careful probing of this question in the interview situation enabled the researcher to identify these specific issues and concerns, whereas most of the comments made in the CUIT survey were of a general nature.

Attitude Towards the Use of ICT

As suggested in Chapter Five, the research literature identifies an individual's attitude towards the use of ICT as one of the major factors in the adoption of ICT. Table 7.16 examines CUIT survey data on those factors that may contribute towards a person's attitude (ie. incentives; specific purpose of technology; level of comfort) towards ICT in their own teaching.

Table 7.16: Attitude Towards the use of ICT (CUIT survey)

I'd be likely to use technology more in my teaching if I:	*Strongly Disagree* %	*Disagree* %	*Neutral* %	*Agree* %	*Strongly Agree* %
Q.22 Was given some incentive to do so.	6.5	9.4	28.9	26.3	22.7
Q. 28 Saw a proven need for technology in my teaching area.	8.9	9.6	30.5	24.2	20.1
Q. 25 Felt more comfortable with the technology itself.	10.4	12.0	31.5	23.4	16.7

Nearly half (49%) of the respondents Agreed/StronglyAgreed that they would be likely to use technology more in their teaching if they were given some incentive to do so. A total of 44.3% of the respondents Agreed/Strongly Agreed that they would adopt ICT if they saw a proven need for technology in their own teaching area. The figures also reflect that there is still a large group (40.1% Agreed/StronglyAgreed) of people who feel uncomfortable with the technology itself.

Other specific questions in the Interview Schedule attempted to gauge how people felt about the use of ICT in their teaching and learning. For instance question 10 asked the respondents *"What do you see as the benefits of integrating IT into your teaching for yourself?"* Table 7.17 (on the following page) presents the six most common responses with sample observations – again noting certain respondents articulated more than one benefit.

It is significant to note that 18.9% of the interview sample were unable to identify or justify any benefits of applying ICT to their own teaching. This same group however did see some benefits for their students. There appeared to be two distinct viewpoints coming from those individuals who made the comment that they couldn't really see any benefits in using ICT. Some of this group who had assigned themselves an integrated ICT level of 4 & 5 (high & very high), expressed that they did not view ICT as having any real benefits - applying ICT in their teaching was simply a different way of doing things. The other group who rated themselves 1 – 3 (very low – medium), suggested that there were not any real benefits for themselves because applying ICT was difficult and time consuming. In other words, one group viewed the adoption of ICT as part of their changing work environment and the other group as another impost which contributed to adding to their work load.

Table 7.17: Benefits of Integrating ICT (Interviews)

Benefits of Integrating ICT For Yourself	No. of Times Noted	N=37	Examples from the Interview Sample
Efficient	18	48.6%	*The concepts that I am trying to get across are much better handled by, like snippets of video and to show people and so on and if I can have that streamlined and efficient well that helps formulate the picture using multimedia. (ID283)* *saves time, paper, space (ID218)*
Easy Access to Information/ Communication	14	37.8%	*Just download it from the web, easier to prepare lecture (ID292)* *when I want additional information I speak to people who are authors of text books, I can speak to them on email, great of communication. (ID217)*
Effective	8	21.6%	*It just makes analysis quick, I just don't think that you could be any more productive if you didn't have reasonable access to it. (ID99)* *I personally find it can be a more effective way to illustrate things…I can create quick time three D things (ID292)*
No Benefits	7	18.9%	*At the moment I wouldn't see a lot. I can see further doubts. (ID181)* *No, it is just a different way of doing things. It may reflect a changing environment which needs to be reflected. I don't think that there are any tangible benefits as in we are not in a better situation than before, it is just a different situation. (ID4)*
Relevance to Society	5	13.5%	*Well I think we are basically keeping up to date, as long as it is relevant, you've always got to ask yourself okay is this just a little toy or is it absolutely relevant to the present day situation. (ID215)* *At this stage I am basically being relevant. It is out there, it is the way the language is changing if you like. (ID27)*
Motivating	5	13.5%	*The technology, also it is more entertaining I think. Dynamic, it is much more dynamic and colourful.* *Students are highly motivated and are totally impressed by the presentation and hopefully a bit of content sunk in. (ID214)*

The top six responses in the Interview Schedule for *"What do you see as the benefits of integrating ICT in your teaching for your students?"* were in order: easy access to information/communication; relevance to society; motivating; more professional; increases student's confidence; students seeing that technology is integral and embedded in what they do.

Other statements made by the respondents during the interview clarified their personal views and attitudes toward the use of ICT in their teaching and learning. From these statements certain elements or characteristics evolved - reflecting an individual's attitude toward ICT. Table 7.18 identifies the range characteristics that were derived from the collection of interview statements. The bracket at the end of each comment reflects the question number where the statement was made, and the individual's identification number which was issued on receipt of their original CUIT survey form.

Table 7.18: Common Characteristics Reflecting Attitude (Interview N = 37)

Characteristic	Typical Example
Lack of Effort	*I am aware of facilities that are there that I don't make use of and I'm just too lazy to try and use them (Q3:ID237).* *I don't rate them high enough for me to warrant me doing it because I would love to use PowerPoint, I would like to be using PowerPoint presentations but I haven't learnt how to do it and as far as I am concerned it is not that important to me to go to a course, and they are offering courses more frequently here now (Q4:ID214).* *I am aware of them but I just haven't taken the time to do it. Too lazy that's what it is basically. I think that if I was more organised I could do it, they don't take that long, most of the sessions are two to three hours (Q5:ID255).*
Accepting Change	*Lets not put our head in the sand here and say well what we have done, how we have done it in the past will be good enough for today and for tomorrow is not true. There is progress and IT becomes more and more important and I think we have to put stuff away more and more whether you like it or not (Q23:ID337).* *It's a matter of a mind set and a change of emphasis on teaching and teaching in the sense of telling students to one of engaging students in learning. As soon as you start engaging students in learning then you have to open your mind to other ways of doing things and certainly then I take control of those vehicles to enable student in learning and there has to be a change. ... But it means opening up your mind to say that's not working too well how can I improve it. That's working well I'll keep it. So resolve it, resolve the barriers we build about teaching and learning (Q13:ID15).*
A Lifestyle	*I actually see it rather more as that I have particular interests in living a cybernetic lifestyle..... lifestyle where I in fact want to combine elements of my sort of non machine related personality. So for me using IT in my teaching brings teaching into the place that I want to be for all of my work. So it is not that I am not using IT and want to apply it as a tool to teaching. I want my life to be a networked IT life and to achieve that I have to teach in that way too. Perhaps more pragmatically the crucial advantage is my ability to pursue pedagogic commitments to flexibility (Q10:ID211).* *I'm not online, I don't have email or anything at home. The reason behind that is financial initially, Secondly if I had it at home I would do more work at home and I try to isolate the two as much as I can (Q14:ID97).*
Personal Teaching Style	*I have no intention at the moment to improve it or to increase it and the reason is that I like to be flexible, I have to be flexible, I want to be flexible if put like that, and my students if you talk to my students they will understand that because they will say that. I like to move, I like to be a person to the students (Q10:ID337).* *I think our students would rate just below average across the university. They tend to have more practical person skills rather than maybe word processing (Q7:ID229).*

Question 13 of the interview asked the interviewees to identify what they saw as the *"main barriers to further uptake of ICT in your school"*. The responses were grouped and coded into seven categories – attitude, support, resources, reward, time, skills, and policy/leadership. Table 7.19 presents these categories along with a typical example for each category. The % of interview subsample who identified the specific item is also noted.

Table 7.19: Barriers to Further Uptake of ICT in Schools

Code	Typical Example	%
Attitude	*Old habits die hard, maybe age. Certainly their methods are tried and true and they are not willing to change and that is probably the main reason I can see and it is an aging staff here. ID:97*	54.1
Skills	*Lack of experience with the technology. ID:101*	24.3
Time	*Many people are too busy, it takes a lot of time to develop these skills ID:4*	21.6
Resources	*It's cash, cash … barriers tend to be having the software, hardware, the technical. Having access to what you want. ID:15*	16.2
Policy/ Leadership	*the person who was appointed in his place, his attitude was research is everything, teaching is nothing. So what happened is that pretty much anybody who is keen on teaching, were told at a school meeting, that if you want promotion, and if we are going to appoint anybody it is going to be based on their research, not on their teaching. ID:249*	13.5
Support	*Secondly there isn't the sort of support you would encourage individuals to move from where they are to where they might want to be. ID:245*	10.8
Reward	*Time and effort of course, not being acknowledge in some sense for undertaking IT, although that is changing these days in the university, which is good to see. ID:247*	10.8

Throughout the open-ended questions in the CUIT survey, the interview and TracIT report data, a variety of important issues surfaced – issues alongside the ones dealt with in this chapter such as time, facilities, training and support. These will be dealt with in detail in Chapter Ten, however one issue that is appropriate to be addressed at this point pertains to an individual's overall attitude toward their use of ICT in teaching and learning. Many of the comments made at various stages by different people were seen as being reflective – in other words they critically questioned their own use of ICT in their teaching and learning. Table 7.20 outlines specific examples of respondents being reflective together with the relevant data source.

Table 7.20: Reflective Comments Made by Individuals

Instrument	Example
CUIT survey	*Provide time to devote to evaluation of current practices (Q36:ID99).* *By establishing and supporting forums where the pros and cons of using IT in teaching can be discussed (Q36:ID219).* *By accepting that IT should only be used where it can be shown to be beneficial AND cost effective. Much of current use of IT appears to be for its own sake (bells & whistles) and does not advance promote critical and creative thinking. Ie the latest gimmick and band wagon. It has good points and should be exploited – WHERE & WHEN relevant and productive. (Q36:ID79)*
Interview	*I used the PowerPoint a lot - for four years, I actually have come back to the view that traditional lecturing is the best (Q10:ID259).* *Involves lots of time and a learning curve, in the initial stages. You know that further down the track that things are going to be easier – change notes and outlines. Better in terms of delivery and presentation. I'm still on the learning curve – it's important not to introduce Technology for the sake of it but to add value (Q10:ID111).* *We've actually got some anecdotal evidence of some skills being lost and others improving so things like the number of students that had used spreadsheets before they arrived dropped (Q7:218).* *IT as an aid to me I have no problems with it at all, it is the issue of what do the students get from seeing IT, and when you fill up your sets you get pretty amazing responses, some say this is fantastic and other will say I really wish you wouldn't do all this stuff and concentrate on solving problems. Because ultimately for their exam that is what they've got to do, it is the easiest way to mark, because **** is raft of problems that you cant solve (Q10:ID292).* *But I am actually moving away for using large amounts of information delivered on the screen. I'm coming to the conclusion that it is in our best interest to print this information out and send it to students. Or pick high quality text books or a number of text books and construct courses around those materials which are using the net primarily for communication (Q9:ID211).*
TracIT Reports	*They had to learn and use their own programming language of choice. . I was quite surprised to see much better quality software by simply just leaving students to their own devices. Teaching students to be dependent on my tuition just gives them a child-like "dependency complex" which deprives them from developing their own self confidence and independent thinking abilities (Oct99:ID119).* *The implications to me mean if I really want to do this I really need to think through this very carefully and a lot of conceptual work needs to be done regarding the course well before I get anywhere near talking to people about how to get it onto Web CT or online some way (July99:ID15).* *What appears on the Web page must be pedagogically correct and refined. Before you have been able to compile such notes....... During a lecture there is the opportunity for interaction. The same applies for a tutorial. A Web page should include these elements as well. Awfully tough!! Particularly the aspect of interactivity!! (June00:ID337).* *As we were without computing facilities for more than a day, it was a bit irritating. Are we depending too much on computers with our work? When they go down everything seems to stop (June00:ID217).*

It is important to note that the respondents were not necessarily being critical about having to adopt ICT, but rather were critically questioning the value of using specific applications of ICT in the context of their own teaching and learning.

ICT Facilities

As noted earlier, the five point Likert-type scale (CUIT survey) was also used to identify whether the level of facilities available to the respondents was a factor affecting the adoption of ICT for these respondents. Table 7.21 identifies access issues concerning facilities outlined in the CUIT survey: up-to-date computers; more computers and internet access in the teaching areas. The two major issues which the respondents identified as hindering their technology use were access to more up-to-date computers, with a total of 48.2% (Agreed/Strongly Agreed) and access to more computers in teaching rooms, 46.4% (Agreed/Strongly Agreed). Internet access in the teaching area was an issue for 32.3% (Agreed/Strongly Agreed) of the respondents.

Table 7.21: Facilities (CUIT survey)

I'd be likely to use technology more in my teaching if I:	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
Q. 26 Had access to more up-to-date equipment.	6.8	8.6	29.9	25.8	22.4
Q. 19 Had access to more computers in my classes.	8.9	13.8	23.4	23.2	23.2
Q. 23 Had access to the Internet in my teaching room.	11.2	12.5	35.2	17.2	15.1

Significantly, nearly half (48.2%) of the CUIT survey sample Agreed/Strongly Agreed that they would be likely to use more technology in their teaching if they had access to more up-to-date equipment.

Some three months later, further concerns regarding ICT facilities surfaced during each individual's interview through questions that were not necessarily specifically targeted on this particular issue. For example:

> *Quite often getting a bunker is more hassle than making an overhead and so I just use overheads. (Q9:ID99)*
>
> *The access to PowerPoint is absolutely abysmal, the actual access to facilities is shocking, shocking, within the university, my computer, look, my computer is so old and I've still got that. I've used PowerPoint but not in my presentations to students because to access it is more trouble that it is really worth… (Q9:ID109)*
>
> *I'm low in that category because I don't have access to computers in my classroom, I don't have access to WWW in my classroom, I don't have access to presentation, projectors and things in my classroom therefore I can't integrate it very well. (Q11:ID15)*

The network is always breaking down. The trouble with what they propose to do when everything is centralised they won't have our specialised software. We have been getting away with it because many of the students have their own computers. But what about those who don't. The situation is pretty shocking. (Q17:ID217)

No if there was true commitment we'd have more of these PowerPoint facilities available to us. Instead of having to literally beg and borrow. That is something that will slow the whole process down if enough people can see that the equipment is not there why rush out to learn the technology if you haven't got the equipment to use it with. So in that regard the commitment isn't there. (Q22:ID214)

And technology just has to work in future, it has to be everywhere, ubicuous, it has to all the time, which is pretty much what the bunker did, unfortunately the bunker seems to be just in the larger lecture theatres and now teaching in the small theatres I have to carry along a projector and a computer and set it all up and it takes a lot of time and effort to do that. (Q10:ID247)

Careful analysis of each staff member's monthly TracIT report revealed that many issues concerning ICT facilities arose over the 12 month period. These ranged from comments concerning lack of facilities, out-of-date equipment and problems with existing facilities. Some examples:

Another problem is that I would like to demonstrate the software and getting access to specialist rooms which are heavily used, there doesn't seem to be enough equipment to support what I want to do and there isn't any portable equipment that can be moved from room to room. So I've seem to be frustrated at every corner. Probably in setting this idea up I should have done is checked out what was available, one makes the assumption that a world class University of technology would have these facilities available – silly assumption. If I had checked it I wouldn't have set this up in the first place – it would have gone in the too hard basket. I will have to try and reserve rooms for their presentations. (Aug99:ID15)

My Machine keeps crashing, and they don't know why - makes it difficult to create web pages for a class. (Oct99:ID375)

Web CT server is very slow. This problem needs to be addressed as wait time is excessive. (Oct99:ID317)

I have a portable PC on loan. It would be nice to prepare some of my lectures for PowerPoint, but I don't think there's enough projectors. (Nov99:ID252)
Our facilities are under strain and starting to look a tad out of date. We will upgrade our main computer lab soon. (Feb00:ID218)

Projection equipment in teaching rooms is inadequate for use with new initiatives. (Mar00:ID283)

We need more multimedia items, I want to add sound and video but can not no sound card and no digital camera or video and if we do have them I don't know where to find them... (Mar00:ID255)

Email not working/system down frequently. (June00:ID214)

*Loss of computer lab in **** building, replaced by smaller lab in ****. (June00:ID25)*

> *This is great as far as accessibility is concerned, but the support materials are not yet in place. We have some high technology trolleys in some rooms of ***, but only a few and the two data show machines we have are always breaking down - like a car being used by multiple drivers, I suppose.*
>
> *Similarly, there's a reluctance to provide lecturers with laptops rather than desk computers - supposedly on the grounds of cost… (July00:ID245)*

It became apparent that the monthly TracIT reports had provided the teaching staff with a timely vehicle for venting their frustrations about their work situation, as much of the detail that was provided on many other day-to-day issues besides those on facilities as noted above.

One of the interview questions (Q15) asked the respondents to rate the adequacy of their work facilities on a scale of 1 – 5, where 1 was poor and 5 excellent. Table 7.22 represents a summary of their ratings.

Table 7.22: Rating of ICT Facilities

Rating	% of Respondents
1 (Poor)	2.7%
2	8.1%
3	8.1%
3 – 4	2.7%
4	45.9%
4 – 5	5.4%
5 (Excellent)	21.6%

These figures indicate that the majority (72.9%) of the interview respondents gave a high to excellent rating on this scale which reflects the view that the majority of people were satisfied with their work facilities.

Summary of Issues Raised

Overall, the Likert-type scale utilised in the survey revealed various areas of concern, which according to the respondents contributed to the lack of adoption of ICT in their teaching and learning. Table 7.23 reflects the order of their concern, where data with respect to the two categories Agree and Strongly Agree have been combined.

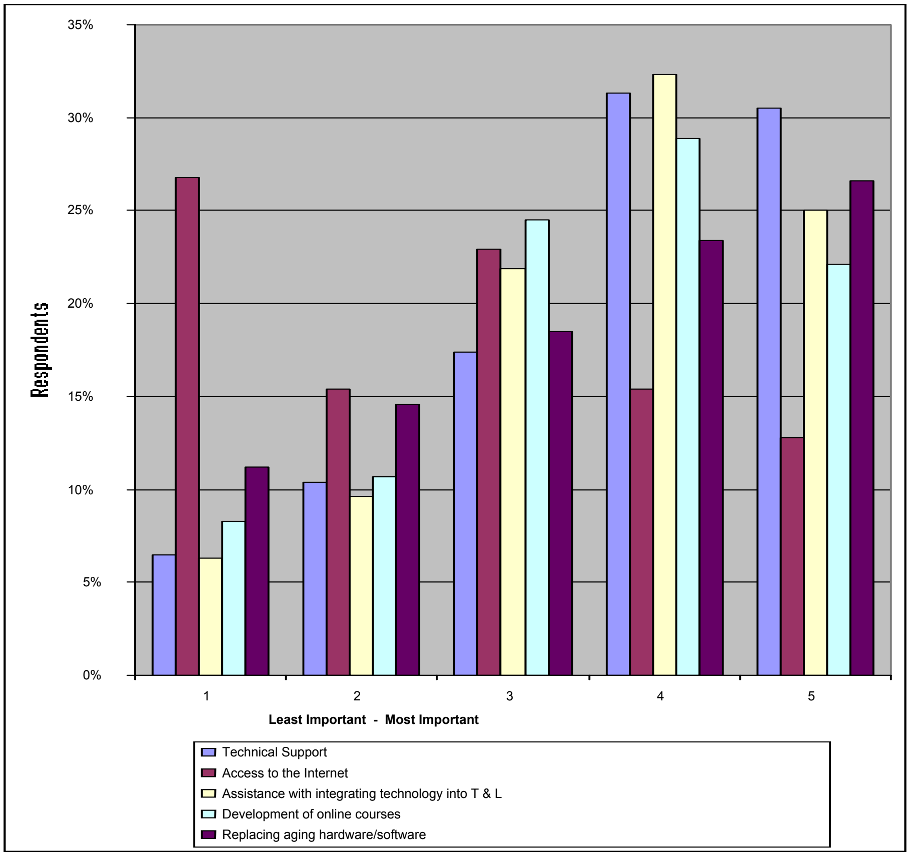
Table 7.23: Summary of ICT Issues (CUIT survey)

Issues	Agree + Strongly Agree %
More time to learn about using technology effectively.	74.1
More technical support.	61.7
Had up-to-date information on best usage in their teaching area.	58.8
More technology training.	51.0
Given Incentives.	49.0
Access to more up-to-date equipment.	48.2
Access to more computers in classes.	46.4
Saw a proven need for technology in their teaching area.	44.3
Felt more comfortable with the technology itself.	40.1
Collaborate with others in my teaching area.	35.7
Access to the Internet in teaching room.	32.3

A five point Likert-type scale (Least Important – Most Important) was utilised in the CUIT survey in order to identify other concerns relating to ICT. Figure 7.2 (on the following page) graphically presents the degree to which the following issues were currently confronting the respondents: *technical support, internet access, integrating ICT into teaching and learning, development of online courses and replacing aging hardware/software*. The respondents were asked to rate the issues according to their importance.

Respondents who assigned a 4 or 5 on the scale, where 5 was Most Important, were indicating that the particular item was an area of major concern for them. The total for the respondents who assigned an item a 4 or 5 on the scale were combined (applying the same procedure as in Table 7.24 Agreed/Strongly Agreed). This resulted in similar outcomes to Table 7.24 as noted in Figure 7.3, indicating a consistency in the responses given by the respondents. For instance in the CUIT survey, 61.7% Agreed/Strongly Agreed that they would be likely to use technology more if they got more technical support (CUIT suvey:Q24), and again in the CUIT survey, technical support (CUIT survey:Q29) was seen as being an important issue currently confronting them at work by 61.8%.

Figure 7.3: Technology Issues Currently Confronting Staff at Work (CUIT survey)



In order to confirm and allow respondents to elaborate their choice of selection in the survey, Question 23 of the Interview Schedule was linked to each interviewee's individual survey response which revealed their specific issues of concern. If an individual had rated a certain issue a 4 or 5 (5 being most important) in the survey, then Q23 of the Interview Schedule would reflect this. For example, Question 23 of the Interview Schedule was: *On the questionnaire you said that the most important IT issues currently confronting you are**: Integrating IT into T&L, and Development of online courses.*** *Could you expand on these?*

Table 7.24: Common Responses for the CUIT survey

Issue	Question/%		Question/%	
Technical Support	Q24	61.7%	Q29	61.8%
Aging Hardware/Software	Q26	51.2%	Q33	50.0%
Assistance with integrating IT	Q21	58.8%	Q31	57.3%
Internet Access	Q23	32.3%	Q30	28.2%

Table 7.25 reflects the issues the interview sample identified as the ones which were confronting them at the time of the interview, some three months after the initial survey.

Table 7.25: ICT Concerns (Interview)

Interview Responses	Times Noted	N=37 %	Examples
Support • Technical • Software • Specific Expertise • Integrating IT in T & L	21	56.7	*The other thing that has struck me recently is not so much technical support is software support. (ID259)* *And IT support, not so much in the fixing of but, and I don't know if IT is support is along those lines, but in the learning of new skills. I haven't seen that to be something at all that the university really provides. because one can sit in a class and learn some things but to integrate it there is nothing like talking to someone on the phone or saying can you come up here and am I doing this right and that doesn't exist. (ID109)*
Resources • Equipment • Internet Access	15	40.5	*The important thing is to equip the schools with industry standard software so the students can work straight away. (ID119)* *mainly hardware. (ID27)*
Developing Online Courses	8	21.6	*One thing I would like to do is to have these manuals online so that as time goes by I can see that in five years time that we are not going to have paper manuals, its going to be online, everyone is going to be able to access that. (ID253)*
Time • Time Release	7	18.9	*it is really a time issue. (ID283)* *the case of finding the time to do that. (ID92)*
Policies and Planning • IT Review Outcomes • Reward Structure	7	18.9	*I believe the IT review could impact on us. The central model doesn't suit us at all. We need to be able to handle things very much locally. We have special software and hardware, how is that going to work. (ID218)* *the most important one at the moment is the failure or the university to come up with a flexible IT policy that, accepting the constrains of budget, enable staff to lead rather than just follow along with what they are told to do. (ID211)*
Training	4	10.8	*Biggest issue is being more knowledgeable myself. (ID111)* *I think as new and advanced software comes about we are going to need more help in training. (ID241)*

It is important to note that Q23 of the Interview Schedule was specifically designed to allow the respondents to confirm and elaborate on the specific issues raised in the CUIT survey. What is relevant is the number of other issues which surfaced, as indicated in Table 7.25 – related to policies, planning, time and training. The interview group identified general support as an issue, though not necessarily technical support.

What became apparent throughout the interviews was that the respondents no longer identified technical support with simply hardware support. The interview subsample were quite specific about their individual needs and the strategies their school/department and the University needed to establish in order to support their ICT use. These support issues will be dealt with in detail in the chapters to follow. This chapter has presented the results pertaining to research question one. The following chapter will provide an interpretation and analysis of these results.

CHAPTER EIGHT

Research Question One: Interpretation and Analysis

To describe the involvement of a University teaching staff in utilising Information and Communication Technology (ICT) in teaching and learning.

Introduction

This chapter will attempt to draw together the results presented in the previous chapter in order to provide an overall profile of the teaching staff at Curtin University of Technology. The profile will reflect how teaching staff are utilising ICT in their teaching and learning, their attitudes, aspirations and concerns. This process should give the reader an appreciation of the working environment of teaching staff at Curtin University in this period of change.

This chapter begins by identifying the need for a researcher assigned 'university rating' in addition to the self-perceived level of ICT integration identified by the case study sample. The 'university rating' leads into the concept of critical mass, in particular whether the teaching staff at Curtin University have reached a critical mass stage. The age and gender distribution is provided for the case study sample which encourages some pertinent comments. The data interpretation and analysis specific to patterns of use, ICT use in teaching and learning, and teaching mode are discussed in separate sections. The penultimate section discusses the factors identified in the data presented in Chapter Seven which affect the adoption of ICT. A final summary is presented at the end of the chapter.

University Rating

This section builds on the self-perceived level of integration that the case study respondents assigned themselves in the CUIT survey in order to determine a variety of issues. One of the emerging key issues was whether the use of ICT in teaching and learning had reached the critical mass stage at Curtin University.

The CUIT survey which was used to collect baseline data asked respondents to rate their IT integration level on a scale of 1 - 5, where one was very low and five, very high. Respondents were required to rate themselves compared to others within their own Department/School. This provided the researcher with a broad picture of the rate of adoption of ICT in teaching and learning of the larger sample. The rate of accuracy of each response was difficult to determine even with the inclusion of other questions in the survey to confirm accuracy. However, once the respondents were selected for the interview subsample the accuracy of their self rating was able to be determined through crucial questions in the interview. This confirmation of accuracy was crucial if the researcher was to eventually compare the case study sample in order to allocate a University wide rating which was reflective of the wider sample - not simply individual Departments/Schools. Table 8.1 reflects the distribution of level of integration for each of the samples used in this study.

Table 8.1: Level of Distribution for the Integration Rating

Level of Integration	*CUIT survey sample N=384*	*Interview subsample N=37*	*Case study sample N=32*
Very Low	12.8	13.5	15.6
Low	26.6	21.6	25.0
Medium	27.9	18.9	21.9
High	22.4	24.3	15.6
Very High	9.4	21.6	21.9

It is interesting to note at this stage the distribution of the integration rating for each of the specific samples. One would automatically assume that the distribution would be skewed toward those who were using a high to very high level of technology in their teaching and learning practices. However, as indicated in Table 8.1 this was not the case, certainly there were less in the very low category compared to some of the others. The range of sample distribution is perhaps reflective of the high level of interest regarding the use of ICT and the ICT environment from the Curtin University staff.

Once again, the issue of whether a specific rating within one School/Department equated to a similar rating within another School/Department was of concern, and therefore was the subject of careful examination of all of the data produced by the various measures (CUIT survey, Interview and TracIT Report). This involved synthesizing all of the data to produce a comprehensive ICT profile for each individual case. These profiles included the individual's background details, self rating level, skill rating level, software applications adopted (personal use, in teaching and learning, and expected their students to use), ICT facilities, ICT support structures, training, attitude toward the use of ICT, personal goals, and changes which occurred over the 12 month period. From these profiles, which reflected each individual's working regime and environment for a period of 16 months, evolved distinct attributes concerning the software applications which had been adopted, their personal attitude toward the use of ICT in teaching and learning and how they had actually adopted ICT. Each case study profile was examined in relation to these key attributes and was used to compare and relate their level of integration to the level of integration of the others in the case study sample. These profiles became invaluable as they emphasised and enhanced the individual details of each teaching staff, providing a more extensive picture of the similarities, differences and traits identified in others within the wider case study sample. This synthesis of information enabled the researcher to allocate a 'university rating' to each teaching staff in the sample. Table 8.2 (on the following page) identifies the level of integration the case study sample (N=32) assigned themselves in the CUIT survey, and the overall 'university rating' assigned to them by the researcher, where 1 is very low and 5 is very high.

In summary, 59.4% (figures in bold) of the case study sample's ratings remained constant - that is, the rating they had given themselves in the survey where they compared themselves to their colleagues within their School/Department, matched the 'university rating' assigned to them by the researcher who compared them to the case study sample. As noted earlier, a synthesis of data from all of the instruments enabled the researcher to make such a comparison and judgement.

A number (28.1%) of the case study sample assigned themselves a level which was lower than the researcher designated University level rating (shaded area). The main reason for this could be that they belong to a Department/School where their colleagues are utilising ICT at a high level and compared to them they are in a much lower category. However, the majority of the people in this group noted in the interview that in the period since the survey (3 months) they felt they had been utilising a greater amount of ICT than they had originally thought in the initial survey. In other words, given another chance to rate themselves they would more than likely have given themselves a higher rating. It appeared therefore, that through the actual interview period and subsequent continuing reflection the case study sample became more aware of their actual ICT practices and habits. It is important to note that being involved in such a study would strongly heighten this awareness.

Table 8.2: Level of ICT Integration – Self Rating & University Rating

ID	School/Dept Comparison Integration Rating *(self assessment)*	University Wide Adoption of ICT in T&L *(researcher assigned)*
335	**1**	**1**
237	**1**	**1**
101	**1**	**1**
94	1	2
15	1	3
181	**2**	**2**
27	**2**	**2**
214	**2**	**2**
229	**2**	**2**
259	2	3
25	2	3
255	2	4
111	2	4
253	**3**	**3**
349	**3**	**3**
245	**3**	**3**
217	**3**	**3**
337	*3*	*2*
292	3	4
375	3	5
97	**4**	**4**
317	**4**	**4**
109	*4*	*2*
92	*4*	*3*
119	4	5
252	**5**	**5**
249	**5**	**5**
218	**5**	**5**
283	**5**	**5**
251	**5**	**5**
211	**5**	**5**
241	*5*	*4*

Code: 1 = very low, 2 = low, 3 = medium, 4 = high, 5 = very high.

The remaining 12.5% of the case study sample assigned themselves an integration level which was higher than the University rating. The data (IS:Q7) also revealed that all but one member of this group noted that the majority of their colleagues were not utilising ICT in their teaching and learning, which perhaps accounted for their high self-rating.

Table 8.3 provides a summary of the self ratings from the CUIT survey and the University Ratings, assigned by the researcher for the case study sample.

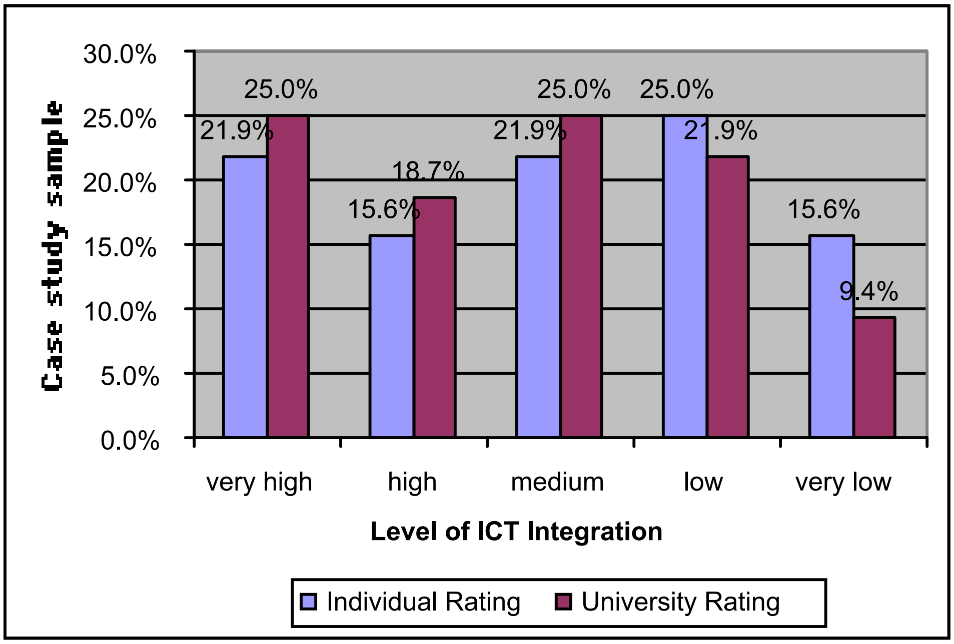
Table 8.3: Self-Ratings and University Rating – Level of Distribution (Case Study Sample)

Level of ICT Integration	School/Dept Comparison Integration Rating (CUIT survey) *N=32*	University Wide Adoption of ICT in T&L Synthesis of Instruments *N=32*
Very Low	15.6%	9.4%
Low	25.0%	21.9%
Medium	21.9%	25.0%
High	15.6%	18.8%
Very High	21.9%	25.0%

The data in Table 8.3 also reveal that there has been an overall increase in the ICT levels of integration from the self-ratings to the University wide rating, with 43.8% of the case study sample assigned a University rating of high and very high, while 31.3% were in the very low and low categories. A number of factors could contribute to such an increase, such as the self-rating process reflecting a comparison of themselves with their colleagues in their Departments/Schools and not the wider case study sample. In other words the sample changed - the initial rating was within one particular Department/School whereas the researcher assigned university rating examined individuals across the University (Department/School N=29, Divisions N=6).

It is important to note that the two ratings were also taken at different points in time - the university rating being assigned 16 months after the self-rating was determined. The overall increase in the ICT levels of integration could very well be attributed to the fact that the case study participants focussed on and increased their ICT use simply by being involved in a study which asked them to identify their ICT changes, through the TracIT reports. If this is the case, perhaps Heads of Departments/Schools could promote or employ such a mechanism when attempting to monitor and increase the use of ICT, or any other innovation. Figure 8.1 graphically reflects the individual self rating (survey data) and the university rating for the case study sample.

Figure 8.1: Case Study Individual Rating & University Rating

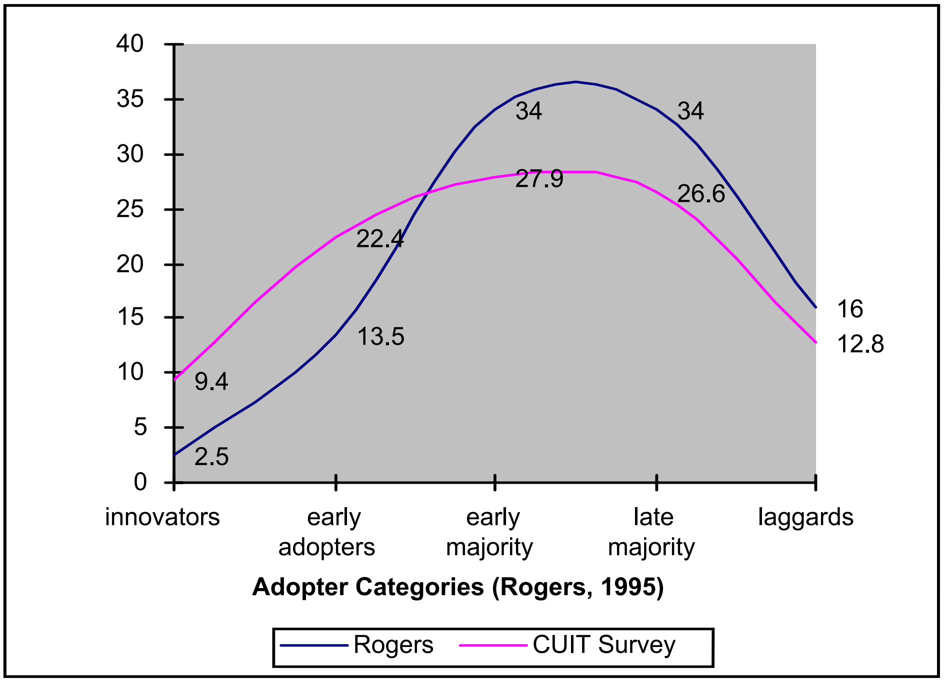


In attempting to identify the impact of ICT at Curtin University it is important to note that individuals within the University have not felt this impact uniformly. Examining the data from the present study through the window of Rogers' (1995) categories (laggards, late majority, early majority, early adopters, innovators) enables us to make some generalisations about the rate of adoption.

Critical mass

Drawing on the work of Rogers' (1995) diffusion of innovation theory it appears that the respondents of the CUIT survey mirror to a significant extent the bell-shaped curve found in Rogers' (1995) own research on innovation uptake. What does vary however, is the proportion in each category. Figure 8.2 provides a comparison between Rogers' (1995) diffusion of innovation distribution and the distribution relating to the level of ICT integration in teaching and learning of the CUIT survey sample.

Figure 8.2: Diffusion of Innovation Categories
Rogers (1995) and CUIT Survey Sample



Under this model, for significant change to occur, a 'critical mass' of individuals need to have adopted and implemented a given innovation (Green & Gilbert, 1995; Rogers, 1995; Deden, 1998). This 'critical mass' occurs when enough individuals have adopted the innovation so that the innovations further rate of adoption becomes self-sustaining. According to Rogers' (1995) typical diffusion curve, this is between 10 – 20 percent adoption, and represents the transition from the early adopter category to the early majority. It would appear that the teaching staff in the CUIT survey sample has definitely reached the critical mass stage regarding the integration of ICT in teaching and learning. Green (1996a) identified that the use of ICT on campuses in the USA had also reached a critical mass stage, although he added that it was decidedly 'low tech'. At the same time it should be noted in an Australian context, Hesketh et al., (1996) identified that ICT had only penetrated university teaching at a superficial level. This has also been echoed in more recent Australian studies and reports (McNaught et al., 1999; DETYA, 2000).

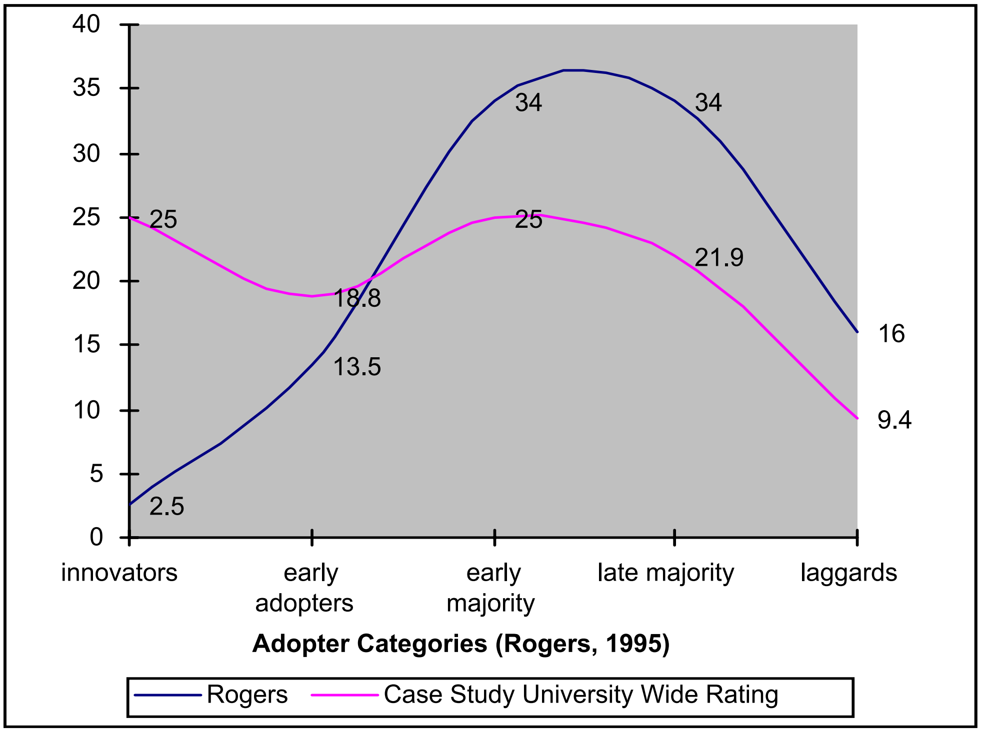
As identified previously, the researcher assigned university rating reflected a more accurate judgment of the case study respondents as a holistic group across the University. It has already been established that the CUIT survey data revealed that the critical mass stage had been achieved, however the university-wide rating was generated by examining three instruments as opposed to the one instrument (CUIT survey) to establish the level of ICT integration. One would assume that this university wide rating would reflect a more valid reflection of the case study sample's integration level. Table 8.4 identifies the various diffusion of innovation categories according to Rogers (1995) and the case study's individual rating as well as the researcher assigned individual rating.

Table 8.4: Diffusion of Innovation Categories

Level of ICT Integration	***Rogers Diffusion of Innovation***	***School/Dept Comparison Integration Rating Individually Assigned Case study sample***	***University Wide Rating Synthesis of Instruments Researcher Assigned Case study sample***
Very Low (laggards)	16%	15.6%	9.4%
Low (late majority)	34%	25.0%	21.9%
Medium (early majority)	34%	21.9%	25.0%
High (early adopters)	13.5%	15.6%	18.8%
Very High (innovators)	2.5%	21.9%	25.0%

Figure 8.3 further demonstrates the difference between Rogers' (1995) categories and the case study's university rating. Unlike the CUIT survey data results where the pattern reflected Rogers' categories, the case study respondents differ greatly. There are less laggards, late majority, and early majority and a greater amount of respondents in the early adopter and innovator categories. This certainly reflects the situation that the adoption of ICT in teaching and learning has reached the critical mass stage. What can be said, based on the evidence of this study, is that the majority (78%) of the case study respondents are at the early majority – innovators stage of ICT adoption in their teaching and learning.

Figure 8.3: Rogers' (1995) Diffusion of Innovation Categories and the Case Study's University Rating



Even though the adoption of ICT has reached the critical mass stage, it is important to establish whether this particular case study group has adopted ICT only at a superficial level, as suggested by Green (1996a), Hesketh et al., (1996), DETYA (2000) and McNaught et al., (1999). As identified earlier in this section, the data from the three key instruments were synthesized in order to establish individual profiles of the case study respondents and from this evolved the key attributes and common elements which were identified at each level of ICT integration. These common attributes were used to determine whether ICT had been adopted at more than a superficial level by individuals in their teaching and learning. Table 8.5 will be introduced again for further discussion.

Table 8.5: Level of ICT Integration - Common Attributes

Level of ICT Use	Application	Attitude	Adoption
Very Low ***N=3***	Very limited use: Basic word processing, E-mail & Internet. No Internet access at home.	Feel Very Uncomfortable with Technology Itself. See very limited benefits. Frustrated with the lack of ICT skill, yet don't make any effort to attend training or improve.	Extremely low ICT skill level. Very little, if any E-mail use with students.
Low ***N=7***	Limited use: • Word Processing (class handouts, outlines) • E-mail & Internet use. No Internet access at home.	Are able to identify the benefits of ICT in teaching and learning for themselves and their students however many are not convinced that it is relevant to their discipline.	Low ICT skill level. Students are not encouraged to communicate via E-mail.
Medium ***N=8***	A variety of Applications: • Word Processing Software • Spreadsheets • Presentation Software • E-mail & Internet Use • Internet access at home.	Are able to identify the benefits of ICT in teaching and learning for themselves and their students. Fairly comfortable with ICT. Seek help through colleagues.	Medium level skills. Producing some Web-based material for delivery of resources. Communicate with students electronically. Set Web-based assessment tasks.
High ***N=6***	A large variety of software: • Presentation software • Internet tools • Specialist Software use in their discipline.	High Interest Level. Experiment 'play' with software. Self Motivated. Resourceful – seek help from a variety of sources.	High level of ICT skills. Producing Web-based teaching material (delivery & interactive) Expects extensive use by students.
Very High ***N=8***	Create & modify software to suit their teaching & learning needs.	Extremely High level of Interest. Explores & Experiments with ICT. Self Motivated. ICT 'a way of life'. Extremely Resourceful.	Very high level of ICT skills. Innovative use of ICT in T&L. Exhibit strong Leadership skills - Agent for change.

Upon close examination of Table 8.5 it appears that the majority of the case study respondents in the medium – very high category are using a variety of software applications for their teaching and learning. For example: word processing, spreadsheets, presentation, electronic communication tools, and Internet tools. It also appears that these applications are being used in a variety of ways in their actual teaching. All of the case study respondents in these three categories had established assessment tasks for their students which included the use of ICT. All of them had developed, or were in the process of developing, Web-based learning environments to use with both internal and external students. It is important to note that the case study respondents in the medium category were more than likely to have had support in setting up such an environment. The support varied (colleague, IT team) and appeared to depend upon the Division in which the case study was a member. The chief distinction between the medium and the high/very high category of innovators was in the way the Web-based environment was used. The medium category adopters were utlising this environment purely for course delivery, for example passing on information, while the others had established interactive features relevant to their own teaching environment as well as course delivery.

As identified earlier in Chapter Three, Moore (1991) had collapsed Rogers' categories into three - early market (innovators & early adopters), mainstream market (early & late) and late market (laggards). Moore (1991) notes that there is such a significant difference between the early market and mainstream market group, that he identifies it as the 'chasm'. He advocated that from a marketing point of view, these two groups require completely different approaches. Once critical mass has been reached and a certain minimum level of ICT has been adopted, then perhaps strategies need to focus on bridging this gap.

Rogers (1995) identified the key importance of targeting the early adopters (high level) as they can trigger the group to the critical mass stage. This may be the case in achieving 'critical mass' - however this study found that the innovators were not only the leaders in adopting the ICT, but also the leaders in initiating and implementing change in their Department/School. The following are taken from the TracIT reports of one of the case study participants who demonstrated strong leadership qualities on various occasions.

> *On my recommendation the School has purchase Inspiration Software a program for mind mapping and planning. We intend to use it in our upcoming curriculum review to visualise the horizontal and vertical connections between units in the undergraduate course. (ID251:Oct99).*
>
> *To replace the single staff member who was in charge of managing IT in the school we proposed a committee. The committee has representatives of academic and general staff. I currently chair this committee. (ID251:Jan2000).*

*I continue to use WebCT as a vehicle to communicate with the first year *** students. This has worked really well. During exam time many of the questions that students needed to ask were posted as bulletins and thus others benefited from the answers as well. These students have the perception that this forum will continue in subsequent years of their course. So now I just have to get the rest of the staff involved so that it can. There is lots of potential and scope to expand this forum and will be useful for fourth year students when they are out on *** and especially when they are on their country placement. (ID251:July2000).*

Prior to establishing whether the use of ICT for teaching and learning by the majority of the case study respondents has penetrated beyond any superficial level, it is important to identify what this means in terms of this study. The key question is really the following: Are teaching staff simply adopting ICT to support and enhance existing practices or has technology changed what is actually taught and how it is taught? This study has not claimed to have fully resolved such an important issue, however it appears from the evidence in the study that existing beliefs are only challenged through experience in applying the new technology. There have been glimpses of reflection identified in the interviews and the TracIT reports that reveal such challenges to pedagogical beliefs. For example:

But I am actually moving away for using large amounts of information delivered on the screen. I'm coming to the conclusion that it is in our best interest to print this information out and send it to students. Or pick high quality text books or a number of text books and construct courses around those materials which are using the net primarily for communication. (ID211:ISQ9).

*IT as an aid to me I have no problems with it at all, it is the issue of what do the students get from seeing IT, and when you fill up your sets you get pretty amazing responses, some say this is fantastic and other will say I really wish you wouldn't do all this stuff and concentrate on solving problems. Because ultimately for their exam that is what they've got to do, it is the easiest way to mark, because **** is raft of problems that you cant solve. (ID292:ISQ10).*

I'm still on the learning curve – it's important not to introduce Technology for the sake of it but to add value. (ID111:ISQ10).

They had to learn and use their own programming language of choice. . I was quite surprised to see much better quality software by simply just leaving students to their own devices. Teaching students to be dependent on my tuition just gives them a child-like "dependency complex" which deprives them from developing their own self confidence and independent thinking abilities. (ID119:Oct99).

The implications to me mean if I really want to do this I really need to think through this very carefully and a lot of conceptual work needs to be done regarding the course well before I get anywhere near talking to people about how to get it onto Web CT or on-line some way. (ID15:Aug99).

What appears on the Web page must be pedagogically correct and refined. Before you have been able to compile such notes....... During a lecture there is the opportunity for interaction. The same applies for a tutorial. A Web page should include these elements as well. Awfully tough!! Particularly the aspect of interactivity!! (ID337:June00).

If "beyond a superficial level" means that ICT has become part of the teaching and learning culture of the majority of the case study respondents in this study, then the response would have to be in the affirmative.

Age and Gender Distribution

Table 8.6 provides a useful summary of the gender distribution, the various age groups, the length of time at the University and the level of integration according to the university rating assigned by the researcher for the case study sample.

Table 8.6: Level of integration – Gender, Age Range and Service

Level of ICT Integration University Rating	***Gender***	***Respondents Age***	***Years at the University***
Very Low N=3	Male (2) Female (1)	60 – over (3)	0 – 5 years (2) 6 – 10 years (1)
Low N=7	Male (2) Female (5)	30 – 39 (2) 40 – 49 (2) 50 – 59 (3)	0 – 5 years (4) 6 – 10 years (1) 16 – over (2)
Medium N=8	Male (7) Female (1)	40 – 49 (5) 50 – 59 (3)	0 – 5years (4) 6 – 10 (1) 11 – 15 (1) 16 – over (2)
High N=6	Male (5) Female (1)	20 – 29 (1) 30 – 39 (2) 40 – 49 (1) 50 – 59 (1) 60 – over (1)	0 – 5 years (3) 11 – 15 years (2) 16 – over (1)
Very High N=8	Male (6) Female (2)	20 – 29 (1) 30 – 39 (3) 40 – 49 (2) 50 – 59 (2)	0 – 5 years (2) 6 – 10 years (4) 16 – over (2)

This study has not attempted to focus on the issue of gender, however comments regarding this issue are pertinent at this stage. The majority of the respondents involved in the CUIT survey were males (60.4%), which consequently led to a greater number of males being selected for the interviews and in turn for case study selection. Importantly, the key criteria for selection for interviews was based on whether they agreed to an interview, the level of integration they had assigned themselves, and the need for an even as possible distribution across each teaching Divisions. Table 8.6

reveals that the majority of the females involved in the case studies were assigned to the low category.

It was also interesting to note that the case study respondents who were assigned a very low university rating were all aged in the 60 + age group. Two of the three staff in this category acknowledged that they could see the benefits of adopting ICT, however their interviews quite clearly revealed their frustration with their own personal lack of knowledge and skills. Regardless of how they felt, there was no evidence from the TracIT report data to show that they attempted to improve their ICT skills or knowledge. The age range varied in all of the other categories, indicating that there was not a specific age that could be identified with any one particular category. The amount of time employed at the University also did not appear to be a factor in the level of ICT adoption. It was interesting to note that five of the seven individuals who had been at the university for 16 years and over, were in the medium to very high categories, indicating that they had not been complacent regarding the adoption of ICT.

Patterns of Use

The data regarding computer access and use as identified in Chapter Seven, clearly indicate that nearly everyone who participated in the CUIT survey had access to a computer (97.9%) with E-mail (97.4%) and Internet (96.6%) facilities. The high frequency of use (95.2%) reveals that ICTs are a major part of the working environment of teaching staff at Curtin University of Technology. It is also not unreasonable to conclude that the majority of the interview subsample were satisfied with these facilities as 72.9% rated these facilities a high to excellent rating.

The high (91.9%) level of computer access at home, with E-mail (63.8%) and Internet (64.8%) indicates that a large majority of the survey sample value the use of computers in their home environment. This high frequency of computer use at home may indicate that much of this use is linked to their work at Curtin University, although this was not totally verified via the interviews. E-mail and Internet was used far less frequently at home with figures of 46.9% and 42.6% respectively. There was evidence that this lack of E-mail and Internet use at home could be due to the quality of the Internet connection. On a number of occasions throughout the interviews, comments were made with respect to the poor Internet connection facilities available through Curtin University. For example:

> *In fact I've given up using Curtin, I actually have my own. I have never, in all the years that I have been here had any success with remote access and people don't want to know (ID245:10a).*

> *I would work more at home if I had a better connection – the university doesn't give you any technical support – and this is concerning the *** School because they are trying to charge a $15 fee (ID111:Q14a).*

ICT Use in Teaching and Learning

It would appear that the majority of the academic teaching staff in the CUIT survey sample utilise ICT in their work environment, however not to a great extent in their teaching and learning other than preparing for their teaching sessions. This pattern was reflected in Table 7.5 where presentation software, the most widely used software application during teaching sessions (34.4%), is also used by 56% of the CUIT survey sample to prepare for their teaching. It is important to note that the level of ICT use during teaching sessions by academic staff often depended on the availability of certain equipment, and hence does not necessarily reflect personal choice. Certain items of the CUIT survey, and many of the comments made throughout the interviews and the TracIT reports, clearly reveal the perceived inadequacies of particular resources and equipment in some teaching areas. For example, 46.4% of the CUIT survey sample agreed/strongly agreed that they would be more likely to use ICT in their teaching and learning if they had access to more computers in their teaching rooms.

Even though the students were expected to use particular software tools, only a small percentage of the academic staff were actually modeling the software they would like their students to use. As identified earlier in Chapter Four - most academic staff do not model the use of ICT skills in teaching (Northrup, 1997; McKenzie, 1998; ISTE, 1999; Trinidad, 2001). Over half (58.8%) of the CUIT survey (Q21) sample agreed/strongly agreed that they would be likely use ICT more if they had up-to-date information on best usage in their teaching area. Similarly, a further 57.3% (Q31:CUIT survey) identified that assistance with integrating IT was an important/most important issue currently confronting them at work. It would certainly appear to be the case that the majority of the CUIT survey sample had very little exposure to advice and support as to how to effectively integrate ICT into their teaching and learning.

As each software application can be conceived an innovation, it was considered useful to identify whether the application had reached the 'critical mass' stage. Table 7.5 (page

140) indicated that word-processing, spreadsheet, E-mail, web browsers, Internet tools, presentation software and CDROMs had reached the 'critical mass' stage regarding the preparation of teaching materials. In fact, the application of word-processing software by 95.1% would be considered to have reached saturation point, where most of the individuals in the survey sample have adopted the innovation (Geoghegan, 1994). Data regarding the software applications used during teaching sessions reveals that only presentation software reached the 'critical mass' stage by the teaching staff in the survey sample. Word-processing, spreadsheet, E-mail, web browsers and presentation software are the only applications that teaching staff *expect their students to use*, that have reached the 'critical mass' stage.

An important finding derived from the interview data was that in some cases an individual's level of ICT skills did not necessarily reflect their level of ICT integration. This imbalance appears to have arisen from the fact that some individuals were able to recognise that being skillful with ICT did not necessarily mean that you could integrate ICT effectively into your teaching and learning. Nearly half (40.5%) of the interview sample acknowledged that their skill level was greater than their integration level.

Teaching Mode

The most common teaching mode adopted by the academic teaching staff (86.7%) who participated in the CUIT survey was the traditional lecture and tutorial (workshop or laboratory) mode, although there was a significant increase in the use of Web-based material for teaching and learning from the initial stage of the data collection period to the final stage, which encompassed a total of 16 months. For example, the CUIT survey data revealed that 8.1% of the interview subsample utilised Web-based material. However at the time of the interviews, 3 months after the CUIT survey, 32.4% of the interview subsample had adopted Web-based material as part of their teaching and learning practice. Similarly, the TracIT reports identified a further increase in the number of case study respondents who were using Web-based material to 59.4%. Table 8.7 represents the individuals in the sample who identified using Web-based material in their teaching and learning.

Table 8.7: Web-based Material Identified by Each Sample.

	CUIT survey N=384	*Interview N=37*	*TracIT N=32*
CUIT survey sample N=384	4.7%		
Interview subsample N=37	8.1%	32%	
Case study sample N=32	6.3%	28.1%	59%

Focussing on the case study sample, the Table 8.7 data indicates that over a period of 16 months there was an increase in those who became involved in applying and developing Web-based material in their teaching and learning, reflecting a change in the traditional teaching mode for these teachers. It is important to recognise the influence of the well recognised Hawthorne Effect on this group.

The interviews revealed that the majority (67%) of staff who were using Web-based material were simply using it to deliver course material. Deden (1998) refers to this use of the Internet as 'shovelware', where traditional content material is simply shoveled onto the Web. Gillespie (1998), Bates (2000), and Weigel (2000) all express a similar view in that using the WWW in this manner adds little to enhance the learning process. On the other hand, Jacobs (1994) argues that it is only natural to begin using the WWW in such a manner – to replicate existing practice. The dramatic increase in such a short time-frame would imply that many of these respondents were perhaps novices and required time to master the skills required. As exhibited by the reflective comments made by the case study sample, with this mastery comes critical reflection which in turn challenges existing practices. It is unrealistic to believe that the adoption of ICT would immediately challenge pedagogical beliefs – this can only occur through experience with applying the technology in teaching and learning.

The increase in Web-based material was also reflected in the Curtin University of Technology WebCT web site (http://webct.curtin.edu.au) through the use of WebCT for teaching units across the campus. During 1998, the number of online courses being implemented by Curtin Schools/Departments using WebCT grew from under 50 to over 300 (http://webct.curtin.edu.au/overview.html). By September 2000 there were over 600 units. This may or may not be an accurate account of the units that are still active. For example, some of the units which were first established a few years ago may not still be in use, but it does reflect the rapid increase in web-based development tools being used by teaching staff for specific units.

The majority of the CUIT survey sample (68%) were able to state their own personal ICT goals, indicating that the use of ICTs was certainly on their personal agenda for the near future. More specifically, the most common (22.2%) personal goal involved the development of high quality on-line material, with a further 9.1% of individuals wishing to develop WebCT units. Development of online courses also featured prominently as one of the key issues currently confronting the CUIT survey sample (Q32). 51% identified that it was an important or most important issue, whereas a further three months down the track, 21.6% of the interview subsample (Q23) felt that it was a major concern also. Such a stance appears to reflect the need to cater for the changing environment - whether individuals are being pressured from students or pressured from department heads - the need to change and adopt web-based learning environments was certainly felt.

The TracIT reports also revealed that the majority of the case study sample indicated that they had used electronic communication extensively with their students (via communication, E-mail lists, WebCT bulletin board, WebCT internal E-mail system, acceptance and marking of assignments). As identified by Green (1998; 1999) online technologies have been the largest area of growth in higher education in the last few years and Curtin University certainly appears to be following this pattern. The data from the various instruments over the 16 month period clearly reveal an increase in both awareness and use of online technologies.

Factors Affecting Adoption

Not surprisingly, the data revealed that a number of factors had a major influence on the level of adoption of ICT in teaching and learning at Curtin University.

Attitude

An important finding for this University was that nearly half (49%) of the respondents to the CUIT survey indicated that providing incentives would aid in their own adoption of ICT in teaching and learning. This supports the views of a number of other researchers - Rossett (1991), Martinez & Woods (1995), Gilbert (1996a), Baldwin (1998), McNaught et al., (1999), and Bates (2000). The importance of providing recognition (i.e being acknowledged for existing practice) also surfaced in the interviews, specifically in Q24, where 21.6% of the subsample identified recognition as a way Curtin University can help them to achieve their personal goals. Question 13, revealed that 10.8% of the interview subsample thought that the lack of an appropriate reward structure hindered the adoption of ICT in their Department/School. The lack of a reward structure was also raised as an issue of concern (Q23) in the interviews by 18.9% of the subsample. Other comments regarding the inadequate reward structure at the University were also made at various stages of the interview. For example:

> *It seems to me that now the balance has gone a bit haywire, that for personal interest and promotional sake people are sacrificing the teaching quality to do the research and I think it is totally unfair from the rewarding point of view but also from the strategic point of view, I think there is a problem. (ID317:Q11).*

It was interesting to note that only three of interview subsample actually identified that research was being rewarded more than good teaching. All of these individuals were very high end users of ICT, which means that they were spending a great deal of time incorporating ICT in their teaching and learning and were obviously not being rewarded. The fact that only three made such comments could also mean that the reward structure is changing at the University, with attempts being made to reward and recognise good teaching. This issue will be discussed in the following chapters.

In Chapter Four it was noted that one of the factors derived from other research studies contributing to the lack of adoption of ICT was a perception by academic staff that ICT has little to do with their discipline (Wetzel, 1993; Gandolfo, 1998; Neal, 1998). This appears to be supported by 44.3% of the CUIT survey sample when they indicated that they needed to see a proven need for ICT in the teaching of their discipline.

It is important to note that 40% of the survey sample indicated they felt uncomfortable with the technology itself. There could be many reasons why this is the case, many of them identified in this chapter, however one of the key reasons would have to be the fact that the technologies themselves are still not that easy to use. As one of the case study respondents noted in the monthly TracIT report, *Usual use of Web/E-mail. All running reasonably well. It's not all that easy though (ID218:March2000).* This respondent is an innovator so one must consider how others feel who do not have the same level of expertise.

The majority of the interview sample (54.1%) identified that the attitude of an individual was one of the main barriers which hindered the uptake of ICT. It was interesting to note the characteristics of the interview sample's attitude toward the use of ICT in their teaching and learning. These surfaced throughout the interview within the context of a number of different questions. Table 7.17 (page 151) provides examples of each characteristic. There was a group who seemed aware of the benefits of adopting ICT, but admitted that they were disinclined to make the effort - the implication being that they did not value highly the use of ICT in teaching and learning. Another group consisted of those who emphasised the need to be able to accept change - adopting ICT simply reflected their changing environment. There were two views in the group who identified ICT with a particular lifestyle and environment. These were poles apart – those who linked the use of ICT purely with work related activities and those who identified the use of ICT as part of their normal everyday environment. The latter group had integrated ICT into their lifestyle in such a way that they could not be separated. The final group consisted of those staff who had linked the use of ICT with a particular teaching style. This group favoured a more personal approach to teaching thus implying that the use of technology was associated with a more impersonal teaching style.

Benefits

As indicated in Chapter Three, one of the key principles of change theory is the need for an individual to perceive the benefits of actually changing and adopting an innovation. In this study all of the interview sample were able to identify the benefits of integrating ICT for their students, however seven of the thirty-seven respondents noted that they did not see that there were any benefits for themselves. Importantly, this group were not solely the low end users of ICT (laggards or late adopters) – they also contained members in the high to very high end users (early adopters and innovators). As noted earlier this particular sub-group viewed the adoption of ICT as a natural progression of change and that ICTs enabled them to do things differently, while the other group could not identify any benefits because making use of ICTs required much more effort than their current teaching practice required. This particular group clearly see that there is not any 'relative advantage' in adopting ICT. Once again, 'relative advantage' can be viewed as the extent to which the new innovation is better than the one it is replacing, and according to Rogers (1995), this characteristic of 'relative advantage' is the best predictor of an innovation's rate of adoption.

Support Issues

At the time of the interviews it appears that each Division within the University has their own technical support strategy in place. As reflected by the data in Table 7.10 (page 145) the type and amount of support certainly varies, however it is important to note that all of the interview sample were able to identify their own technical support person or persons. It was easy to see which Divisions had the most technical support. Regardless of the type of technical support strategies the Department/School had in place, the majority (62.1%) of the interview sample claimed they were satisfied with these support strategies. As noted earlier this figure did not support the evidence from other indicators derived from the CUIT survey (Q24:61.7% and Q29:61.8%) which identified that technical support was in fact a significant issue in their uptake of ICT. The TracIT reports also revealed major concerns regarding a perceived deterioration in the technical support over the 12 month period. In light of this conflicting data it appears that the interview sample rated their support person, not necessarily the support process, which is what was actually being asked of them. Perhaps the researcher needed to make this issue clearer. The changes which occurred over the 12 month period (TracIT reports) regarding ICT support will be further examined in the following chapter.

Other sources also revealed that technical support was not the only type of support of which individuals were in need. For instance, 42.2% of the CUIT survey (Q37) felt that the University could help them better achieve their personal goals by providing technical support, people support, and specific support for online tasks. This was further reinforced in the interviews, where the respondents no longer identified technical support with simply hardware support. The interview subsample were quite specific about their individual needs and the strategies their School/Department and the University needed to establish in order to support their ICT use. This was especially emphasised in Q23 where the subsample were asked to elaborate on their concerns which were highlighted in the CUIT survey. Support was the most common issue identified by 56.7% of the interview subsample. The type of support they referred to included: technical; software; specific expertise; integration of ICT into teaching and learning.

Time

The strongest single issue that surfaced from the CUIT survey was the issue of time. A large majority (74.1%) of the CUIT survey sample agreed or strongly agreed that they would be likely to use technology more if they had *more time to learn about using the technology effectively*. It was interesting to note that 10.2% disagreed and strongly disagreed with this statement, perhaps reflecting Rogers' (1995) "laggards" category that even if they had more time to learn, they still would not use technology more than they already do.

The issue of time was also identified in the open ended question (Q37) from the CUIT survey, where respondents were asked how Curtin University could help them to achieve their personal goals. Nearly half (40%) noted that they required time release, or time for training, or a reduced teaching load. The follow up interview which asked the sample to elaborate also identified the issue of time as a major source of assistance. Almost a third (32.4%) asked Curtin University to provide some form of time release. The third most common barrier to further uptake of ICT within individual Schools identified by the interview sample (Q13) was also time (21.6%). These respondents acknowledged that developing effective ICT skills takes time and noted that many people are just too busy.

The TracIT reports supported many of these conclusions, indicating that the lack of time was a real issue throughout the duration of the study. These comments fell clearly into two categories, lack of time to learn and train, and lack of time due to the heavy workload. For example:

> *Obtaining time to attend even during the semester break for the CEA courses was difficult. Seems to be so many administrative demands along with assessment and results. Seeing failing students and changing study plans, checking units going onto Student One and developing new courses (ID94:July2000).*
>
> *I'm not undertaking any training in IT at the moment - hardly have enough time to do what I can already do, let alone learn new techniques! (ID245:July2000).*
>
> *Students are decidedly more computer literate than last year's first year cohort. This means real change for teaching because students expect staff to be there especially in a university of technology. The change hurts when you can't put a brake on the speed (ID252:May2000).*

McNaught et al., (1999) found that the ability to increase the contact with students actually motivated staff to adopt computer facilitated learning, however regardless of the real benefits to students, they and others (Gilbert, 1996b; Baldwin, 1998; Bates, 2000) identified that this increased contact through electronic communication can result in an overload of work. Fox (2000) advocates that such "unintended consequences" need to be considered when adopting and reviewing any new technology.

Simpson (1998) and Fox (2001) also suggested that the introduction of new technology can increase stress in academic staff. This was certainly the case when teaching staff who had adopted new technology, were faced with having to teach their students how to actually use the technology in order for the students to apply the technology in their particular course.

Training

The majority of the academic teaching staff who participated in the CUIT survey had basically taught themselves how to use ICT. Nearly half (40.6%) were purely self-taught with a further 28.9% identifying themselves as being self-taught with some level of additional training. The age bracket of the majority of the respondents would indicate that they had not grown up with personal computers and that their initial undergraduate, and in some cases postgraduate education, did not involve the use of ICT. The MCEETYA (2000) study involving 1258 Australian teachers also found that the teacher's ICT skills were based on what they had actually picked up themselves.

The CUIT survey data revealed that just over half (51%) of the sample agreed or strongly agreed that they would be likely to use ICT more if they had more technology training. This issue also surfaced in the open ended question of the survey, where 20.4% of the sample noted that the University could help them to achieve their personal goals by providing training (staff development, in house, free). This same question was further discussed in the interview (Q24) with 32.4% identifying the same issue.

As noted earlier, the need for assistance in integrating ICT into teaching and learning surfaced on a number of occasions. This issue needs to be dealt with in context of professional development and training provided by the University.

Facilities and Resources

The highest response (47.8%) by the CUIT survey (Q37) as to how Curtin University can help them achieve their personal goals was in the provision of, *resources and funds.* The CUIT survey (Q33) sample also noted that *replacing aging hardware/software* was an issue currently confronting 50% of them at work. In the follow-up interview (Q23), 40.5% of the subsample supported this same issue - that resources were of a major concern to them at the current time. The interview subsample (16.2%) also identified that the lack of resources as barriers to the uptake of ICT in their particular School/Department.

Summary

One of the key constructs applied in this study was Rogers' (1995) rate of adoption categories. Through the CUIT survey, individuals were asked to assign themselves a rating according to their level of ICT integration into their teaching and learning in comparison to others within their Department/School. This proved to be a valuable exercise. However the researcher was concerned about how comparable the ratings were as each Department/School were clearly different entities within the University. In order to make these ratings more comparable all of the instruments were synthesized to produce a detailed ICT profile for each individual case study participant. Certain distinct attributes evolved and each case profile was examined in relation to these key attributes and was used to compare and relate their level of integration to the level of integration of the others in the case study sample. This process enabled the researcher to assign each case study participant a 'University Rating'. The application of Rogers' (1995) rate of adoption categories enabled the researcher to make some generalisations. In particular, regarding the concept of 'critical mass', it appears that the critical mass stage for integrating ICT into teaching and learning has been reached by the teaching staff in the CUIT survey sample. Examining the 'University Ratings' for the case study sample the same can also be stated. In fact, the majority of the case study participants were at the early majority - innovators (high - very high level) stage. It appears that nearly all teaching staff have access to computers with Internet access at work, with a large majority having the same access at home. The survey sample utilise ICT at work, however not to a great extent in their teaching and learning other than preparing for their teaching sessions. The most common teaching mode adopted by the survey sample is the traditional lecture and tutorial (workshop or laboratory) mode. The data revealed that over the 16 month period of the study there was a large increase in the use of Web-based material for teaching and learning.

The data revealed that a number of factors emerged which affected the adoption of ICT. These factors included: attitude toward the use of ICT; the perceived benefits of adopting ICT in teaching and learning; the provision of adequate support structures; the time factor; training; facilities and resources.

CHAPTER NINE

Research Question Two: Results

> *What is the relationship between the ICT behaviours of a University's teaching staff and the strategies used to implement the University's ICT strategic planning initiatives?*

Introduction

Ultimately the purpose of this chapter is to identify the ICT strategic initiatives implemented by Curtin University and whether these initiatives have impacted on the staff at an individual level. This was achieved by first identifying the University initiatives which were aimed at encouraging and supporting the use of ICT by academic staff. The survey as well as the interview data provided valuable links between the staff and these initiatives, however the key instrument used to respond to this research question was the TracIT report. Through the TracIT reports over the 12 month period the case study participants were monitored closely to ascertain the extent to which the strategies implemented by the University had filtered through to them. The aim was to identify at which point there was a synergy between the strategies implemented and a corresponding change in ICT behaviour for the case study participants.

This chapter has four main sections. The first section begins by portraying the ICT strategic planning initiatives implemented by Curtin University of Technology. This section is further subdivided into professional development initiatives which have an ICT skills focus: the Surviving IT Courses; Computer Literacy for Academics at Curtin, Curtin Computer Training Centre Courses; and Student One Courses.

The second section identifies the initiatives Curtin University has implemented in an attempt to encourage and promote the use of ICTs in teaching and learning across the University. These initiatives are examined in subsections which address training, grants and awards.

The third section discusses the IT Review, which was established by the University to examine the existing Information Technology and Telecommunications service delivery. Incorporated into each of the University initiatives are the researcher's attempts to identify any links found between the strategic initiatives implemented by Curtin University and the actual behaviour of teaching staff. These links are revealed through the examination of the data provided by the three data collection instruments (CUIT survey, Interview, and TracIT).

The last section of this chapter provides a summary of the changes identified by the case study sample through the TracIT reports and attempts to identify the origins of these changes. This particular results chapter does not include a final summary.

Curtin University ICT Initiatives: Skills Focus

"Providing professional development and IT training for staff" was identified as one of the priority strategies for 1999 in the "Curtin University Key Strategic Priorities 1999 – 2001" (Curtin University of Technology, 2000d) planning document. This initiative was directly linked to the Teaching and Learning Key Strategic Initiative, *"Continue development of a flexible learner centred environment"* (Curtin University of Technology, 2000a). In response, the University's Office of Teaching and Learning established a number of initiatives with respect to staff professional development. This section examines the professional courses and other initiatives designed to provide Curtin University academic staff with specific ICT skills.

Since the formation of the Centre for Educational Advancement (CEA) at Curtin University, a Centre within the Office of Teaching and Learning, the Centre has been responsible for implementing a variety of professional development courses for all staff (general and academic) and students. These professional development courses have been conducted in order to fulfil Priority 3 in the CEA Plan (Curtin University of Technology, May 1999a) - "*Designing, producing and supporting appropriate applications of learning technology to encourage and support self-directed learning"*. All of the courses identified in this chapter that are run by the CEA are held in a dedicated CEA training laboratory located within the main library at the Curtin University Bentley campus. The CEA advertise that they are willing to provide specifically designed professional development sessions for all Schools/Departments in order to cater for individual needs. The CEA courses are advertised via the CEA Web site [http://cea.curtin.edu.au/seminars/], Enews, Curtin Link and via regular electronic mail.

The following subsections identify the professional development initiatives implemented by the Office of Teaching & Learning through the CEA, and in particular the courses designated as: *Surviving IT; Computer Literacy for Academics;* and *Student One.* The attendance figures for each course run by the Centre have been obtained and are presented in order to provide a clearer picture of the viability of such courses. It is important to note that the researcher has specifically attempted to provide a great deal of detail regarding the actual course, as the information is pertinent to the findings identified in the following chapter.

"Surviving IT" Courses

One of the long term professional development courses which was originally run by Curtin University's Computing Centre, was the *Surviving IT* course. Since the restructuring noted in Chapter Two, such courses were taken over by the CEA and the Library and Information Service. These courses are targeted at academic staff and postgraduate students and aim to improve overall ICT skills. This course consists of a selection of free ICT seminars which are usually run during the last two weeks of each semester break. These seminars usually run for 2 hours and include sessions on: word processing (word essentials, using styles, handling long documents, annotating with word and using Endnote); presentation software (PowerPoint); Spreadsheets (Excel); Statistical Analysis (SPSS and Questionnaire Design); and Web Authoring (Forms and Questionnaires on the Web and Web Authoring with HTML). Table 9.1 identifies the profiles of the attendees and the attendance figures during Semester I, 1999 at the *Surviving IT* seminars.

Table 9.1: Attendance Figures and Profile - Surviving IT Courses (Semester 1, 1999)

Profile	**Attendance**	**% Attendees**
Academic	67	32.5%
Postgraduate	128	62.1%
General	11	5.3%
Total	**206**	**100%**

The figures presented in Table 9.1 were taken from the "CEA Surviving IT Seminars Semester 1 1999 Report" (Yates,1999) and surprisingly reveal that the majority of the attendees (62.1%) were postgraduate students. In order to obtain similar figures for subsequent courses run in Semester Two, 1999 and Semester One, 2000 the researcher sifted through all of the relevant individual evaluation forms (completed at the end of each training session by the attendee) as well as the initial enrolment lists. The individual evaluation reports usually identified the person's status (general, academic, postgraduate), however the enrolment lists contained only names and/or ID numbers. Fortunately, the researcher had obtained an electronic database of academic staff from Human Resources earlier in the study for the initial mail-out of the CUIT survey. Thus, in order to obtain accurate attendance data, the researcher electronically searched the database for either the name or the ID number for those attendees who didn't complete an evaluation form. If their name appeared on the database then they were registered on the attendance list as an academic staff member. Table 9.2 presents the time period, the total attendance, the number of academic staff from Curtin University who attended the courses and the percentage of academic staff who attended.

Table 9.2: Attendance Figures - Surviving IT Courses (Semester 2, 1999 – Semester 1, 2000)

Courses Held Over Period	Total Attendance	Academic Staff	% of Academic Staff
Semester 2, 1999	237	22	9.3%
Semester 1, 2000	252	34	13.5%

The only identifiable problem with the above method used of obtaining data was that some academic staff may have been new to the University, thus not appearing on the database which had been obtained in March 1999. The researcher was also unable to secure accurate figures for postgraduate students and general staff members who may have attended the courses - however due to the small percentage of academic staff attendance identified in Table 9.2 it is not unreasonable to assume that as in Table 9.1, the majority of the attendees in Table 9.2 were postgraduate students.

The monthly TracIT report was designed to allow the case study sample the opportunity to document all ICT changes which had occurred over the previous month. As noted earlier, the case study sample through the TracIT report were guided to focus upon ICT changes specifically relating to - teaching, students, ICT support, ICT facilities and training. The monthly reports therefore included providing the researcher with details regarding any training sessions each individual attended within the corresponding month. Many respondents also added their evaluation of the session, examples of which are included in the following table. These specific comments provide typical examples of the dialogue which occurred through the TracIT reports, with the nature of the dialogue depending very much on the personality and character of the case study individual. Table 9.3 identifies three members of the case study sample who had attended the *Surviving IT* courses over the 12 month period as documented in their TracIT reports.

Table 9.3: Case Study Participation in "Surviving IT" Courses (August 1999 – August 2000)

Surviving IT Courses		
ID15	August 1999	*Signed up for endnote and attended the course. It was a pretty awful course and I didn't really learn any more than I already knew.*
	August 1999	*I also attended a course on long documents and that was useful and gave me some tips.*
ID252	August 1999	*Attended CEA Web page design courses. They attempt too much too quickly. I think a longer time (say 5 sessions at 2 hours) where each class member sets up and modifies their own web page would be much more helpful than one two hour session which soon gets forgotten.*
	August 1999	*I've also done a questions design course for SPSS. This was really pre computer, a little too crowded but well conceived.*
ID259	June 2000	*I have attended a session at LIS … Will be referring students to it. Have arranged classes for students next semester.*

Table 9.3 reveals that three case study participants attended a total of five sessions. In other words over a period of 12 months, 9.4% of the case study participants utilised the *Surviving IT* courses run by the CEA.

"Computer Literacy for Academics @ Curtin"

The CEA also initiated the implementation of the professional development program called *Computer Literacy for Academics @ Curtin* in May, 2000. According to the "Computer Literacy for Academics @ Curtin - Program Report" (Yates, 2000), this program was developed in response to a number of requests from academic staff. The data (evaluation forms) from the *Surviving IT* program (noted in the section above) indicated that Curtin academic staff wanted *"further courses developed on the use of Information Technology"*. The aim of such a program was to *"improve the computer literacy skills of Curtin's academics, with the emphasis on enhancing teaching and learning"* (Centre for Educational Advancement, 2000a).

This program ran from May 29 – June 28, 2000 and similar to the previous programs, were of 1.5 – 2 hours duration. The topics addressed in this program were: Getting to know your computer; Managing your PC; E-mail (basics & advanced); The Internet; Putting your course notes online; Effectively searching the web; Electronic Journals; Excel; PowerPoint; Getting started with Microsoft Word; MS Word – Beyond the basics; Graphics; and Statistical analysis. Many of these topics are skills-based and similar to the *Surviving IT* courses, however it is evident that their primary intention was to demonstrate how to use the productivity tools effectively in an educational context. The assumption is made that *"improving academics' ability to use the generic tools [will]and, in an indirect way, improve teaching and learning on campus"* (Yates, 2000). Table 9.4 identifies the staff profile of all Curtin University staff who attended the *Computer Literacy for Academics @ Curtin* courses as identified in the Report (Yates, 2000).

Table 9.4: Profile of Attendees - Literacy for Academics @ Curtin (May 29 – June 28, 2000)

Profile	Attendance	%
Academic	71	54.8%
Postgraduate	4	3.0%
General	15	11.4%
Not Stated	42	31.8%
Total	**132 People**	**100%**

Even though the course *Computer Literacy for Academics @ Curtin,* was geared towards academic staff, postgraduate students and general staff were also able to participate. Table 9.5 refers to the case study sample who had acknowledged in their TracIT reports, their participation in the *Computer Literacy for Academics @ Curtin* courses.

Table 9.5: Case Study Participation in Computer Literacy for Academics at Curtin (August 1999 – August 2000)

Computer Literacy for Academics @ Curtin		
ID252	May 2000 May 2000 June 2000	*Taking 3 (or more) short IT programs. Yesterday's one on putting lecture notes on the web was good in that it showed me how to work a bit more efficiently, and confirmed my frustrations with the automation in Word (and Publisher). It was a beginners course, but I think was too fast for beginners. I kept up only because I had already had some experience.*

The TracIT reports revealed that only one out of the 32 case study sample participated in the *Computer Literacy for Academics @ Curtin* courses. This particular academic staff member (ID252) attended three training sessions. As noted earlier, this program had only been established in May 2000.

Curtin Computer Training Centre

The Curtin Computer Training Centre is a part of the Information Management Services (IMS) area, known as the University Information and Systems Technology (UIST) until 1999. The mission statement for this Centre is *"to meet the individual needs of our clients by providing flexible and total training solutions, which draw on the highest levels of expertise, facilities and economy"* (Curtin Computer Training Centre, 1999). Such training courses are fee-paying and range from 1/2 – 2 days in duration. They are held throughout the year with the program schedule being distributed with individual staff pay slips, prior to each semester. These courses are also advertised through a Web site (Curtin Computer Training Centre, 1999), as well as the IMS Web site. In other words, these courses are widely promoted to Curtin staff – both general and academic. Students are also welcome to participate in these training sessions. These courses are also available to the general public.

Each training course is usually targeted at various ability levels – introductory, intermediate and advanced. The Centre attempts to provide courses on the latest software packages with well documented resources and a guarantee of small class sizes (maximum of 10), as well as providing participants with two month follow-up telephone assistance. The training schedule for September to December 2000 included: Introductory (PC's & Windows 95, Macintosh); Windows 98 – 95; Word Processing (Word for Windows 2000 & 97); Spreadsheets (Excel for Windows 2000 & 97); Graphics (Adobe Photoshop, Page Maker, Publisher, PowerPoint 2000 & 97); Databases (Filemaker Pro, Microsoft Access 2000 & 97); and Internet (Netscape Communicator, Internet Explorer, Web Publishing with Front Page). Table 9.6 presents the attendance figures for those who attended Curtin Computer Training Centre courses in the period of July 1999 – July 2000.

Table 9.6: Attendance Figures for the The Curtin Computer Training Centre Courses (July 1999 – July 2000)

Profile	Attendance Figures	% Attendance
Academic Staff	88	12.8%
General Staff	456	66.4%
Curtin Students	34	4.9%
Unknown	109	15.9%
TOTAL	**687**	**100%**

Table 9.6 reveals that the majority of attendees who attend the fee-paying courses at the Curtin Computer Training Centre are general staff, with only a small representative of academic staff. It is important to note that these are fee-paying courses usually paid for by individual departments and schools. Specific comments from the two members of the case study sample who noted in their monthly TracIT report that they had attended the Curtin Computer Training Centre are reflected in Table 9.7.

Table 9.7: Case study Participation in Curtin Computer Training Centre (August 1999 – August 2000)

Curtin Computer Training Centre		
ID241	Aug 1999	*I did a one day course on using Microsoft Frontpage to help me develop units for the Web.*
	Sept1999	*2 day Access 97 course last week*
	Oct 1999	*Completed advanced course in Frontpage*
ID253	Sept 1999	*Have also been to a Nud*ist session. Will follow that up a bit later when I start to collect the data.*

Student One

In April 1999, a new University-wide interactive student records system, *Student One*, was launched at Bentley Campus. Student One training courses were organised through the Academic Registrar's Office (ARO) by the *Student One* Training Team. All academic and general staff who were involved with any aspect of student records were required to attend training. The goal of these training sessions was stated quite specifically - *"That on 7 April when Student One is officially implemented, all staff will be confident and competent to carry out their tasks in the work place*" (Walsh, 1999).

The first Training Schedule, at the Bentley Campus began in February – April, 1999. The Schedule outlined each training session and identified the staff who were required to attend such a session. Two hours was allocated to each session. The next Training Schedule (May 1999 – July 1999) provided similar topics with the inclusion of a variety of new training options: self paced, refresher and lunch time sessions.

Training sessions for *Student One* are ongoing and information about these sessions is available on the Student One Web site (http://access.curtin.edu.au/training/info). The Student One Training Team supported staff through a number of initiatives, including - ongoing training courses, just-in-time training, on line help (built into the system), as well as providing on-the-spot support through a Help Desk facility. *Student One* training is compulsory for all staff (academic or general) who deal with student records and enrolments - in fact, staff are unable to get an access code to the system without having completed the training. Table 9.8 presents the figures for all of the Curtin staff who had attended *Student One* training courses and the number of sessions attended.

Table 9.8: Attendance for Student One Training
(September 1998 – November 2000)

Profile	Attendance Numbers	Sessions Attended
Curtin Academic Staff	300	557
Curtin General Staff	684	2439

The profile of those academic staff attending the Student One sessions tended to be those who were in positions of course advisement. Table 9.8 indicates that 300 academic staff attended a total of 557 training sessions, while 684 general staff attended 2,439 sessions. Table 9.9 identifies those case study participants who attended Student One sessions during the 12 month period TracIT report time frame.

Table 9.9: Case Study Participation in Student One Courses (August 1999 – August 2000)

Student One Courses		
ID94	August 1999	*… makes me remember all the time spent with the Divisional Student One team placing all our courses and units on the system. Perhaps recognising the diverse information and amazing data capacity it will have when it really manages to work well.*
ID211	Aug 1999	*Student One Training*
ID245	Aug 1999 x2 Oct 1999 x 2	*Student One Training* *Student One*
ID109	Sept 1999	*Student One*
ID337	Sept 1999	*I have attended this week a Student One information session with hands-on experience. A must when the new system is to be introduced soon.*
ID119	Nov 1999 (3 sessions)	*I went to learn the basics of "Student One", a software package for entering and retrieving data on students, their subjects, grades, contact details, etc. (I found it to be user-unfriendly, unintuitive, very slow and inefficient really)*
ID218	Feb 2000 March 2000	*Rapid learning Curve on S1. I have been nominated as ___ rep for the committee to investigate S1 implementation problems.* *Have attended more S1 training.*
ID252	Feb 2000	*Did a Student One training program. Program was okay but I think the whole concept of presentation is alien to my way of learning.*
ID241	Feb 2000	*Student One Training*
ID317	March 2000 June 2000	*Student one is a pain. Too slow and inconsistent. Most of the time retrieve is the option then it changes into print for another module. Most staff find it too slow and if you impatient you tend to think the system has crashed. It takes too much memory and student names are combined that is first name and surname are one field. How frustrating.*
ID375	April 2000 x 2	*Student One*

Table 9.9 indicates that eleven of the case study sample attended one or more *Student One* training sessions. In total, 19 sessions were attended.

Teaching and Learning ICT Initiatives

The initiatives identified in the previous section were the professional development courses which focussed on training staff in specific ICT skills, whereas this section attempts to identify those initiatives which attempted to develop a more effective use of ICT's in teaching and learning. As noted earlier, the *Computer Literacy for Academics @ Curtin* program assumes that staff would apply the skills covered in the courses to their own teaching and learning. The other initiatives such as *WebCT* courses, *Teaching & Learning @ Curtin* courses, the New Media Initiatives, the LEAP project and the ITP awards clearly suggest that these initiatives were designed to promote and specifically help staff integrate ICTs into their teaching and learning, in the hope of supporting and encouraging real change in teaching practices. As the *University Strategic Plan 1998 – 2003* reflected:

> *Rapid technological developments, ... are affecting university teaching in three ways: by producing new curriculum content, by modifying traditional classroom teaching situations and, most importantly, by transforming the very nature of educational provision itself ... As information technology infrastructure develops, radical consequences should be anticipated. There will be a need for continued research and development into the most effective ways of using technology to support teaching and learning.*
>
> *(Curtin University of Technology University Strategic Plan 1998-2003, 1997a).*

Each of these ICT initiatives are discussed in the following section.

WebCT Courses

In 1998, Curtin University allocated Quality funds to the Office of Teaching and Learning in order to encourage and co-ordinate the use of ICT. As a consequence of this funding, the Office of Teaching and Learning established a number of projects which were known as the 'New Media Initiatives'. The WebCT initiative was one of these funded projects.

WebCT is an integrated web publishing environment specifically designed for web development within a teaching and learning context and accessible via a standard web browser. As noted earlier in Chapter Six, WebCT has been adopted by a number of Schools/Departments and individuals across the University in order to accelerate their web-based course delivery. WebCT has been encouraged and supported because it is the identified way for staff to move courses on to the World Wide Web at Curtin University. WebCT provides tools which allow individuals to publish lecture materials, course notes, audio & video content, as well as integrate email and chat facilities, glossaries of terms, quizzes and various other functions. Included in this initiative was training and support in the use of WebCT.

Unlike the other 'New Media Initiatives' discussed earlier, WebCT has continued to be promoted and encouraged through the CEA. The CEA established a support team and continued to provide on-going training sessions. As with other training sessions organised by the CEA, these WebCT sessions are free of charge. These sessions are about 2 hours in duration and are held through out the semester at various times and days. They cover a range of web based techniques and skills - Introduction to Web Based Learning, Developing Web Based Learning Environments, On-Line Web Based Assessment Tools, and Preparing Teaching Materials for Web Delivery. The WebCT team also attempt to cater for individual School/Department needs by providing custom made courses. WebCT sessions attendance figures were unavailable. Table 9.10 reflects the case study participant in WebCT courses.

Table 9.10: Case Study Participation in WebCT Courses (August 1999 – August 2000)

WebCT Courses		
ID15	Aug 1999	*I went to a two hour WebCT course – the implications to me mean if I really want to do this I really need to think through this very carefully and a lot of conceptual work needs to be done regarding the course well before I get anywhere near talking to people about how to get it onto WebCT or on-line some way.*
ID111	Aug 1999 Nov 1999 Nov 1999 April 2000	*WebCT course undertaken (very good)* *WebCT courses (2)* *Assessment & General* *WebCT training course undertaken (CEA)*
ID317	Oct 1999	*WebCT training course*
ID217	April 2000 April 2000 April 2000 June 2000	*April was WebCT month. I attended 3 sessions during the month and hope to write a first year unit for second semester.* *I have gone to a number of those 2 hours sessions at CEA particularly those dealing with WebCT. I am hoping to have at least 1 or 2 units on WebCT for Semester 2. These have been quite good in that they don't take a lot of time and you get an intro to what it is about and some contacts.*
ID 229	July 2000	*I attended 'Introduction to Web Based Learning' 2 hour course run by the CEA at Bentley*

According to the TracIT reports, five of the case study sample attended WebCT courses, with two individuals participating in four sessions while the remaining three attended one session.

"Teaching and Learning @ Curtin"

The *Teaching & Learning @ Curtin (T&L@C)* program initiated by the CEA was implemented for the first time in first semester, 1999. The program was designed specifically as a major professional development initiative in teaching and learning for Curtin academic staff. The semester one, 2000 series consisted of ten seminars which focused on *"practical suggestions for enhancing teaching practice and the development of new strategies to improve student learning"* (Kulski, 1999). These sessions were also free, lasted 2 hours and were usually held on a weekly basis over 12 weeks. Unlike the other professional development courses discussed in this chapter the program is not ICT-based although one of the main components of the program addressed issues of ‘flexible learning’. For example, the program for second semester 2000 addressed professional development across the following themes:

- Postgraduate Supervision - Supervising postgraduate students at Curtin, creating a supportive environment for postgraduate students, establishing and maintaining effective supervisor-student relationships and helping postgraduate students to be effective writers.
- Flexible Learning - Introduction to flexible learning, developing flexible courseware, improving online teaching, and standards for online teaching and learning.
- Assessing Learning and Evaluating Teaching - assessing online, exploring outcomes focused education, evaluating your teaching using SEEQ and other strategies and documenting teaching and learning in a professional portfolio.

Participants had the option of attending the complete program or a single session of their choice. At the end of the program the participants received a certificate indicating which sessions they had attended for inclusion in their teaching portfolio. This type of formal acknowledgement of attendance does not appear to be included in any of the other CEA courses. Table 9.11 reflects the attendance figures as well as identifies the participating Curtin University staff profiles for each session of the *T&L@C* course in Semester I, 2000.

Table 9.11: Attendance for Teaching & Learning @ Curtin Courses (Semester One, 2000)

Date	Session Title	Academic Staff	Postgraduate	General Staff	Total
13/3/00	Making the Most of Your Teaching	19	2	1	22
20/3/00	Planning Effective Teaching & Class Sessions	7	3	3	13
27/3/00	Helping Students to be Effective Learners	12	2	2	16
3/4/00	**Supporting Flexible Learning**	**18**	**1**	**4**	**23**
10/4/00	**Fostering Self Directed Learning**	**12**	**1**	**1**	**14**
1/5/00	**Teaching Online**	**13**	**1**	**2**	**16**
8/5/00	Integrating Generic Skills	10	1	2	13
15/5/00	Designing Effective Unit Outlines	9	1	1	11
15/5/00	Assessing Student Learning	10	1	0	11
15/5/00	Developing Students’ Cross Cultural Perspectives	8	0	2	10
	Total Attendance	**118**	**13**	**18**	**149**
	%	**79.2%**	**8.7%**	**12.1%**	

As noted earlier, unlike the other professional development courses which were purely ICT based, these courses have an ICT component – identified by the shaded areas. The most popular course was *Supporting Flexible Learning*, followed closely by *Making Most of Your Teaching*. The majority of the attendees were academic staff (79.2%) with small numbers of postgraduate students and general staff. Table 9.12 outlines the attendance figures as well as identifies participating Curtin University staff profiles for each session of the *T&L@C* sessions held during second semester, 2000. There were seven sessions conducted over second semester 2000 with the majority of attendees continuing to be academic staff (87.5%), with only a small representative of postgraduate students. The two most popular sessions were: Supervising Postgraduate Students and Improving Online Teaching & Learning.

Table 9.12: Attendance for Teaching & Learning @ Curtin Courses (Semester 2, 2000)

Date	Session Title	Academic Staff	Postgraduate	General Staff	Total
31/7/00	Supervising Postgraduate Students	23	2	0	25
14/8/00	Supervising Postgraduate Students	16	1	0	17
14/8/00	Establishing & Maintaining Effective Student - Supervisor Relationships	16	5	0	21
21/8/00	Helping Postgraduate Students to be Effective Writers.	20	5	0	25
4/9/00	**Introduction to Flexible Learning**	**13**	**2**	**0**	**15**
11/9/00	**Improving Online Teaching**	**20**	**2**	**0**	**22**
18/9/00	**Standards in Online Teaching & Learning**	**18**	**1**	**0**	**19**
	Total Attendance	**126**	**18**	**0**	**144**
	%	**87.5%**	**12.5%**	**0%**	

The TracIT reports revealed that there were not any members of the case study sample who attended these *Teaching & Learning @ Curtin* sessions. This was also verified by the researcher who obtained the attendance figures for the *Teaching & Learning @ Curtin* sessions by sifting through the attendance list for each session. Fortunately the attendance list specified the name as well as their profile (academic, general, postgraduate).

The New Media Initiative

In 1998, a priority of Curtin's Strategic Plan was the development and support of the use of ICT to support teaching and learning. As noted earlier in this chapter, the

University allocated funds through the Office of Teaching and Learning to support this initiative. A host of projects were funded under the umbrella of "The New Media Initiative". The WebCT initiative was one of these and as discussed previously is still ongoing. Other projects which were funded included:

- The Alternative Delivery Development: Communications and IT Project – a project team was established to *"report on both technology-based and non-technology-based opportunities for introducing open and flexible modes of learning to satisfy student's demands in the future"* (Curtin University of Technology Information Technology Strategic Plan, 1998a);

- New Media Associates Program – Funding was provided for a part-time position for a New Media Associate for each Division at Curtin. The New Media Associate was to foster and coordinate the use of new technologies for teaching and learning;

- New Media Projects – Projects were funded to encourage academic staff to incorporate new instructional technologies in their teaching. Grants were awarded in October 1998, for completion by July 1999. Each division was awarded the following number of projects: Curtin Business Schools (8), Health Science Division (6); Engineering & Science (5); Humanities (3); Muresk (2) and Kalgoorlie (1);

- The We3 Project (World Wide Web for Effective Educational Excellent) – Funding for the development of *"a set of guiding concepts, ideas and questions to assist Curtin academic staff in developing Internet-based education"* (Winship, 1998). Funding for this project was given in March 1998 and was completed in 1999 with the development of *"The Internet-based Learning Construction Kit"* (http://cea.curtin.edu.au/ibl/).

The funds provided for the New Media Initiative projects were short term and most of the work occurred prior to the commencement of this study. There was not any indication that any of the interview subsample or the case study participants had been involved with any of these projects.

The Learning Effectiveness Alliance Program

Another of the Teaching & Learning key strategic initiatives identified in the "Curtin University Key Strategic Priorities 1999 – 2000" was to 'introduce reward mechanisms for good teaching'. The Learning Effectiveness Alliance Program (LEAP) is one of the major strategies implemented by Curtin University of Technology in response to such a priority. The program according to the overview:

> *is designed to enhance the quality of teaching and learning by providing financial and other forms of support for several exemplary developments in selected areas of the University. Those selected are seen as being able, through participation in LEAP, to make a major impact on other areas as well as their own. ... aims to facilitate significant change through collective effort by teams of colleagues. It also enables the University to refine its indicators of quality in teaching and learning.*
>
> *(Curtin University of Technology, 2000f)*

The LEAP grants are designed to assist teaching and learning at the School/Department or Divisional level over a three year period with the objective of initiating real change. Table 9.13 presents the projects which were successful in Round 1, 1999 and Round 2, 2000, with specific reference made to those projects which had an ICT focus.

In total, ten LEAP grants have been awarded to various Curtin University Schools over the past two years, with five (those identified in the shaded area) specifically focusing on ICT. The distribution of the LEAP Grants over the Divisions were Health (3), Curtin Business School (2), Humanities (2), Engineering & Science (2), and one LEAP Grant awarded to Muresk (Agriculture).

Table 9.13: Successful LEAP Projects (Round 1, 1999 & Round 2, 2000)

Time/ICT Focus	Project Title-Area
Round 1, 1999 ICT Focus	***Creating a single learning community for on- and off-campus students by provision of consistent and comparable learning experiences through open and flexible teaching and learning.* - School of Biomedical Sciences**
Round 1, 1999	*Preparing CBS graduates for successful employment: an integrated approach to developing professional skills.* - Curtin Business School
Round 1, 1999	*Developing student-centred learning within an outcomes-focused environment".* - Faculty of Education
Round 1, 1999	*Student performance evaluation project.* - Division of Eng. & Science
Round 1, 1999 ICT Focus	***A Model of integrated learning delivery.* - Graduate School of Business**
Round 2, 2000 ICT Focus	***Developing Flexible Learning Environments: A broad scale strategy to increase both course and unit flexibility within the Division of Engineering and Science.* - Division of Engineering and Science**
Round 2, 2000	*Creating an Environment for Collaborative Language Learning.* - School of Lang & Intercultural Education
Round 2, 2000 ICT Focus	***Developing and evaluating flexible delivery methods to achieve generic and professional skills and contribute to a consolidated teaching environment across the University.* - Muresk Institute of Agriculture**
Round 2, 2000	*Meeting Student Expectations.* - School of Physiotherapy
Round 2, 2000 ICT Focus	***Fostering flexible delivery and self directed Communication and Information Technology Literacy in a cross-cultural context for students and staff in the Division of Health Sciences.* - School of Public Health**

The TracIT reports revealed that three of this study's case study sample were actively involved with three of these LEAP projects. Two were involved with ICT-based projects, and the third with one of the projects that had an ICT component. Table 9.14 identifies the case study individuals involved in the LEAP projects, the ICT integration into teaching & learning level they assigned themselves in the CUIT survey and the ICT skills rating they gave themselves during the interview.

Table 9.14: Case Study Individuals Involved in LEAP

ID	LEAP Project	Individual Integration Rating (Survey)	Skills Rating (Interview)
ID292	ICT Based	3	5
ID25	ICT Based	2	4
ID15	ICT Component	1	3

Code: 1=very low, 2=low, 3=medium, 4=high, 5=very high.

The researcher is unable to reveal those specific projects in which the case study participants were directly involved due to confidentiality agreements. It is important to note however, that although those individuals who were involved with the ICT-based projects gave themselves a medium (3) and low (2) level of ICT integration, they assigned themselves a much higher level for their skill rating. In other words, they claimed a high level of ICT skills, yet acknowledged that they had not as yet applied these skills to their teaching and learning.

Innovative Teaching Practice Awards

The Innovative Teaching Practice (ITP) Award program at Curtin University was initiated by the Office of Teaching & Learning to provide recognition and reward for exemplary teaching by individuals, teams and Schools. The concept of such a program was to raise the profile of teaching across the University by rewarding innovations in teaching practice. Similarly to LEAP, the ITP scheme was also a priority strategy for 1999, located under the umbrella of initiatives which *"introduce reward mechanisms for good teaching"* (Curtin University of Technology, 1999a).

The award includes a framed certificate and cash ($2,000), to be used for any academic purpose. This program was also linked to "Curtin University's Teaching and Learning Plan" – *"to promote, recognise and reward quality teaching"*. In 1999 the CEA introduced a seminar program which enabled the winners of these awards an avenue to showcase their 'exemplary' work. There were nine award winners in 1999 (4 individual and 5 teams). Importantly, one of the individual winners was recognised for his, *"re-innovation and the use of low and high technology in creating a more challenging, rewarding, and interactive learning environment"* (CEA, 1999).

Ten recipients (4 individual and 6 team) received ITP Awards in October 2000 (CEA, 2000). Three of the awards were given to those who were strongly linked to developing on-line and flexible learning environments. In addition to these ten awards, the Vice Chancellor of Curtin University contributed $30,000 for a School Innovative Teaching Practice Award. Nine Schools in the University participated in the award scheme (Reid, 2000). Over the past two years (1999 – 2000) there have been 19 recipients of the Innovative Teaching Practice (ITP) Awards. In total, four of the awards have been given for innovative ICT use in teaching and learning – however ICTs did feature in the summary profiles of other recipients.

Without disclosing individual identities, two of the interview subsample were recipients of the awards and two of the case study sample were also recipients of ITP awards. Due to confidentiality agreements put in place for this study, the researcher is unable to identify the year, whether it was for an individual or team award or the reason for the award. Table 9.15 indicates which sample the recipients were from and their level of ICT integration and their skill level.

Table 9.15: Interview and Case Study ITP Recipients

ID	Sample	Individual Integration Rating (Survey)	Skills Rating (Interview)
ID247	Interview	5	5
ID4	Interview	5	5
ID259	Case study	2	2-3
ID101	Case study	1	1

Code: 1=very low, 2=low, 3=medium, 4=high, 5=very high.

The level of integration and the skills rating of each individual ITP recipient is the same except for one slight variation, participant ID259. This would infer that they have applied their ICT skills in their teaching and learning.

ICT Infrastructure Initiatives

Chapters Four and Six touched on the importance of appropriate infrastructure in order to support the effective use of ICTs in teaching and learning. Curtin University of

Technology has responsibility for this infrastructure as stated in the University Strategic Priorities:

> *Provide IT infrastructure and support services that allow the University to fully exploit the efficiencies of electronic information retrieval and information exchange in the day to day operations of the University.*
> *(Curtin University Key Strategic Priorities 1999 – 2001, 2000d p21).*

The IT Review became part of this strategic initiative. The following section addresses the IT Review initiated by Curtin University of Technology.

IT Review

In October 1998, the Planning and Management Committee at Curtin University gave their approval to seek external guidance regarding the Information Technology and Telecommunication (IT&T) service delivery at the University. This decision appeared to be in response to the concerns across the University regarding a perceived 'IT Support Crisis' (Winship, 1997; Walton, 1998). A public tender document was issued entitled, "Effective Management & Development of the Corporate Information Asset: Development of a Business Plan" (Curtin University of Technology, 1998d), which provided a brief background of Curtin's strategic position, their organisational structure, a detailed description of the existing IT&T infrastructure at the University, and the objectives and scope of the proposed business plan. The document also identified the need for external advice:

> *Curtin, as with many other large agencies, has, in its embrace of a rapidly evolving and expanding IT&T environment, failed to completely appreciate the resultant support consequences. The University recognises that it is in a precarious position. It seeks, through examination of its current position, to return IT&T support and growth to a sustainable position.*
> *(Curtin University of Technology, 1998d, p5).*

The tender document also specified certain other matters which needed to be examined, such as the nature of the corporate asset, standardisation of operating environments, acquisition policy, service delivery model, the management regime, IT&T priorities, role and structure of University Information Systems & Technology (UIST) and other related issues. Ericsson Consulting became the successful contractor in January 1999. A team of members comprised of Ericsson Consulting and Curtin University staff began work in January 1999 on the review of IT&T service delivery (the *IT Review*) at Curtin University.

A mid-term report was released by the project team in March 1999 with 20 recommendations. These dealt with: the corporate leasing of IT&T equipment; a Standard Operating System (SOE); review of the email system; implementation of a Total Cost of Ownership Model and related IT&T policies. A committee (the IT Review Project Steering Committee, [ITRPSC]) was established in April 1999 for the purpose of managing the implementation of the Mid-Term Report. Funding was also approved for the implementation of these recommendations. The final *IT Review Report* was delivered in June 1999 with a further 33 recommendations presented. In addition to the previous recommendations these included recommendations relating to a new IT&T support model, UIST structure and an IT&T Management Regime.

In July 1999, the Vice-Chancellor of Curtin University of Technology sent an email titled 'IT Review Update' to all staff at the University advising them of the outcome of the IT Review. He acknowledged in his email that this was in response to 'a high level of interest' in the IT Review. In his email statement the Vice-Chancellor specified some of the conclusions of the IT Review:

- *That there is a major user dissatisfaction with IT&T service delivery;*
- *That an important part of Curtin remaining competitive is improving IT&T service delivery;*
- *That achievement of improvement requires additional rigour in IT&T practice, additional IT&T resources and a more 'corporate' approach to IT&T oversight and management; and,*
- *That any model for sustainable IT&T service delivery must encompass the needs of students as well as staff.*

(Twomey, 1999, p 4)

The Vice-Chancellor continued his statement by further identifying the areas of concern and stating the recommendations in some specific areas of interest: Standard Operating Environment (SOE); Email Review; Corporate Leasing; IT&T Support Model; UIST Structure; Total Cost of Ownership; IT&T Policies; IT&T Management Regime. The Vice-Chancellor ended his email with this statement:

> *The final Report (Business Plan) included a cost benefits analysis of the IT Review's 53 recommendations. This identified a funding gap to achieve initial implementation but, provided there was a recoup of identified benefits, identification of a positive return to the University within four years. This said (and assuming a decision to proceed), this entails a major shift in current policy and funding practice. The transition required is both significant and complex and will require some time to determine. Recognising this as a pivotal issue, the ITRPSC has recently authorised Ericsson to work with Divisions and Financial and Commercial Services to undertake the required level of analysis necessary to prepare a feasible route to implementation. (Twomey, 1999, p 3).*

Approximately four months (November, 1999) after the Vice-Chancellor's IT Review Update, the University Information Systems & Technology established 'UIST News' and published the first issue on the Website: http://it.curtin.edu.au/uistnews/Previous%20Issues/17-Dec-1999.htm. In similar vein, to the Vice-chancellor's email message, the newsletter was initiated *"in response to our clients' request for more information on what is happening at UIST"*. This newsletter appeared to be a useful mechanism for the dissemination of the policies and strategies deemed from the recommendations made from the IT Review. UIST News published 15 issues from November 1999 to August 2000. Table 9.16 refers to the major accomplishments identified in UIST News in the period of November 1999 – 2000. The significance of identifying the milestones in Table 9.16 is to establish whether these new strategies and procedures affected the behaviour or environment of the case study sample in any way.

Even though the IT Review project team had presented all of their recommendations by June 1999, (prior to the researcher's interviews being conducted), concerns about the impact of these recommendations didn't appear to feature to a great degree in the interviews. Only three of the interview subsample made reference to the IT Review.

Table 9.16: ICT Accomplishments as Identified in UIST News

UIST News	Accomplishments
November 1999 Issue 2	**SOE** – Developed with the PC platform and active since October around Curtin in a number of areas.
Feb 2000 Issue 6	**SOE** - UIST Seminar Series on exploring this environment. **Student One** - UIST working with the Student One team and noted a 'high success rate for Student One version upgrade implementation'.
Feb 2000 Issue 7	**Lecture Theatre Upgrades** – all theatres have partial or complete bunkers. Mobile bunkers available: (http://it.curtin.edu.au/facilities/bunkers/MobileBunkers.html) Implementing new IT Support Model for the Vice-Chancellory, Kalgoorlie and Muresk Campus.
March 2000 Issue 8	**The IT Review Project Steering Committee (ITRPSC)** was formally disbanded. The Information Management Committee (IMC) was established as a subcommittee of the Planning & Management Committee (PMC) and will complete the business of the ITRPSC. The aim of such a committee is to 'provide a forum where a global planning framework can be used to evaluate and approve University wide IT planning decisions'.
March 2000 Issue 9	**Corporate Leasing Agreement** and **SOE** Finalised **Contract Management Office -** established to manage the leasing arrangements.

Table 9.16: ICT Accomplishments as Identified in UIST News (cont'd)

UIST News	Accomplishments
April 2000 Issue 10	**SOE Extension** - designed by the SOE team and the divisional/school IT support staff (tier 2) for the purpose of keeping a standard desktop, as well as meeting the specific needs of schools/departments/units.
June 2000 Issue 14	**Messaging Solution** – Strategic Planning Solutions were awarded the contract and began work at Curtin in May 2000 **UIST Structure** – Last stage of the IT Review recommendations. The New structure should be fully in place by Sep/October 2000.
July 2000 Issue 15	**UIST Structure** – UIST renamed to Information Management Services (IMS). IMS no longer has a Director but a General Manager. Four new appointments were made each with the title of Director in the following areas – Technical Infrastructure, Applications, Strategic Services, and Quality and Policies. **IT Support Model** - Launch of the new Vice-Chancellory and remote campuses (Kalgoorlie, Muresk and Esperance) Help Desk **A Vice Cancellory User Focus Group** - established to help implement the new three tier support structure.
August, 2000 Issue 16	**Messaging Solution** – IMS scheduled for migration to the new messaging system 25th September, followed by Vice-Chancellory in October. **SOE** – The new version is due for release on 15th September.

(Curtin University of Technology, 1999b)

Table 9.17 identifies the remarks made regarding the IT Review in the interviews.

Table 9.17: IT Review Comments (Interviews)

ID & Question No.	IT Review Comments
ID 218 Q23	*I believe the IT review could impact on us. The central model doesn't suit us at all. We need to be able to handle things very much locally. We have special software and hardware, how is that going to work.*
ID 217 Q17	*The network is always breaking down. The trouble with what they propose to do when everything is centralised they won't have our specialised software. We have been getting away with it because many of the students have their own computers. But what about those who don't. The situation is pretty shocking.*
ID 211 Q23	*Yes I mean all of those are issues but I would say the most important one at the moment is the failure of the university to come up with a flexible IT policy that, accepting the constrains of budget, enable staff to lead rather than just follow along with what they are told to do…*

The main concern for these three interviewees appears to be the issue of 'centralisation', which they viewed as a process by which the autonomy of individual schools was to be removed (e.g by threatening their use of specialised software).

As noted, there was little reference to the IT Review in the actual interviews conducted by the researcher. However, the implications of the IT Review recommendations were revealed to a greater extent in the TracIT reports over the 12 month period, August

1999 – August 2000. Table 9.18 presents samples of the comments made by the case study sample about the impact of the IT Review recommendations. See Appendix D.5 for the complete data set referring to the IT Review.

Table 9.18: IT Review Comments (TracIT Reports)

IT Review Comments	***No of Case study***	***No of Comments***
Centralising ICT Support *On the IT support side we have had a further downgrade of support. We have a temporary guy helping out for 3 months but then I fear we will have to draw our support from a Divisional Team. I fear the worst but we'll hopefully cross that bridge when we come to it. (ID218:July 2000)*	7	9
Corporate Leasing of Equipment *A major barrier to IT use in our School has suddenly appeared on the horizon. It appears the University's desire to make business connections with the community may result in a monopoly-like situation that increases the financial burden on the Schools while removing their autonomy. The computer leasing policy will freeze out Mac users, cost the School twice as much as our current budget for IT while forcing us to lease rather than purchase. This will have significant implications for part time staff and students, particularly graduate students (ID251:March2000).*	3	3
Standard Operating Environment *The main thing this month has been the change-over of computers to the new leased SOE ones. They look good and the change-over went fairly smoothly except that the day chosen was the last day that exam results were due.(ID21:June2000)* * two of the case study sample had made comments earlier.	2**	4
Total	**12**	**16**

Table 9.18 reveals that 12 (37.5%) of the case study sample identified changes in their environment which directly related to the IT Review recommendations. The impact of these changes is examined in the following chapter.

Awareness and Attitude – Professional Development Courses

Previously in this chapter, the researcher has attempted to identify and present those initiatives implemented by Curtin University which advance and support the use of ICTs in teaching and learning. With regard to the professional development courses available to Curtin University staff, the researcher has attempted to provide a clear picture of the pattern of usage by presenting the figures of attendance for Curtin University staff at the courses, where possible. The researcher has also identified the case study participants who attended each professional course, in order to judge whether the initiative had filtered through to the case study sample who were distributed across the University. These identifiable links between the initiatives and the case study sample enabled the researcher to better establish the effectiveness of each initiative through the qualitative data found in the TracIT reports.

As identified earlier in Chapter Eight, the nature and extent of training appeared to be a contributing factor to the adoption or lack of adoption of ICT. Prior to establishing the effectiveness of a particular professional development initiative, the researcher attempted to examine whether Curtin University staff were aware of Curtin University training courses (CUIT survey), and their attitude toward training (Interviews, TracIT reports). These issues are addressed in this section.

One of the questions in the CUIT survey was used to ascertain whether the survey sample were aware of the training options available at the University. *"Q15 – which of the following training options are you aware that Curtin University offers its academic staff?"* Respondents were given the choice of the following responses: short courses; all day sessions; general courses; specific software courses; integrating ICT into teaching and learning courses and providing their own. Respondents were able to make more than one selection. Table 9.19 presents data regarding the awareness of Curtin University Courses by the CUIT survey sample.

Table 9.19: Awareness of the Courses Available at Curtin (CUIT survey)

No of Courses	**% N=384**
Not aware of any Curtin University courses	7.6%
Aware of one course	11.2%
Aware of two courses	18.8%
Aware of three courses	17.4%
Aware of four courses	20.8%
Aware of five courses	24.0%

Table 9.19 reveals that the majority (62.2%) of the sample were aware of at least three of the training courses Curtin University provided for their teaching staff. The three most widely known courses were the short courses, the software specific courses and the all-day sessions. A total of 18.8% were aware of the existence of only two training courses, while 11.2% were aware of only one of the options. Finally, 7.6% of the respondents didn't know about any of the courses the University provided.

One of the questions in the interview asked the subsample to *"rate their own IT skills on a scale of 1 – 5 where 1 is poor and 5 is excellent".* If the respondents gave themselves a rating of 1, 2, or 3 the questions which followed were *"Q3 Which specific skills would you like to improve?"* and *"Q4 How will you go about improving these skills?"* Of the 16 teaching staff from the interview subsample who were asked this question, 50% of them identified that they would attend a course (37.5% *'short courses – when required'*, and 12.5% '*Computer Training Centre'*). The respondents had the option of making more than one response and the next most common response (37.5%) was *"finding time to improve".* There were a variety of other responses mentioned only a few times such as, '*ask the computing person', 'ask colleagues', 'practice', 'read manuals/books'* and, *'there needed to be more commitment from their Department/School in supporting their need to improve ICT skills'.* These responses ultimately revealed each individual's personal strategy for improving their ICT skills.

Attitude Toward Training Courses

At various stages of the interviews comments surfaced specifically relating to the training courses held at Curtin University. Twelve (32.4%) of the interview subsample made a total of 17 comments at various stages of their interviews which reflected their attitude toward training sessions at Curtin University. Four of the interview subsample noted how useful the Curtin University courses had been. For example:

> *...with the Student One training that I have just been undertaking, which is extremely good. But in part because the stuff that I was doing was the courses management elements and the target market was much more closely defended, but the trainer did an extremely good job (ID211:Q5a).*

Three of the interview subsample identified that although they were well aware of the Curtin University courses, they hadn't put any effort into attempting to attend. For example:

> *I am aware of them but I just haven't taken the time to do it. Too lazy that's what it is basically. I think that if I was more organised I could do it, they don't take that long, most of the sessions are two to three hours (ID255:Q5b).*

The remainder of the comments reflected some level of discontent concerning the courses. The most common concerns experienced by four of the individuals were the inappropriate structure of the actual sessions being run. For instance, the duration of the course and the varied ability levels of participants within the one session obviously caused some problems. For example:

I go to Canning College at least two hours a week to train myself into some of these things because these half day courses are useless to me we actually need more structure two hour a week training courses around this campus. I need to practice a bit but that is no way of learning (ID241:Q24).

Another main concern identified by three of the interview subsample was that each session provided far too much information to actually process and apply. For example:

What I've often found is you go to a course and they tell you stuff and you think that sounds cool but if you don't immediately use it then it is gone (ID27:Q2)

Concern was also expressed about the situation of having to pay for their own training (this was widely acknowledged in the CUIT survey – Chapter 7) and that the content of the courses was often inappropriate. Importantly, of the 12 interview subsample (identified above) who made comments which reflected their attitude toward Curtin University courses, nine of them did not attend any training sessions over the 12 month period identified through the TracIT reports. Appendix D.6 contains transcripts of all of the comments concerning Curtin University courses made by the interview subsample.

Lack of Time to Attend Training Courses

Time was an issue which clearly surfaced in Chapter Eight regarding the inability to adopt ICTs effectively. The interview and TracIT report data reveal the links between time and training – in particular, the lack of time to attend training sessions. A typical example noted in the interview data:

I haven't gone to any courses mainly because I don't have the time. I would love to go to them and I get the list and every time I look and think it would be great to go to that and I tick something off and when the time comes I don't have time. It's not as if I don't want too, I can see it would be very useful (ID253:Q5a).

Table 9.20 identifies the interview subsample and the case study sample who made similar comments to the one above. The instrument, the location of the remark and whether the individual actually attended any training during the 12 month period, is also identified in the table.

Time was an important issue that surfaced in the survey data and constantly through out the interviews and the TracIT reports. Table 9.20 identifies only those comments which specifically refer to the time available for training. Close examination of the individual TracIT reports reveal that of this group of nine case study members, six of them attended Curtin University training courses.

Table 9.20: Lack of Time to Attend Training Courses

ID	Instrument & Location	TracIT Report Sample – Training Attendance
ID 99	Interview Q4	Interview subsample only
ID 253	Interview Q5a	Curtin Computer Training Centre
ID 349	Interview Q24	No Training
ID 101	Interview Q 2	No Training
ID 283	TracIT - March 2000	No Training
ID 337	TracIT - April 2000	Student One
ID 229	TracIT - Jan & June 2000	Student One
ID 94	TracIT - May 2000	Student One
ID 111	TracIT - June 2000	Web CT courses
ID 245	TracIT - July 2000	Student One

It is important to note that four of those who attended training participated in Student One sessions, and as disclosed earlier, these sessions were compulsory for some staff. This would indicate that two out of the nine who identified not having enough time, actually made the time to attend a training course of their own choice.

TracIT Report Changes

This section attempts to identify the changes which occurred over the 12 month period through the individual TracIT reports. The primary purpose of this tracking mechanism was to investigate the origins of these changes and to ascertain whether any of the Curtin University initiatives outlined earlier in this chapter had contributed to these changes.

In order to obtain an overall picture of the changes and when they occurred over the 12 month period for the case study sample, the comments made for each month on the TracIT Report were summarised and divided into comments which reflected 'real change' in the individual's usual pattern of ICT use and those comments which simply reflected their existing pattern of use. If a specific comment contained elements of each category (real change and existing pattern of behaviour) the comments reflecting 'real change' subsumed the others. In this instance, the importance of identifying real change and attempting to trace the origins of these changes outweighed the importance of detailed descriptions of existing patterns or environment. In other words 'real change' was seen as a behaviour which had not been identified either in the survey or the subsequent interview data.

It is important to note that any change identified was of an individual nature, independent of the behaviour patterns of other case study individuals. This meant that a certain behaviour or initiative considered to be a ‘real change’ for a particular case study individual, may not be in comparison to others. For example, creating an online unit could be considered a ‘real change’ for one staff member, yet not for another because their existing teaching & learning practice had already involved creating online units.

Table 9.21 provides an example of the coding system adopted by the researcher which identifies ‘real change’ and ‘descriptions of existing patterns’ specifically relating to teaching and learning practices.

Table 9.21: Comments Reflecting Teaching Initiatives & Existing Patterns

Comments Reflecting Real Change	Comments Reflecting Existing Patterns of Behaviour
I am busy trying to convert two units for Web delivery using Frontpage. We will be converting or rewriting all of our units for Web-based delivery over the next twelve months (ID241:Aug99). *I am using the Student 1 system for course planning since last we spoke. This system has, buried within it, the capacity for significant pedagogical thought / planning: many of my colleagues don't interact with data about course and unit structures in the way that allows them, conceptually, to take advantage of S1 in this manner (ID211:Jan2000).*	*What I am not able to do because of lack of a portable computer and projector is to show the students the material, demonstrate what I think are the good bits and incorporate this material into the workshop sessions with the students (ID15:May2000)* *I am making a lot of use of overheads to illustrate *** aspects connected with the *** of meetings. In the past I relied on a limited number of OHs but this semester I have produced a large number (ID335:March2000)*

This table (Table 9.21) reflects a small sample (see Appendix D.7 for more examples) of the real changes identified in the TracIT Reports. The most common changes found amongst the case study sample regarding their teaching and learning practices involved, adopting new software, modifying software to suit individual teaching needs, producing Web-based material, and creating CD Roms.

Table 9.22 presents comments noted in the TracIT reports which reflect ‘real change’ and ‘existing patterns of behaviour’ regarding the *students* involved in the teaching and learning environment of the case study sample. Once again, Table 9.22 reflects a small sample (see Appendix D.8 for additional examples). The real changes that were identified by the case study sample specifically related to student-involved changes, in students' behaviour compared to previous groups of students, in the tasks that had been assigned to the students which involved more ICT use.

Table 9.22: Comments Reflecting Changes & Existing Patterns - Students

Comments Reflecting Real Change	Comments Reflecting Existing Patterns of Behaviour
About 10 -15% of students could not do these (Excel tests). This week we have set up remedial classes to help these students. Initially we have allocated 10 hours of instruction (ID217:August1999) *I initiated the formation of the *** Club and act as club 'staff facilitator' I recommended students create a website for the club. They liked the idea and instead set up a communication site similar to WebCT for social, professional, and academic exchange. The site is part of a web service called eCircle it has a chat function, email, discussion group, games, gifts virtual, a place to share files, and a list of favourite website functions. We are thinking of having a virtual club meeting on a Sunday and they thought it was a good way to keep in touch during holidays (ID255:August1999).*	*Some students still ask me if I want to put the lecture notes on the Internet. I have no intention as yet to do it although I feel that the time is drawing near that it should be done (ID337:April 2000).* *Encouraging students to use email to send in assignments and to communicate. I'm often out of my office and if they send an email to me it is "in my face" more and I can respond in writing and answer their whole query. If they leave messages on my voice mail I do not know the full extent of their query and when I try to return their telephone call they are often not in. Email is sent and the job is complete. (ID253:August1999)*

Table 9.23 provides examples of comments which reflect 'real changes' and 'existing patterns of environment' facing the case study sample regarding their *ICT support* as identified in the TracIT reports during the 12 month period.

Table 9.23: Comments Reflecting ICT Support Changes & Existing Patterns

Comments Reflecting Real Change	Comments Reflecting Existing Pattern of Environment
We are disappointed with the divisional support, as no-one turned up to assist the lecturers set up the thin-client lab, in spite of making appointments. ... The staff fear that inadequate support will not encourage confidence in the use of IT, and result in delays in implementing IT in the curriculum (ID252:August1999) *To replace the single staff member who was in charge of managing IT in the school we proposed a committee. .... (ID251:Feb2000)* *Laughable - now need to go through a few committees to get a project approved. Basically a bureaucratic response that means I have what looks like a 2 to 3 month wait to get something approved - useless for a fast paced environment (ID375:April2000)*	*The support from colleagues is great, that is very good (ID15:October2000).* *Still very limited. Our Systems Administrator is still too busy to look after all computer facilities within our school to pay a lot of attention to my personal needs. And if one would experience certain difficulties then you develop ways and means to get around these problems. Often rather exciting! (ID337:Oct1999)* *IT Support helped develop personal web page (ID111:Jan2000* *Used IT support to assist with students getting access to Web CT page (ID111:March2000).*

The changes in the ICT support structure found within each individual Department/School/Division contributed to many of the real changes identified over the 12 month period, while the level of the support also drew much attention and appeared to be the catalyst for many of the changes. See Appendix D.9 for further comments reflecting real change and existing patterns of behaviour regarding ICT support.

Table 9.24 presents examples of comments reflecting the issues which contributed to 'real change' and descriptions of 'existing patterns of the environment' regarding the *ICT facilities* of the case study sample.

Table 9.24: Comments Reflecting Changes & Existing Patterns - Facilities

Comments Reflecting Real Change	Comments Reflecting Existing Pattern of Environment
We have created a new 6 seat computer lab for the first time - Masters entry students (a new course). I acquired a Zip drive for large sound files. I have also acquired Claris organiser to help me with my complex lists of things to do and other responsibilities (ID283:January2000). *A major barrier to IT use in our School has suddenly appeared on the horizon. It appears the University's desire to make business connections with the community may result in a monopoly-like situation that increases the financial burden on the Schools while removing their autonomy. The computer leasing policy will freeze out Mac users, cost the School twice as much as our current budget for IT while forcing us to lease rather than purchase (ID251:March2000).*	*Computing not printing much of the time (ID101:October1999).* *Web CT server is very slow. This problem needs to be addressed as wait time is excessive (ID317:October1999)* *My Machine keeps crashing, and they don't know why - makes it difficult to create web pages for a class (ID375:October1999).* *Student One package is NOT very user-friendly or intuitive for a beginner to use, and it is poorly documented, with little (if not ANY) on-line help(ID119:Jan2000).* *projection equipment in teaching rooms is inadequate for use with new initiatives (ID283:March2000).*

There were many comments which surfaced during the TracIT report expressing concern about the lack of facilities - these comments were coded as related to an 'existing pattern of environment' as they were describing the individual's current situation and in most cases the situation had not changed. Many of these changes noted regarding facilities referred to issues relating to hardware and software upgrades and the leasing of new equipment. See Appendix D.10 for additional examples of real change and existing patterns of behaviour regarding ICT facilities.

The professional development courses attended by the case study sample were classified as 'real change'. Table 9.25 provides a summary of the courses attended by the case study sample.

Table 9.25: Summary of Course Attendance (TracIT)

Course	Case Study Sample	Session Attendance
Student One	11	19
WebCT	5	11
Surviving IT	3	5
Curtin Computer Training Centre	2	4
Computer Literacy for Academics at Curtin	1	3
Formal In-house Training	3	3
West One Training	1	2
TOTAL	**26**	**47**

As evidenced by the data presented in Table 9.25, Student One sessions were certainly the most prominent training courses attended by the case study sample, followed by WebCT. The data in Table 9.25 does not necessarily reflect the training profiles of this group as some would have attended more than one course. Table 9.26 provides a clearer picture, representing the number of training sessions individuals attended over the 12 month period.

Table 9.26: Number of Training Courses Attended (Case Study Sample - TracIT)

Number of Training Courses	Number of Case Study Sample
0	13 people
1	6 people
2	5 people
3	3 people
4	4 people
6	1 person
Total	**32**

Nineteen (59.4%) of the case study sample attended at least one training session over the 12 month period. It is important to note that eight of the nineteen who attended training sessions participated solely in Student One courses, and as revealed earlier, these were compulsory for those academic staff who dealt with student records. In other words, eleven (34.3%) would be a more relevant statistic for the case study sample who had attended training sessions specifically dealing with improving their ICT skills. Importantly, thirteen (40.6%) of the case study sample did not attend any training at all over the 12 month period. Three (9.4%) of the case study respondents indicated that they had every intention of attending some form of training, yet never carried through with their intention:

The courses available in computing as short courses are great and I hope to do 3 of them (ID181:Nov 1999).

No changes except library offering some useful looking courses for me! (ID 237:March 2000)

The TracIT reports not only revealed the training sessions the case study sample attended or intended to attend, but they also revealed the teaching staff's own personal 'self training' regarding the use of ICT. 'Self training' implies they trained themselves. This 'self training' when identified was coded as 'real change'. The teaching staff thought this 'self training' as important and relevant, as they noted each occurrence in their monthly report under 'training':

No time to do more training although I am trying to get used to a new computer. So I train myself using the systems administrator in our school, by trial and error and by using books and notes which describe the use of Office 2000 (ID337:April2000).

Ten (31.2%) of the case study sample identified at various times in the TracIT reports that they were teaching themselves new ICT skills. Four of the teaching staff identified in this subgroup did not attend any formal training sessions over the 12 month period. Table 9.27 provides a summary of the case study sample's training regime.

Table 9.27: Summary of Training for the Case Study Sample (TracIT)

Criteria	Case Study Sample N=32
Attended Training Courses/Sessions Student One Only (25%)	59.4%
Did not Attend Any Training Sessions	40.6%
Intended to Attend Training however did not follow through.	9.4%
'Self training'.	31.2%
No Training or Self Training	25.0%

In summary, just over half (19 - 59.4%) of the case study sample attended formal training courses or sessions, with 8 (42.1%) of this case study subgroup having attended solely Student One courses. 'Self training' was identified throughout the TracIT reports by 10 (31.2%) of the case study sample, while (25%) of the case study sample didn't attend any formal training or acknowledged that they had been involved with any 'self training'. As noted earlier, attendance at professional development courses and self training were identified as 'real change' in the TracIT reports.

Table 9.28, which is located on the following page provides a summary of the overall changes for the 12 month period August 1999 – August 2000.

A synopsis of the overall changes which occurred over the 12 month period as identified through the TracIT Reports is given in Table 9.28. This table identifies the number of changes that occurred over the 12 months, with some indication of the initiation of the change identified by specific symbols. For instance, in the teaching section, under the 'identified change' column seven case study individuals made comments which identified real change during the month of April, 2000. Two demonstrated that the change was initiated by their School/Department, one change involved a LEAP project and three indicated a particular training course was directly linked to their change in teaching practice regarding the use of ICT.

It is important to note at this point, that the researcher documented and identified all changes which had occurred over the 12 months, whether they had positive or negative connotations. In some cases they were negative, and in others they were positive. These issues will be examined further in the following chapter where the researcher attempts to trace the origins of the changes and the resulting outcomes through an interpretation and analysis of the data generated by the instruments.

Table 9.28: Summary of Overall Changes (TracIT)

TracIT Report	TEACHING			STUDENTS			TRAINING			ICT SUPPORT			ICT FACILITIES		
	Identified Change	Existing Pattern	No Real Change	Identified Change	Existing Pattern	No Real Change	Identified Change	Existing Pattern	No Real Change	Identified Change	Existing Pattern	No Real Change	Identified Change	Existing Pattern	No Real Change
August 1999	13 ✓ ✜ ✜ ✜	3	19	9	9	23	11	2	21	3 *	5	29	8	3	24
September 1999	8	3	24	2	3	30	5	2	27	2 *	1	30	2	0	30
October 1999	4 ✜ ✜	7	28	4 ✈	6	28	3	1	29	1 *	6	31	3	7	29
November 1999	5 ➶	3	27	3	3	29	2	3	30	3	1	29	3	3	29
December 1999	0	0	32	0	0	32	0	0	32	0	0	32	0	0	32
January 2000	7	3	25	2 ✈	3	30	3	1	29	1	6	31	3	2	29
February 2000	5 ✜	0	27	4 ✈	3	28	5	0	25	2	3 *	30	2	2	30
March 2000	7	9	25	5	4	27	6	3	24	4	4	28	5 *	4 *	27
April 2000	7 ✓✓ ➶ ✜ ✜ ✜	7	25	1	6	36	8	2	24	3	3	29	2	1	30
May 2000	4 ✓✓ ✜	6	28	1	4	28	4	3	28	0	2	32	1	4	31
June 2000	3 ✓✓✜➶	8	29	2 ✈	4	28	5	1	27	5 *	6	27	8 *	3	24
July/Aug 2000	6	8	26	6 ✈	2	30	1	5	31	5 ****	6 *	27	7 **	6 *	25

Initiation of Change for Teaching

- Individual
- School/Department ✓

Training affect Teaching Change ✜

Students having Problems with ICT Environment ✈

IT Review Comments *

LEAP ➶

CHAPTER TEN

Research Question Two: Interpretation and Analysis

> *To examine the relationship between the ICT behaviour of a University teaching staff and the strategies used to implement the University's ICT strategic planning initiatives.*

Introduction

Curtin University of Technology has demonstrated a certain level of commitment to the use and encouragement of ICT in teaching and learning through a number of initiatives implemented in recent years, more specifically the ones identified in the previous chapter: Professional Development Courses, Grants, Awards, and the IT Review. This section presents an interpretation and analysis of the data on these issues in order to determine which initiatives actually penetrated to the teaching practices of staff involved in this study and whether these initiatives have caused any real change.

Initiation of Change

Table 9.28 in the previous chapter attempted to represent the overall changes which occurred for the individual case study participants over the 12 month period. This chapter will deal with the origins of these changes, examine the effects of being a 'studied' group (Hawthorne Effect) as well as identify which elements influenced the individual case study participant to change.

The real changes identified in the teaching patterns and practices appear to be individually driven for most of the case study sample except for the six who indicated that pressure for change for them was coming from elsewhere. Table 10.1 identifies these individuals and the origins of their change.

Table 10.1: Initiation of Change

ID & Month	Comments
ID241 August 1999	*I am busy trying to convert two units for Web delivery using Frontpage. We will be converting or rewriting all of our units for Web-based delivery over the next twelve months*
ID218 April 2000	*Converted some course materials into WebCT. I now expect to use WebCT personally and Dept wise extensively in the next few semester.* *Why - management reasons - I can look at what all staff are doing at any time.*
ID292 June 2000	*Learning to use **** via workshops organised by the department.*
ID245 May 2000	*There are quite a few challenges in **** at the moment.* *I'm putting all my units onto PowerPoint as a basis for inclusion on the Web once **** determines which programme to use.*
ID92 May 2000	*A big push is starting here for more online delivery of courses, in Outreach programs and all other programs. I've been appointed to a 0.5 position as flexible delivery coordinator. A big part of that is coordinating online delivery.*
ID217 June 2000	*We had a 2 day retreat at the end of the semester at ****. The main discussion was about our new 3 year course design. But included in this was the push to 'flexible learning'.*

These statements indicate that the decision to alter their usual pattern of behaviour regarding their ICT use was initiated by others – in each case the relevant School or Department. It is also important to recognize that students are also placing increasing pressure on teaching staff to adopt particular ICT teaching practices. Even though it was not possible to link changes to these pressures, comments were made in the TracIT reports reflecting their concern. For example:

> *Students asked if lecture notes are on the internet - no email use with students. (ID337:Aug99).*
>
> *Students pressure for lecture notes on the Web. No intention, however time is drawing near that it should be done (ID337:April2000).*
>
> *No notes on the Web - students should attend lectures (ID337:June2000).*
>
> *Students want notes on the Web - would be time consuming. A Web page should include these elements as well - (interaction) ... Awfully tough especially the interactivity! (ID337:July2000).*

One could almost feel the pressure being placed on this individual to place the unit's lecture notes on the Web. In an unexpected twist, some of the other case study respondents expressed their concern in the interviews about students not attending lectures because their lecture notes were placed on the Web. One of the same individuals who had said during the interview that he was discontinuing the Web mounting of notes, obviously had a change of mind as he made the following comment in the TracIT report:

> *I had planned not to place lecture slides on Web - however students preferred this.*
> *I'm concerned about students not attending lectures (ID111:March2000).*

Students were also experiencing a variety of problems in simply coping with the ICT related tasks being asked of them, and thereby placing pressure on their instructors if problems arose. For example:

> *Students complained about the questions not being on time due to the delays caused by the support staff (ID317:Oct99).*
>
> *Had to show students how to use the Web, PowerPoint and Excel. Big learning curve and many students complained about computer access at home and printing costs (ID255:Feb2000).*
>
> *Some students had trouble accessing tests as they were removed - they can be downloaded and will do this in future (ID259:Nov99).*

Not surprisingly, the use of Web based material has featured in many of the comments that reflected 'real change'. The increased adoption and implementation of Web-based material clearly has been promoted by Schools/Departments as well as by the individuals themselves.

Professional Development

The *Surviving IT* Courses, which are far and away the longest running training sessions at the University, still appear viable as over 200 individuals are attending these workshops during semester breaks. However, it appears that only a small percentage of academic staff are utilising these courses. This same sentiment was echoed in the *Information Technology Strategic Plan, Appendices* (Curtin University of Technology, 1998b) where it was noted that the *Surviving IT* courses had caused little penetration into the majority of academic staff. It appears that the CEA has attempted to rectify this by targeting academic staff through the introduction of the *Computer Literacy for Academics @ Curtin* courses, in May – June, 2000. This was a clever marketing ploy as many of the topics appeared to be the same as the *Surviving IT* courses. This appeared to be an effective initiative as a total of 71 academic staff attended these sessions. The basic difference between the two courses was that the *Computer Literacy for Academics @ Curtin* courses were specifically catering for academic staff by demonstrating the productivity tools in an educational context. The other difference between the two was the time the courses were held. Perhaps the last two weeks of semester break, when the *Surviving IT* courses were held, is no longer a suitable option for academic staff. The TracIT reports revealed that academic staff are usually preparing for the following semester during this time and traditionally allocate very little time to training sessions.

The Curtin Computer Training Centre courses were certainly well attended, however not necessarily by academic staff. It appears that the general staff were sent to these courses by their Departments/Schools in order to keep their skills up-to-date. Importantly, this meant that the general staff did not have to personally pay for the training themselves, unlike most of the academic staff where this money would come from RPI funds or their own personal funds.

As noted earlier, the *Student One* courses were well attended - but they were compulsory. The researcher was unable to obtain the WebCT attendance figures, however apart from the *Student One* courses, the Web CT courses were the most attended (5 individuals attending 11 sessions) by the case study sample over the 12 month period of the TracIT report. Even without the specific attendance figures for the Web CT courses, it would appear that the most well attended professional development courses for academic staff at Curtin University are *Student One*, followed by the *Teaching & Learning @ Curtin*, Curtin Computer Training Centre, *Literacy for Academics @ Curtin* and finally the *Surviving IT* courses.

The majority of the survey sample (62.2%) were aware of three or more of the courses provided by Curtin University of Technology for teaching staff, indicating that lack of awareness of these courses did not contribute to the low attendance figures. It appears that over the last few years the professional development courses at Curtin University have evolved from specific ICT skill-based courses to courses focussing on more generic skills which enable and encourage individuals to apply these skills to their teaching and learning environment. Even though the IT Strategic Plan, 1998-2003 (Curtin University of Technology, 1998a) recognised that *"staff development needs to be school-based or discipline-based" (p 18),* and that the CEA attempted to cater for specific school-based needs by providing specialised training sessions, there has been no evidence through the interview and the TracIT report data that any of this actually occurred.

The TracIT reports were not only able to provide the researcher with individual case study views on their training regime but also provided information on whether the training session(s) they had attended had influenced any changes in their ICT use. There appeared to be a direct link between the training session and comments made regarding a change in ICT behaviour in the teaching section of the TracIT report by seven of the case study participants who attended training sessions. Table 10.2 provides examples of the links between professional development sessions attended and those comments which reflect a change in the case study's use of ICT in teaching & learning.

Table 10.2: Outcomes from Professional Development

ID	Training Attended	Change in ICT Use
ID111	August 1999 *WebCT Course*	August 1999 *Developing WebCT material*
ID241	August 1999 *Frontpage* October 1999 *Frontpage*	August 1999 *Busy converting two units for Web delivery …* October 1999 *Writing material in Frontpage to attach to WebCT for support.*
ID252	May 2000 *Comp Literacy for Academics courses x 2*	May 2000 *Used on-line lecture notes for the first time.*
ID217	April 2000 *WebCT*	May 2000 *Working to convert my first unit to WebCT.*
ID317	October 1999 *WebCT*	October 1999 *Included multiple choice tests*
ID211	August 1999 *Student One*	August 1999 *The system has buried within it the capacity for significant pedagogical planning.*
ID259	June 2000 *Surviving IT*	June 2000 *Initiated course for students.*

Seven of the eleven (34.3%) case study sample who attended ICT courses (not including *Student One*) showed evidence of actually integrating what they had learned into their teaching and learning. Perhaps the others did also, but this was not revealed in the TracIT reports. It appears that the training sessions provided them with the skills which enabled them to change their existing patterns of ICT use. Although it is clear changes did occur, it is important to note that the individuals were already motivated to attend the training sessions in the first place and had therefore already embarked on the road to change.

Of the 16 (interview subsample) who had indicated a skill level of 1-3 (1 being very low and 5 very high), only half of them noted that they would attend a course in order to improve their skills. The interview data also quite clearly indicated that most of the sample had used a variety of sources (experimenting, books, manuals, online tutorials) to teach themselves how to use ICT in a variety of ways. The data indicates that some people prefer to learn in a different manner than the traditional professional development courses which the University provides. In fairness, the existing courses attempt to cater for a variety of needs by trying to classify the classes according to ability level, with demonstrations, hands on experience and written support materials. In total 34.3% of the case study sample attended training sessions which specifically dealt with ICT. This figure excludes *Student One* attendance, as this was compulsory. A total of 40.6% of the case study sample did not attend any training at all.

As identified earlier, there appears to have been an evolution in the Curtin University courses from basic content and skills to more generic skills, where sessions are conducted on modeling and developing sound pedagogical principles on the integration of ICT into teaching and learning. This is an important change as the data indicates that such resources were not taken advantage of by the academic staff, as attendance figures for the skills-based courses being offered during the period of this study were very low. The courses which demonstrated and reflected on the use of ICT in an educational context were certainly more popular. Once again this suggests that the academic staff at this University are beyond going to courses to learn a specific skill, many of them already have the basic skills and if they want to learn a particular skill they have other means of acquiring them. This was clearly evident in the interview data where individuals identified that they experimented with the software, looked at books, manuals, asked a colleague, or searched for online tutorials. This resourcefulness not only reflects on their individual capacity to learn but is also a product of their changing environment where more of the information is at their fingertips and time is a precious commodity.

Grants

Apart from the WebCT training sessions, The New Media Initiative appeared not to have any impact on the interview or case study sample involved in this study. It appears that these short term projects, were exactly that, and perhaps impacted directly only on those involved without affecting any real change to the rest of the staff in the relevant Department or School. If they had, it would be safe to assume that there would be some evidence or remnants identified by the various groups. As noted earlier in the literature review, these one-off projects (Lone Ranger and Tonto approach) have been the most prominent way of encouraging the use of ICT in teaching and learning, however they are now considered to be no longer appropriate (McNaught et al., 1999) as they have little impact on the regular teaching culture of the university (Smith, 1991; Tallantyre, 1995; Daniel, 1997; Bates, 2000; McNaught et al., 1999).

McNaught et al., (1999) noted that the trend in Australian universities was to move away from the one-off projects to a more collaborative and multi-disciplinary team approach. This is certainly the case within Curtin University, with the introduction of the LEAP initiative. This is a long term (over three years) collaborative team approach at the School/Department or Divisional level which aims to initiate real change in teaching and learning practices. Table 9.28 indicated that the involvement in the LEAP projects have initiated real change in certain individual's teaching patterns.

Curtin University has also put in place very stringent regular monitoring processes which provide extra funds for those LEAP teams who are well on their way of achieving their goals. The LEAP initiative resembles the Project Management Approach where a team of individuals with various skills is managed by a leader or project manager. Academic departments working in this collaborative, supportive team approach is strongly advocated by many commentators and researchers (Wright & O'Neil, 1995; Reynolds et al., 1996; Ramsden, 1998; Bates, 2000).

IT Review

The recommendations of the IT Review appeared to make some impact on the case study sample. This effect was seen mainly through the restructuring of the ICT support, leasing of computers and the development of a standard operating environment (SOE). As noted earlier, the Vice Chancellory and the Kalgoorlie and Muresk Campuses adopted a centralised ICT Support Model. The teaching Divisions on the main Bentley Campus (except for Engineering & Science) opted for a Divisional ICT support structure where the ICT support team would support the Division only and the team would be housed in one area of the Division, unlike the previous structure where the ICT support people were housed within their Department or School. It appears that these changes have started to filter through to the case study sample and have begun to affect them, mainly so in July/August 2000, where eight of the case study sample made statements directly relating to these changes.

Individual Receptivity to Change

This chapter has attempted to identify the ICT initiatives that Curtin University of Technology has implemented and how they have affected the respondents in this study, more specifically the interview and the case study sample. At a deeper level the researcher has attempted to identify whether these initiatives have lead to any real change in teaching and learning practices. Although a micro (each initiative) approach was generally adopted by the researcher, it is beneficial to take a more holistic view to examine whether individuals have made any real change in the course of the 12 months during the TracIT reports. Table 10.3 provides a summary of the case study sample who exhibited real change in their teaching, students, training, IT support and IT facilities.

Table 10.3: Individual Change Identified in the Case Study TracIT Reports

ID No	Level of Integration (Survey)	Teaching	Students	Training	IT Support	Facilities	University Rating
335	1						1
237	1				Δ		1
101	1	Δ		Δ		Δ	1
94	1	Δ	Δ	Δ			2
27	2						2
214	2	Δ				Δ	2
181	2		Δ		Δ	Δ	2
337	3		Δ	Δ		Δ	2
229	2			Δ		Δ	2
109	4		Δ	Δ		Δ	2
349	3					Δ	3
253	3	Δ		Δ		Δ	3
217	3	Δ	Δ	Δ	Δ	Δ	3
245	3	Δ	Δ	Δ		Δ	3
92	4	Δ	Δ	Δ		Δ	3
15	1	Δ	Δ	Δ		Δ	3
259	2	Δ	Δ	Δ			3
25	2	Δ	Δ		Δ	Δ	3
255	2	Δ	Δ	Δ			4
111	2	Δ		Δ		Δ	4
292	3	Δ	Δ	Δ		Δ	4
317	4	Δ	Δ	Δ	Δ	Δ	4
97	4		Δ	Δ			4
241	5	Δ	Δ	Δ	Δ	Δ	4
375	3	Δ	Δ	Δ	Δ	Δ	5
119	4	Δ	Δ	Δ	Δ		5
283	5	Δ		Δ	Δ	Δ	5
249	5	Δ	Δ	Δ	Δ	Δ	5
218	5	Δ	Δ	Δ	Δ	Δ	5
251	5	Δ	Δ	Δ	Δ	Δ	5
211	5	Δ		Δ	Δ	Δ	5
252	5	Δ	Δ	Δ	Δ	Δ	5
	Real Change Identified	23 71.9%	22 68.7%	24 75%	14 43.7%	24 75%	

Change Δ No Change
Code: 1=very low, 2=low, 3=medium, 4=high, 5=very high.

It is important to note that the teaching staff involved in the case study sample had no control over any of the ICT support changes which have occurred within their Department/School or Division and little control over their facilities (unless they have decided to personally purchase new hardware and software). However with regard to their teaching, their students and their training, they have had to make a conscious decision to alter their behaviour in some way, which in turn often reflected real change in their ICT use. Table 10.3 shows that four (12.5%) of the case study sample did not exhibit any real change with regards to the ICT use in their teaching, their students ICT use, and their ICT training. In other words over the 12 month period they did not increase their ICT use. Their university rating ranged from 1 – 3. If one would look at the patterns in Table 10.3 it would appear that the majority of the real changes (symbolized by Δ) noted in teaching, students and training, occurred in those individuals who scored a university rating of 3 – 5 (medium – very high use). As identified earlier, the characteristics which evolved through the individual and group profiles indicate that this group with the higher level of ICT integration appear to be more receptive to change through their willingness to experiment. Their TracIT report reflections also appear to indicate that they are more aware of and sensitive to, their changing environment ICT.

Summary

This chapter has attempted to answer research question number two by identifying when the synergy of the Curtin University initiatives and the change in teaching practice for the case study participants occurred. In order to determine this, the Curtin University initiatives were identified and the TracIT reports were examined to determine whether they had impacted on their teaching practices. The TracIT reports revealed the changes in behaviour and the changes in the ICT environment, as well as the source of initiation of the change. The comments on the TracIT reports were divided into two categories: real change and existing patterns of behaviour/environment. The 'real changes' were identified and the origins of these changes were explored. It appears that most of the 'real changes' which occurred in the teaching practice of the case study sample were individually driven, with the others being influenced by their own Department/School.

The most well attended professional development courses by the Curtin University academic staff were *Student One*, followed by the *Teaching & Learning @ Curtin*, *Curtin* Computer Training Centre, *Literacy for Academics @ Curtin* and finally, the *Surviving IT* courses. There appears to be a change in focus from the skill-based courses to courses focusing on generic skills which address pedagogical issues in the professional development courses conducted at Curtin University.

Close examination of the TracIT reports revealed that there was a direct link between the training sessions attended and the change in teaching practice by the case study individuals who attended professional development sessions. It is important to note that the interview data revealed that individuals are using a variety of sources to teach themselves how to use ICT. The data also revealed that the LEAP initiative also made some considerable impact on the teaching practice of certain individuals involved in this scheme. The majority of the real changes identified in teaching practice, students and training occurred in those individuals who scored a 'University Rating' of 3 – 5 (medium – very high use).

CHAPTER ELEVEN

Assertions and Emerging Models

Introduction

As outlined in the previous chapters, a number of themes have emerged from the various data sets which in turn have generated a number of assertions about teaching at the tertiary level within an ICT environment in an Australian university. The assertions are specifically based on the data collected in this study concerning current teaching practices and existing working environments of the teaching staff at Curtin University of Technology. These assertions have been generated from a synthesis of the research findings outlined previously and in some instances have necessarily evolved beyond the initial research questions. The assertions and the data which warrant them are summarised in this chapter. This chapter also presents two models, the 'Curtin University Professional Learning Community Model' (CUPLCM), and the 'Professional Learning Community Model' (PLCM) – frameworks which were empirically derived from the data obtained in this study. The CUPLCM is directly applicable to Curtin University of Technology, while the PLCM may be applied to other Australian higher education institutions. These models attempt to address the final research question (What is an appropriate model for future implementation of ICT into teaching and learning at an Australian University?), one of the key forces driving this study.

Assertion 1: Major cultural change across an entire university needs to occur if there is to be any significant change to the University's teaching practices.

Data strongly suggest that Curtin University of Technology has already undergone a major cultural transformation at both an individual and organisational level regarding the integration of ICT in teaching and learning. The change which has had the most profound affect on teaching and learning was the establishment of the Office of Teaching and Learning – a parallel structure to the powerful Office of Research and Development Office. Such a move was a timely indication to all stakeholders that the University valued teaching and research equally.

The restructuring at Curtin University also saw the establishment of the Centre for Educational Advancement (CEA) – a key branch within the Office of Teaching and Learning. The chosen division of labor within this Centre – staff development, educational media support, distance education - signaled a further commitment to the quality of teaching and to the integration of ICT in teaching and learning. This strategy also meant that the University had made a clear distinction between educational media support and the already well established technical support.

It appears from the data collected over the 16 month period of the study, that the central thrust of the University's professional development courses as organised by the Centre for Educational Advancement have changed over time. The changes are subtle and may go unnoticed, yet the changes appear crucial. There appears to be an evolution from basic content and skills being covered to more generic skills where sessions are being conducted on modelling and the development of sound pedagogical principles with respect to the integration of ICT in teaching and learning.

As discussed earlier, the Office of Teaching and Learning also instigated a number of initiatives to reward and encourage good teaching - The Innovative Teaching Practice (ITP) Awards and the Learning Effectiveness Alliance Program (LEAP). The focus of both of these initiatives has been on teaching and learning practice, however by publicly identifying and rewarding certain individuals, teams, Departments/Schools and projects, the University is clearly acknowledging those practices the University wishes to encourage and emulate. Importantly, over the past few years the use of ICT has been a feature of the winners of these awards and grants. Such an initiative has a revitalising effect on the whole University as it rewards the practice of good teaching as well as encouraging the practice of good teaching through modelling. Providing an effective means of dissemination is essential, as the research literature has identified that effective modelling of the appropriate use of ICT in teaching and learning is seriously lacking in most tertiary institutions.

Another key initiative which caused major structural and subsequent cultural change was the instigation of the IT Review and the implementation of its recommendations which occurred at significant cost to the University. It is recognised that changing the structures within an organisation does not necessarily equate to changing the culture of an organisation, however the evidence is that the particular structural changes resulting from the review were brought about by the commitment from the University to changing the culture of teaching and learning at the University. Within Curtin University these structural changes were crucial if real change in the existing culture was to occur. As Fullan (1998) indicates, it is the people who place pressure on existing structures, which in turn force them to change.

The changes that have been outlined indicate that the University has undergone what Cuban (1988) refers to as second-order change, where the fundamental organisational structures, roles and goals of an organisation have been altered. This has been clearly evidenced at Curtin University through the restructuring, the new strategic plan, the commitment of the University to support and reward the integration of ICT into teaching, and most importantly the change in practice of teaching staff.

According to McClenney (1998), innovation is transformative only if institutions can find ways of employing examples of success which can lead to new forms, new structures and new cultures. This is certainly the case with the ITP Awards as well as the LEAP Grants. Curtin University appears to be working toward the common features identified by Clark (1998): 'a strengthened steering core' – identified in the new Strategic Plan; 'a diversified funding base' – developing fully online units, stimulating offshore market development; 'a stimulated heartland' – teaching staff are adopting ICT in their daily teaching practices; an 'integrated entrepreneurial culture' that embraces change – reflected in the approach and language of the Strategic Plan as well as the changes in structure to support these changes.

Assertion 2: The adoption of ICT into the working environment of a university teacher significantly increases the workload of individual staff.

Information and communication technologies have enabled people all over the world to work anywhere and anytime, allowing a much more flexible working environment. Specifically at Curtin University, 63.8% of the CUIT survey sample used email and Internet access at home, while 84.4% of the case study respondents had access at home and identified that they worked at home.

ICTs not only allows more flexibility in the location, timing and social context of work, but it has the potential of increasing the working day. Such a flexible working environment which has no boundaries has great potential but also has 'unintended consequences' (Fox, 2001). This is especially relevant for a generation of staff who were not raised in the Information Age, but have become accustomed to a structured working environment where jobs were completed in a specific location and in clearly specified hours.

The references to the heavy workload (teaching, research and committees) and the lack of time to complete all of their assigned tasks was evident throughout the data collected over the 16 month time period (CUIT survey, Interviews, & TracIT). One of the factors which appeared to contribute to the increased workload was that individuals perceived they were receiving less administrative help than they had previously received. The data certainly reflects the changing roles found within the university for teaching and administrative support staff. It is important to note that the nature of these changes may have reflected the need to cope rather differently in more stringent economic times, rather than as a direct result of the introduction of ICT into the working environment. However, the matter is not one which was clearly decided by the data collected. Another contributing factor to the increased workload was the fact that teaching staff were having to deal constantly with a great deal of information. Information overload was certainly felt by the majority of the case study sample. The dramatic increase in electronic communication with students, via email or discussion groups in a structured web-based environment such as WebCT, was identified as the main contributor to this information overload. This rapid escalation in electronic communication with students also required the need to re-examine unit management policies and include in course outlines the appropriate procedures and protocols for electronic communication with students.

The use of electronic communication in both teaching and learning has not been the sole contributing factor to the increased workload of the teaching staff at Curtin University. The data also indicated there has been an increase in workload for those staff who have adopted Web-based materials for their teaching and learning. Creating Web-based resources was not the only concern – the issue of constant maintenance was certainly identified in the TracIT reports. Although creating Web-based material has become easier, it is still a time consuming task. There appeared to be a cycle where integrating ICT in teaching and learning had caused the workload of teaching staff to increase, and yet on the other hand some teaching staff claim to have been unable to increase their use of ICT due to their heavy workload.

There were many examples throughout the TracIT reports relating to stressful situations which were derived from having to do more tasks with less help and less time and with unfamiliar tools. Certainly the introduction of ICT in higher education has enabled teaching staff the means to complete certain tasks with efficiency, and affords them the luxury of flexibility and the ability to explore new ways of teaching. Furthermore, it appears to have become embedded in the working culture of the University to the extent that it is now difficult to function without the technology.

As indicated in Chapter Two there are a variety of global factors (economic stringency, ICT, knowledge growth, a great number and a more diversified students) which have contributed to the high rate of change in higher education. At the local level this constant change has greatly impacted on the workload of teaching staff. In particular this study has identified that as the environment and teaching practices have changed, the workload of teaching staff at this University has increased. The specific elements which have contributed to such an increase include: more students, less administration help, information overload and the introduction of Web-based teaching environments.

Assertion 3: A necessary condition for the effective implementation of an ICT policy for a university is the university's basic commitment to providing appropriate resources.

> *It is very time consuming creating these pages so if they want me to continue to do this they have to make it easy for me so I won't have many excuses not to do it. (ID255:March2000).*

Time appears to be the most sought after resource by teaching staff at Curtin University of Technology. This lack of time was the single strongest resourcing issue raised by the CUIT survey sample. The issue of time was also carried through with the case study sample where there was constant reference to the lack of time in their monthly TracIT reports. Overall, the comments reflected the teaching staff's lack of time to complete tasks due to their heavy workload, as well as the lack of time to learn and practice new ICT skills.

As noted earlier, various elements of support were identified, one in particular being the need to have a particular type of technical support – one which would assist in Web-based development. Academic staff would provide the content while the technical support staff would provide the expertise in placing the material on the Web. Another critical element identified by the study was the need for specialist/expertise help for those who were not the 'ordinary user'. This group, as one would expect, were the innovators, who required very specific high-level help with more complex problems.

There was strong endorsement identified in the data derived from all sources in this study for technical support to be located physically in the actual Department/School. Other data identified the need for the technical support people to present a more 'humanistic' face when assisting others. This implied face-to-face meetings with real people, rather than logging problems via electronic communication or telephone systems.

> *Technical support with technicians who adopt a humanistic, rather than technocratic approach to teaching me (& assisting). (ID238:CUITQ37).*

Finally, all of the case study respondents, regardless of their level of integration acknowledged the importance of ICT support, with any differences relating to the degree of support and the type of support they required to adopt or continue utilising ICT effectively.

It is clear that the morale and productivity of staff are profoundly affected by the technological quality of their environment. Inadequate facilities for integrating ICT into teaching and learning quite clearly influenced the teaching practice of the staff involved in this study.

As identified earlier, the introduction of ICT in tertiary education has enabled a greater flexibility in the working environment for teaching staff. However, this change has also placed, and will continue to place, more pressure on a university's remote access facilities and policies. Certainly it is clear from this study, that if a university wishes to encourage the use of ICT in teaching and learning and embrace the notion of working anywhere at anytime, the university must provide appropriate levels of support mechanisms for this to occur. This means that there needs to be technical support for a University's remote access as well as automatic access, preferably without fees. This should be part of University policy and included in the facilities the University provides all staff.

These issues of inadequate resourcing are certainly not restricted to Curtin University, being a major issue affecting many tertiary institutions nationally and internationally. Green (2000) notes that providing adequate user support has been the second-most important issue confronting campus officials over the last five years in the USA. It is obvious that as more academic staff adopt ICT in their teaching and learning then more pressure will be placed on existing resources. One of the major concerns is not whether people are going to adopt ICT, but how tertiary institutions will provide an adequate level of resourcing. As this study has clearly indicated, resources are not just hardware and software, but also the human infrastructure that actually make the physical infrastructure work as well as support others. As seen from the data collected at Curtin University of Technology, there are a variety of support mechanisms which need to be put in place to form this human infrastructure. These key mechanisms are related to: incentives, reward structures, recognition, training and effective leadership.

In summary, the effective use of ICT in teaching and learning can be strongly encouraged through the provision of appropriate resources. These resources take the form of provision of time, adequate facilities and staff support. Time needs to be allocated for staff to develop their ICT skills as well as to develop and maintain Web-based resources. Up-to-date facilities need to be provided for staff to be able to work anywhere and anytime. If the use of ICT is to play a major role in the teaching and learning process of any university, then teaching classrooms need to be adequately resourced with ample computer access and projection equipment. Finally, a holistic approach to staff support is required. This means that technical support people need to be located within Departments/Schools, to be able to be called upon by neophytes to learn a new skill, to help solve complex problems for the high end users, and importantly to adopt a humanistic approach. These factors seem to be crucial if the University wishes the teaching staff to integrate ICT effectively into their teaching and learning practice.

Assertion 4: The existence of transformational leadership across all levels of the university is a major factor in the promotion and adoption of ICT and ultimately in the development of a truly professional learning community.

The study reveals that leaders at Curtin University have adopted an entrepreneurial approach to the formation of the current University Strategic Plan. Kaplan and

Norton's (1996) Balanced Scorecard method was adopted where specific goals and initiatives could be assessed rather than relying simply on financial indicators. The overall planning process revolved around productive partnerships in terms of the staff and organisational culture, clients, core activities and financial security.

Within the context of ICT uptake, the evidence is that the leaders within the University have attempted to provide a balance of pressure and support. It has been identified through the data collected in this study that there has been significant pressure to adopt ICT in teaching and learning, in particular online development of courses. It appears that at various times the balance of pressure and support was uneven. The IT Review was a major initiative which attempted to correct this imbalance.

The establishment of the Office of Teaching and Learning was another major leadership initiative which clearly helped to reshape teaching and learning across the University. The Deputy Vice-Chancellor of the Office of Teaching and Learning is on record as being a strong advocate of the use of ICT in teaching and learning. He also released a major discussion paper entitled *Toward a Flexible, Learner-Centred Environment* (Reid, 1999), reflecting his personal belief and commitment to the application of ICT in teaching and learning. On numerous occasions he publicly supported the use of ICT and often questioned existing traditional practices in public forums.

Leithwood (1992) noted that the goals of transformational leaders were to encourage people to develop and foster a collaborative and professional culture, to encourage and stimulate staff development, and to promote the use of collective problem solving. The initiatives at Curtin University have been instigated for exactly these purposes. These initiatives have been mentioned on numerous occasions throughout this report and are characterised by the following descriptors: the Office of Teaching and Learning; the Centre for Educational Advancement; the Innovative Teaching Practice Awards; the Learning Effectiveness Alliance Program.

Transforming the culture of an organisation into a professional learning community requires individual staff to take on leadership roles within the various levels of the organisation – and more importantly in the 'academic heartland'. The innovators identified in this study were the leaders in adopting ICT but also the leaders in initiating and implementing real change in their Department/Schools. It is important to note that only one innovator held a leadership position while the others actually adopted a leadership role – truly transformational.

Assertion 5: In order to assist a university to become a truly professional learning community, strategies involving targeted staff development and reflective practice need to be built into the working regime of all teaching schools and departments.

Assisting staff to integrate technology into their teaching has been identified as the single most important information technology issue confronting US education organisations (Green, 1998). Nearly 60% of the CUIT survey sample indicated that integrating ICT into teaching and learning was the most important issue currently confronting them at work – with a similar response from those who indicated they would use technology to a greater extent if they had more information on the best usage of ICT in their teaching area.

This assertion highlights the structure of the University's Professional Development initiatives in light of the data collected, and addresses the need to focus more on developing teaching professionals. A variety of issues surfaced regarding the University's professional development needs, the most common concern being the issue of time to attend training sessions. It is a persuasive argument that the time to undergo professional development needs to be recognised as part of the total academic workload. This is a crucial element if there is to be a culture where life-long learning is to be valued and practised. It is important to also recognise that professional development needs to be part of the working calendar. Time needs to be allocated to encourage reflective practice which enables individuals to identify their own needs and design a course of action to meet these needs. This can be done in conjunction with a member of a central body (such as the CEA at Curtin University) or a colleague who is able to provide support. If this is to occur certain policies and mechanisms need to be established at the individual school level, as well as the university level. If such time was allocated, then staff would be responsible for their own participation in ongoing professional development. This could quite easily be monitored, included in portfolios and formally documented through yearly reviews.

The request for some kind of individual professional development has been raised on various occasions. McNaught et al., (1999) identified that the majority of those who requested one-to-one assistance tended to be those who were reluctant users of an innovation. The evidence from the present study was that those requesting assistance found such one-to-one support more productive than attending a session with others who had very different needs and skill levels than their own; and that requests came from individuals with varying levels of expertise.

Targeted in-house training sessions appeared to be a more preferred option than attending the professional development programs organised by the University for many of the Departments/Schools. It was interesting to note that the CEA also claimed to provide in-house training where they would design special sessions for the particular needs of the Department/School. There was no evidence however from the case study sample that they had participated in any of these. Calling upon the existing resources of the CEA would seem to be beneficial for all Departments/Schools. Perhaps the CEA needs to have more of a physical presence in each Division, in similar fashion to the specialised library staff who have been assigned to each Division and are physically located within each Division. The need for continuous training sessions as opposed to one-off sessions was also seen to be an essential strategy.

As indicated earlier, the majority of the CUIT survey sample had taught themselves how to use ICT. The data also revealed that they called upon a variety of sources for help. A university needs to tap into this resourcefulness of its staff by providing a variety of resources for their learning such as manuals, online tutorials, listservs, project development and mentorship schemes. These opportunities would enable many teaching staff to learn new skills, get up-to-date information on how to use a particular technology effectively and to discuss pedagogical issues with others while developing specific projects with new technologies.

Even though the data revealed that some teaching staff at Curtin University were reflective about their personal ICT goals and their adoption of technology, it is still important that more avenues are provided for individuals to continually reflect and modify teaching practices according to these analyses. Reflection is one of the key elements of a professional learning community, while productive collaboration can add a valuable dimension to reflective practice.

Professional development and reflective practice needs to be ongoing commitment on the part of the University, Department/School, and also the individual. This means that individuals need to accept responsibility and a commitment to exemplary practice, with student learning as the focus. This is crucial if individual staff members are to be perceived as members of a truly professional learning community.

Assertion 6: Some form of on-going monitoring of ICT experiences at an individual level is a crucial component of a reflective practice strategy.

The widespread use of email by Curtin University staff certainly facilitated the data collection process in this study. At the end of each month the respondents simply responded to the email prompt sent by the researcher. The respondents were required to return the email even if there had not been any changes. This regular monitoring provided the case study sample the opportunity to reflect on the past month and how their ICT use had changed regarding: teaching, students, training, IT support and facilities. What was interesting was that the case study respondents were asked to identify changes in existing behaviours and environment but on many occasions they simply documented what they had been doing regarding the use of ICT.

It also became apparent that the monthly TracIT reports had provided the teaching staff with a timely vehicle for venting their frustrations in their work as considerable detail was provided on many other day-to-day issues besides those they were specifically asked to address. The implications for the success of such a process which encourages the professional attribute of reflective practice is that these contributions could be valuable additions to the teaching portfolio of individual staff.

Department/School leaders may wish to adopt a similar process when attempting to monitor the introduction of a particular innovation. The identification of a nominated leader who is clearly interested in an individual's opinion and behaviour certainly has a positive affect on the attitude of the individual. Some of the case study respondents developed a friendly and collaborative rapport with the researcher when on numerous occasions they would make inquiries about other ICT issues.

Assertion 7: The integration of ICT into teaching and learning practices is more likely to occur if teaching staff are in the position to identify significant benefits for not only their students, but also for themselves.

There is strong support from the general change literature indicating that an innovation will not be successfully adopted if the individual does not perceive any real value in making any changes. All of the interview subsample were able to identify the benefits of adopting ICT in their teaching and learning for their students, however significantly, a small group from this sample were unable to identify the benefits for themselves. Within this group, those who rated themselves in the high and very high adoption category could not identify any benefits for themselves as they viewed adopting ICT as simply a different way of doing things. What appears to be clear is that posing the question in terms of measurable benefits is no longer appropriate to this group of high end users – they see that the adoption of ICT in their teaching and learning as a natural response to the changing university environment.

This assertion is embedded in the data derived in particular from the low-end users who could not identify any real benefits for integrating ICT for themselves. They noted that utilising ICT, especially in the initial stages, was difficult and time consuming and added to their already high workload and therefore they saw no real benefits for themselves. In other words, it was not productive for them to utilise ICT. An important finding was that the TracIT reports identified that the first group who had moved beyond identifying ICT as a benefit (part of their very culture) continued to use and experiment with ICT in their teaching and learning, while the pattern of ICT use did not alter over the 12 month period for the other group. It seems that those who cannot identify any benefits for themselves are less likely to attempt to adopt ICT into their own teaching and learning.

Dixon's (1999) study revealed that personal factors, or the ways in which teachers create meaning for an innovation, have the strongest influence on whether or not the program will succeed in becoming embedded in the culture, and is pertinent here. Rogers (1995) refers to this as 'relative advantage'. He noted that 'relative advantage' was one of the best predictors of the rate of adoption of an innovation. This was certainly the case for the low-medium ICT integration group at Curtin University who could not identify any benefits. Relative advantage was not an issue for the case study subsample who could not identify any benefits for themselves and were in the high –

very high ICT integration group as they simply accepted that it was a different way of working.

Assertion 8: The motivation of teaching staff to adopt ICT in teaching and learning is as much about a response to departmental/student expectation, than it is about the professionalism and accountability of individual teaching staff.

There appeared to be a real increase in pressure from students for teaching staff to adopt ICT in their teaching and learning. This point was also identified in another Australian study by McNaught, Phillips, Rossiter & Winn (1999). This pressure became more obvious through the TracIT reports where the respondents spoke about the expectations that students have regarding teachers adopting ICT in their teaching and learning. The following example reflects the subtle difference.

> *The problem is that our students are demanding teachers who use these skills and because some teachers don't work this way it looks bad ... students notice the difference and make judgements about staff in the center based on this.*
> *(ID4:ISQ13).*
>
> *Students are decidedly more computer literate than last year's first year cohort. This means real change for teaching because students expect staff to be there especially in a University of Technology. The change hurts when you can't put a break on the speed.*
> *(ID252:May2000).*

There was also evidence of a more subtle pressure from the Department/School to adopt technology by simply communicating electronically and expecting individuals to submit student results electronically. On numerous occasions the case study sample clearly identified the need to create online units in order to satisfy the requirements of their Department/School. Thus, it appears that students, Departments/Schools and the University as a whole have been placing pressure on individual teaching staff to adopt ICT in their teaching and learning, however when attempting to identify the impact of this pressure, it is important to reflect on whether the pressure brought about any real change.

A large majority (87.5%) of the case study sample demonstrated real change in their teaching behaviour, the ICT tasks they set their students, as well as the way in which they communicated with their students and their ICT training regime over the 12 month period. Some of these, such as teaching changes and training session attendance, were initiated by their Department/School (push for online units) and the University (Student One), however the majority were self-driven. A large majority of the case study sample were reflective and motivated enough to change their existing behaviour – the degree of change certainly varied, but none the less real change did occur.

The majority of the case study sample were aware of meeting the needs of the changing environment by being able to reflect on the benefits of integrating ICT into their teaching and learning. As indicated earlier, the case study data revealed that certain professional attributes came to the forefront. Attributes which would strongly be encouraged in any university working environment included: being flexible, committed, resourceful, reflective and collaborative.

Assertion 9: Students entering higher education institutions are still and will continue to be, a vastly diversified group regarding their ICT skills and literacy levels. The integration of ICT in their courses is more likely to be effective and rewarding for both students and teachers when sound principles of andragogy are applied.

In attempting to describe the changing working environment of the teaching staff at Curtin University of Technology, it is important to remember one of the main purposes of higher education – to help students change their conceptual understanding of phenomena, in a bid to change the way they understand the world around them (Ramsden, 1998). Laurillard (1993) suggests that "it is the teacher's responsibility to create the conditions in which understanding is possible, and the students' responsibility is to take advantage of that" (p1). If this is the case, then it is important to identify the student's current environment so that they can play an important part in the process. It has been stated earlier in this report that some case study participants noted that most students expected the teaching staff at the University to adopt technology in their classes. It appears that students expect staff to adopt technology in their units and that most teaching staff expect students to enter their units with certain ICT skills and familiarity with ICT.

It is interesting to note, but certainly not unexpected, that those teaching staff who have adopted ICT to a much greater degree than others, are those who have indicated that their student's ICT skills are very low and that their facilities are not adequate (i.e. very low and low rating). With few exceptions, the evidence from this study is that students are often faced with teaching staff who have made certain assumptions about the skills and experience of students, and expect their students to adopt the technology without necessarily determining whether the students actually know how to use the technology. In other words, the case study sample introduced new technologies to their courses assuming that the students would be able to use the technology. When introducing new technologies into courses, it is important that teaching staff employ sound andragogical principles by identifying the prior knowledge and skills of their students and allocating some teaching time, or other support resources for those students who require assistance. As some of the case study found, not all students enter university with adequate computer and information literacy skills.

Technical support has clearly been a contributing factor in adopting ICT for the teaching staff at Curtin University and it appears that technical support has also become an issue for those students participating in these units.

> *(Students) got frustrated with the failure of the various systems being used – from online access through to their own systems. This reflects on me, my units and Curtin.*
> *(ID375:Jan2000).*

> *Some students still do not have email access. Have identified cases of students being overloaded with IT probs. Some students are not reading email.*
> *(ID218:March2000).*

It appears that the circumstances of students must be brought into any discussion on the pedagogical benefits of such changes and certainly be involved in the implementation process. It is crucial to the quality of higher education, that all teaching staff become familiar with the practice of andragogy, particularly as it relates to the science of teaching adults. These andragogical principles differ from general pedagogy in that the learning process is more in tune with an individual's interests, needs and developmental readiness. One of the problems contributing to the lack of discussion and involvement is that very few teaching staff at tertiary institutions have a teaching degree, which means that through lack of exposure they are unfamiliar with the important learning theories that should guide their teaching and learning strategies. Bates (2000) claims that the industrial model of apprenticeship still pervades tertiary institutions, where new staff tend to adopt the teaching strategies of their seniors.

As the market place is becoming more competitive, with students as the consumer having the option of taking their purchasing power wherever they choose, they will demand, and have every right to demand, the highest possible quality teaching and learning environment.

Assertion 10: The use of a planned diffusion model such as Rogers' (1995) diffusion of innovation theory in the implementation, monitoring and evaluation of ICT adoption, can be an important component in implementing change within a university environment.

One of the key theoretical constructs adopted by this study was Rogers' (1995) so called "rate of adoption categories" and his "critical mass" concept. Being able to identify the rate of adoption of various staff members proved to be a most useful tool and was subsequently applied on numerous occasions throughout the data collection period and analysis, as it enabled the researcher to make some generalisations about the rate of adoption, and whether this had changed over a period of time.

Once the rate of adoption categories were identified for a particular subsample the researcher was able to determine whether critical mass had been reached. For instance from the CUIT survey sample, the researcher was able to identify very early in the study that the integration of ICT in teaching and learning had reached the critical mass stage at Curtin University. According to Rogers' theory once a critical mass stage has been reached, then the innovation can be self-sustaining. He also recognised that it was important to target the early adopters group (high level) as they can trigger the larger group to the critical mass stage. As Curtin University was beyond the critical mass stage, this particular study found that the innovators were not only the leaders in adopting the technology, but also the leaders in initiating and implementing change within their own Department/School. It is therefore important for institutions to recognise and strongly support the early adopters and innovators as both are crucial to the diffusion process.

Assertion 11: As the use of ICT becomes institutionalised in the working culture of the university organisation, a set of performance standards or guidelines need to be established for staff (new and existing) if they are to enter into and function effectively within such an environment.

As education Departments around Australia are developing and have developed competency frameworks and benchmarks for practicing School teachers, it is important for universities to demonstrate their commitment to developing and strengthening professional excellence in teaching and learning, by following a similar path. Establishing a set of guidelines or benchmarks for staff is important so that they are aware of what is expected of them regarding those skills and processes which need to be adopted in their teaching and learning practices. Establishing such benchmarks enables staff to reflect on their professional effectiveness, identify professional development opportunities and encourage life-long learning.

Within this study, the researcher was able to identify a set of performance standards specific to Curtin University staff through the close examination of the individual profiles. Again Rogers' (1995) adoption categories aided in the evolution of certain common attributes. These common attributes identified in each adopter category provided a general overview of how most of the individuals with that particular category had adopted ICT in their teaching and learning. In particular, certain patterns evolved which identified the applications they utilised, their own personal attitude toward ICT and how they actually adopted ICT in their teaching and learning.

When adopting such a process to develop performance standards or guidelines the focus must be on the early majority category (medium level). Specific to Curtin University teaching staff the following minimum performance standards are suggested in Table 11.1.

Table 11.1: Minimum Performance Standards for Teaching Staff at Curtin University

Application	*Attitude*	*Adoption*
Staff at Curtin University will be able to utilise the following applications: • Wordprocessing • Electronic Communication • Work/Home • Spreadsheets • Presentation software • Web Browsers • Web-based Development Tools	Teaching staff at Curtin University will be: • able to feel comfortable with the technology itself. • able to identify the benefits of integrating ICT in teaching and learning. • resourceful – able to seek information from a variety of sources. • reflective in the use of ICT.	Teaching staff at Curtin University will be able to: • communicate with students and colleagues electronically. • encourage and promote the use of ICT through developing Web-based material for delivery of resources as well as initiate real learning, and set Web-based assessment tasks.

These are very simple, yet practical guidelines. Too often competencies are written in such a generic way that they are difficult to measure and almost impossible to achieve. It is important for universities to constantly revisit such benchmarks and monitor whether the benchmarks reflect the University's current vision and strategic plan.

The approach adopted here is strategically simplistic – it is important to establish baseline data about an organisation prior to establishing future directions. The most effective strategy seems to be to establish performance standards which require small incremental changes, not big leaps for the majority of the staff. These standards may actually represent significant changes for many of the staff but not for the majority, and if the University puts in place strategies which enable staff to easily take these steps, then the performance level is more likely to be achieved.

Reconceptualising Higher Education

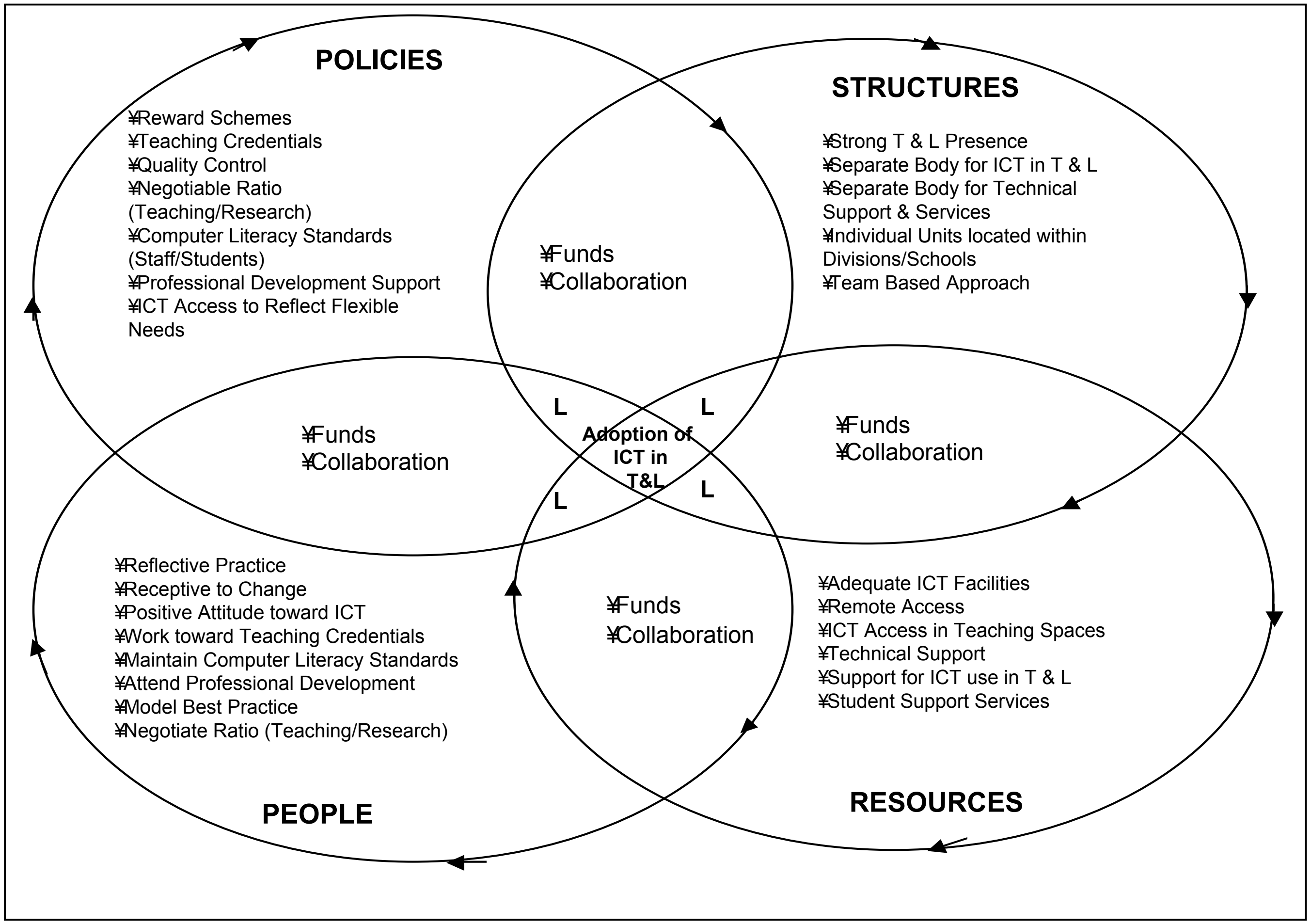
One of the key research questions for this study was:

> *What is an appropriate model for future implementation of ICT into teaching and learning at an Australian University?*

In light of the extensive data derived from this $3^{1/2}$ year study, it is apparent that if higher education institutions are to meet the needs of the Information Age, major transformations need to occur. The key to unlocking the nature of such a process may well be is to re-conceptualise the very roots of higher education institutions. If universities are to survive in the future the evidence is that they need to view themselves as a professional learning community. The key principles of a professional learning community encompass a number of characteristics which have been derived from the individual work of Alvesson (1993), Senge (1990), Sergiovanni (1993) and Fullan (1998). One of the key characteristic is that the culture of such a community is configured by multiple cultures where individuals may principally identify with the university, with a sub-unit within the university such as a Department/School and with the wider professional community. Such a community is seen as open and dynamic by the very fact that each individual brings with them certain cultural characteristics which in turn influence the community.

As a result of this study at Curtin University of Technology, in order to be an effective professional learning community, a key feature that has been identified is for the members within the community to have a shared vision, where everyone is collectively responsible for achieving the vision. Another characteristic coming through the data is that leadership roles need to be distributed throughout the community and that collaboration within the community needs to become the cultural norm. Learning is viewed as the key to such a community and failure simply provides the opportunity for learning to continue along alternative pathways.

Two models or frameworks will be presented, the first being the Curtin University Professional Learning Community Model, which has evolved from the evidence gathered at the case study site. Figure 11.1 found on the following page, is a representation which was empirically derived from the data obtained in this study –


POLICIES
¥Reward Schemes
¥Teaching Credentials
¥Quality Control
¥Negotiable Ratio (Teaching/Research)
¥Computer Literacy Standards (Staff/Students)
¥Professional Development Support
¥ICT Access to Reflect Flexible Needs
STRUCTURES
¥Strong T & L Presence
¥Separate Body for ICT in T & L
¥Separate Body for Technical Support & Services
¥Individual Units located within Divisions/Schools
¥Team Based Approach
¥Funds
¥Collaboration
¥Funds
¥Collaboration
L
L
Adoption of ICT in T&L
L
L
¥Funds
¥Collaboration
¥Reflective Practice
¥Receptive to Change
¥Positive Attitude toward ICT
¥Work toward Teaching Credentials
¥Maintain Computer Literacy Standards
¥Attend Professional Development
¥Model Best Practice
¥Negotiate Ratio (Teaching/Research)
¥Funds
¥Collaboration
¥Adequate ICT Facilities
¥Remote Access
¥ICT Access in Teaching Spaces
¥Technical Support
¥Support for ICT use in T & L
¥Student Support Services
PEOPLE
RESOURCES

more specifically from the data collected for the purpose of answering the specific research questions, the numerous issues which have arisen from the emerging themes, and relevant contemporary theory on change and innovation.

The results derived from the current study strongly suggest that the glue that binds together this type of professional learning community is commitment – strong commitment from the university organisation and strong commitment by individual members within this community. This can ultimately be achieved through the allocation of adequate funds, the allocation of time in order to provide the opportunity to collaborate, and the quality of respective leadership. These three elements are viewed as the core elements which drive this model. Adequate funding is simply a given. The literature strongly supports the view that individuals are the key to cultural change, and if they are unable to perceive the value in changing then they will simply not change. It is therefore vital that Curtin University include their input in the change process by providing opportunities for collaboration. As outlined in a number of previous sections, leadership is one of the most important elements when attempting to develop a professional learning community that will be able to sustain effective technological change. Leaders need to be aware of the human face of change and critically evaluate the need for certain change. Leaders are also responsible for setting goals and striving for certain standards within predefined time frames and one of the keys to being a good leader is making sure that these expectations are realistic and humanly possible. There is strong evidence in this study that Curtin University has high quality leaders distributed across various levels of the University.

The second model will move beyond the specific case (Curtin University of Technology) and will attempt to provide key principles and elements of a professional learning community which may be applied to other higher education institutions in Australia. Both these models propose certain elements which reflect university and individual commitment implying that it is only when there is a synergy between these forces that real change can occur and be sustained. The models suggest that such a professional learning community will be better able to meet the demands of the Information Age as well as respond to other changes the future may bring. The following sections expand on the characteristics and implications of the suggested models.

Curtin University Professional Learning Community Model (CUPLCM)

The Curtin University Professional Learning Community Model is made up of four major components – Policies, Structures, Resources and People, as seen in Figure 11.1. Each component has key elements which make up that particular component. One of the basic principles of this particular model is that each component is unable to stand alone and needs strong support from the others if the adoption of ICT for teaching and learning is to occur. The common elements which drive the model are adequate funds, the allocation of time for collaboration, and strong leadership. The model is cyclical in nature, hence the arrows are going in the same direction. Each major component is constantly feeding into the other components and is directly susceptible to and strongly influenced by global and local factors. This is an extremely important feature, as such a professional community needs to be constantly aware of their environment and act accordingly. The community's boundaries go far beyond the institution's walls. A professional learning community needs to be reflective not reactive. Ultimately the adoption of ICT for teaching and learning can be achieved if these components, principles and elements are in place.

A number of components involving university policies, structures, and resources espouse Curtin University of Technology's commitment to developing a professional learning community. Each major component will be addressed, followed by the specific elements of the model.

Policies

As identified in the Figure 11.1, university policies are one of the four major components which need to be in place if the adoption of ICT for teaching and learning is to become a reality for Curtin University. The following elements are indicative of the type of policies which need to be established in a professional learning community.

Reward schemes

The data from the present study and the relevant research literature (Ramsden, 1998; McNaught et al., 1999; Bates, 2000) have clearly indicated the need for any model to incorporate policies encompassing effective reward structures and incentive schemes which value teaching as much as research. This is especially important if ICT is to be integrated effectively into teaching and learning – as the findings of this study have clearly shown that the use of ICT in teaching has actually contributed to an increase in the overall workload of teaching staff.

As a direct result of this study it is suggested that a policy needs to be formed which advocates an equivalent strategy to the operation of Curtin University's Research Performance Index (RPI) which tracks and rewards research activities – the Teaching and Learning Performance Index (TLPI). This process should also include dimensions which directly relate to the use of ICT in teaching and learning. For such a policy to succeed, the University needs to establish a working party to investigate an equitable university scheme for rewarding teaching and community service in addition to research. One of the more difficult tasks would be to determine what level of 'proof' or evidence would be required that clearly reflects that the individual has participated in or achieved, a specific outcome. Perhaps the new Teaching and Learning Performance Index (TLPI) could include such dimensions as: receiving a teaching award; creating a new unit; being responsible for co-ordinating a unit, which involves mentoring other colleagues; incorporating web-based resources in units; developing stand alone online units; achieving a certain rate on the student evaluation form by a certain percentage of the students in one particular semester; mentoring colleagues in a way which helps them to integrate ICT into their teaching and learning; attending conferences; attending professional development sessions aimed at increasing the use of ICT for teaching and learning.

The policy of providing awards and grants such as the already well established Innovative Teaching Practice (ITP) Awards and the Learning Effectiveness Alliance Program (LEAP) has been well received by the academic staff at Curtin University and clearly indicate that the University is trying to encourage and promote good teaching practice and initiate change. The most valuable aspect of the LEAP Project described in this study was that the project was funded over a three year period which enabled planned incremental change and promoted the project team-based approach. On a yearly basis external reviewers were called in to evaluate the progress of the project, a strategy which strongly encouraged the project team to stay on task. One of the conditions of both of these schemes was that participants were required to disseminate widely across the University the details of their teaching approach or progress of their project. As indicated earlier this opportunity for disseminate is vital and needs to be incorporated with any scheme which rewards good teaching and learning practice.

Computer literacy standards (staff/students)

If this University is serious about achieving their vision, *"Curtin aspires to be Australia's world-class University of Technology",* then this must involve having academic staff who are competent ICT users not only to conduct their research, but also to integrate ICT into their teaching and learning. The data gathered specifically from the case study respondents in this study indicate that students also expect staff to have certain skills and adopt ICT in their teaching with the converse of this also occurring, where academic staff expected students to be competent ICT users.

To this end, the University needs to begin to set computer literacy standards for academic staff as well as for students. As indicated in Assertion 11 these standards require the provision of practical guidelines. It is crucial that these competencies are constantly revisited and monitored to determine whether the benchmarks reflect the University’s current vision and strategic plan. These standards should be based on the needs of the current environment and, as indicated by this study, focus on the early majority group of adopter categories. Specific to Curtin University teaching staff, the following minimum performance standards are suggested in Table 11.1, presented earlier in this chapter in Assertion 11.

Setting computer literacy standards is the easy part – what is more difficult is the subsequent enforcing and monitoring them. One way of achieving this could be through the yearly review that all staff are required to undertake with their Head of school. Staff members would document their achievements and indicate their plan of action for achieving these standards through a professional portfolio (the use of a professional portfolio has been strongly encouraged at Curtin University). The Head of school would be required to discuss and monitor their progress via the portfolio. If the staff member has demonstrated their mastery of these standards and indicated that they have surpassed them, then the Head of school could provide recognition for these achievements through a scheme such as the suggested Teaching and Learning Performance Index. The professional development sessions conducted by the CEA could also strongly reflect these performance standards, where evidence of attendance at these sessions could be included in the portfolio.

Computer literacy standards for students are also required to reflect the needs of the environment and the reflective performance standards for teaching staff at the University. An example of a set of potential performance standards for students at Curtin University of Technology is identified in Table 11.2.

Table 11.2: Minimum Performance Standards for Students at Curtin University

Application	*Attitude*	*Adoption*
Students at Curtin University will be able to utilise the following applications: • Wordprocessing • Electronic Communication Work/Home • Presentation software • Web Browsers • Web-based Development Tools	Students at Curtin University will be: • able to feel comfortable with the technology itself. • able to identify the benefits of utilising ICT in their teaching and learning process. • resourceful – able to seek information from a variety of sources. • reflective – utilise ICT when and where appropriate.	Students at Curtin University will be able to: • communicate with students and colleagues electronically. • utilise multimedia software to support and express their ideas, thoughts and concepts. • utilise Web-based environments created for them to aid the process of teaching and learning. • create web-based resources as a way of expressing their ideas and thoughts.

Setting a common core computer literacy unit for all first year students regardless of their discipline would begin to work toward ensuring that these performance standards are achieved by the students at this university. At the present time, the Faculty of Education at Curtin University tests all first year students on their literacy and numeracy skills. Regardless of having achieved an adequate Tertiary Entrance Raking (TER) the Faculty of Education had decided that it was still a major concern that many students had a low level of literacy and numeracy skills. The inclusion of a computer literacy test is also now being strongly considered – this would certainly help students achieve the suggested performance standards in computer literacy.

Negotiable teaching/research/community service ratio

The study clearly indicated that academic staff face a significant challenge if they are expected to simultaneously produce high quality research, innovative teaching and meaningful community service. This particular issue is also highlighted by Boyer (1990), Fisher (1994) and Baldwin (1998) who all question the value of each and every academic staff member fully engaging in teaching, research and service. Institutional policies need to reflect this concept by providing initiatives which encourage and support Department/Schools to allow individual staff to negotiate their teaching, research and community service balance according to their interests, expertise and the specific needs of the school. These duties could be negotiated on employment and continued at the annual reviews with the Head of the Department/School. Interestingly, in the case of this University, it allows individuals to make such judgements about the balance of their own teaching and research tasks in the work place in its own internal promotional procedure. However this has no bearing on what actually happens in practice.

Time allocation for teaching in an online mode

This particular study has found that the workload of individuals tends to increase as they integrate ICT in their teaching and learning. Writing a new face-to-face unit is time consuming, but having to write a unit to be delivered in an online environment is particularly time consuming. Individuals need to try and make the transition from paper to electronic, as the principles which guide the two learning environments (face-to-face, online) are vastly different. This requires a great deal of time and effort and the evidence is that this can only occur once academic staff have worked in such an environment and have become reflective about their own practice over a period of time.

One of the specific concerns which have arisen through this study concerns the time required to perform the mechanics of creating, maintaining and teaching in such an environment. One of the outcomes of this study strongly suggests that if units have an online component or are totally online, then the time required to create, maintain and teach in such an environment needs to be factored into the teaching allocation of individual staff. Establishing how much time should be allocated to these tasks would be difficult to determine, but not impossible.

Teaching credentials

One of the criteria for new appointments at the university is the completion or near completion of a Doctor of Philosophy (PhD) qualification. There is usually no reference to teaching credentials, unless the position is in the Faculty of Education which requires this qualification in order for the employee to supervise students during their field experience placements. It has become clear that the successful completion of a PhD does not necessarily mean that the individual is able to teach in a tertiary environment. In particular, the interview data indicated that a high level of ICT skills did not necessarily equate to a high level of ICT integration into teaching and learning. These respondents admitted that they felt quite competent when utilising ICT for themselves however were unable to integrate ICT effectively in their teaching. If new staff entering the University or existing staff do not have teaching credentials then perhaps the University needs to recommend that each new academic staff member complete a comprehensive teaching induction program. At this level the awareness of sound androgogical principles is essential. The CEA currently has such courses available but it is up to the individual to attend these sessions if they so wish to. Part of such an induction could include assistance in the use of ICT in teaching and learning and could also make the participants aware of the computer literacy standards expected of them.

Professional development support

There appears to be minimal level of support in place at Curtin University of Technology for those who wish to participate in conferences, if the level of financial renumeration is a measure. The amount of renumeration varies depending on the particular division/School/Department policy. However it usually amounts to academic staff being able to claim for one conference per year – a specific level of funding is available depending on whether the conference is international, national or state. These funds barely cover the registration fee, with the staff member being responsible for the remainder of the cost for airfares and accommodation.

In this study there was evidence that the innovators and early adopters were very active participants in encouraging others to adopt ICT. These groups are often dealing with new and innovative software and have very little use for any of the professional development sessions organised by the CEA. The University is under a real obligation to cater for these groups if they wish to encourage new and innovative use of ICT. In summary, if the University is serious about life long learning and the individual professional development of staff members, then they need to assign more funds to conference attendance and assistance in participating in professional development sessions outside of their in-house offerings.

ICT access to reflect flexible needs

As the adoption of ICT becomes part of the overall working culture of the University, the University's remote access facilities and policies relating to these facilities, need to be continually monitored and adjusted in order to reflect the specific working needs of the teaching staff. The data in this study clearly indicate that the reputation of the remote access facilities at Curtin University is very poor.

The data also indicate the need for the University to be flexible when implementing hardware and software policies. Standardising equipment for most situations is required for the obvious reasons, however there needs to be some flexibility where innovators can continue to experiment at the cutting edge. Weigel (2000) warns universities of the need to be aware of falling into the trap of "commoditisation", where products or services become standardised to the extent that their attributes are roughly the same. It appears that Curtin University will head in this direction if it continues to support and encourage the use of WebCT as the sole authoring software across the University. The researcher understands the need to economise and that the various disciplines need to provide some consistency for students and staff, however the end result of removing individual autonomy and having every unit within a course resemble every other unit across all disciplines, is clearly what Weigel (2000) refers to as "commoditisation". This is where universities need to be creative and resourceful and perhaps provide a suite of options. These same concerns are expressed by Bates (2000) and by the innovators involved in this study. The following comments reflect the concerns made by one of the case study participants:

> *My major concern is in the rush to corporatise (is there such a word?) IT operations within the Uni, IT innovators like myself may be hobbled to the point of being unable to stretch the boundaries of IT in Teaching and Learning. The IT review outcomes appear to lock down all systems so tightly that it restricts the flexibility of innovators.* *(ID218:Oct99).*
>
> *I think that IT innovation flourishes best in semi-archaic IT environments where innovators have the opportunities to try out things that are not always compatible with corporate users. Long term implementation is another matter since once these innovations have been tried and found useful, a more robust system would be appropriate. At the same time the innovators should still be able to experiment etc.* *(ID218:Oct99).*

Structures

Another major component of the Curtin University Professional Learning Community Model is summed up by the term "Structures". In the words of Ramsden (1998) "After the culture is right, then the structure can be improved. The structure is very important. But it is secondary" (p 262). However this model strongly suggests that the culture of this community will more than likely adopt ICT if certain structures, resources and policies are in place. The key elements in the structure component of the model are: a strong teaching and learning presence; a separate body for ICT in teaching and learning and one for technical support service; individual support units located within division/Schools; and a team-based approach is adopted. The structure and resource components in this model are very closely linked. The relationship between the two is represented in Figure 11.2 which can be found on the following page.

Strong teaching & learning presence

The formation of the Office of Teaching and Learning at Curtin University was a positive demonstration to the wider community that the University valued teaching and learning as much as research and development. This structural figurehead representing teaching and learning, in concert with a leader who actively supported initiatives and strategies which promoted the use of ICT in teaching and learning, appeared to have a profound effect on the culture of the University community. This was also recognised in the preliminary findings of the Shortland-Jones and Baker (2001) survey conducted at Curtin University.

The Office of Teaching and Learning at Curtin University resembles a clearinghouse where strategies and initiatives were designed to enhance the quality of teaching and learning conducted at the University, with the Office attempting to support these initiatives by strategically creating structures and resources which would guarantee their success. For example, the ITP awards, the LEAP grants and the professional development courses were the initiatives with the appropriate structure to support these initiatives being the Centre for Educational Advancement (CEA). For instance, the CEA helped staff write their ITP applications and they conducted a variety of professional development sessions to aid in the development of online units. They also worked closely with the LEAP teams and supported where and when required.

Figure 11.2: Structures & resources

Such an approach indicates that the University is committed to the enhancement of teaching and learning. It would now be an opportune time to initiate the Teaching and Learning Performance Index, as suggested earlier in the model.

Support services

As indicated earlier, the Office of Teaching and Learning established the CEA, a key branch which was responsible for staff development, educational media support and distance education. This was in addition to the already well established technical support services, under the Information Management Services (IMS). The data collected in this study indicate that the successful adoption of ICT is also strongly dependent upon the accessibility of specific support structures. Even though the participants were from different disciplines, had varied levels of ICT skills, applied ICT in their teaching in a number of unique ways, worked under a range of facilities – there surfaced common support needs. These support needs fell into two discrete categories: technical development and professional development. Specific roles for each support system will be clearly identified in the resource component of this model. Separating the two services appears to be the best way to meet the support needs required to adopt ICT in teaching and learning.

Individual units located within Division/School

Universities cannot promote the use of ICT in teaching and learning without providing adequate support and, as more people adopt ICT, the support needs are simply going to increase. It would seem that the project team model advocated by Bates (2000) could assist with many of these support issues. In the case of Curtin University this involved a very large centralised body (The Office of Teaching and Learning), which already provided an extensive range of university wide services through the CEA. In addition however it also needs to provide support at a local level perhaps by creating small flexible learning units housed within each large Department/School. Each unit could be comprised of one technical support person (1:25 staff utilising ICT for teaching) and one educational technologist (1:50 academic staff), a ratio suggested by Bates (2000).

At the present time at Curtin University this would not be viewed as a very practical suggestion as most teaching Divisions (based upon the recommendations of the IT Review) in the University have spent a great deal of time and resources into sourcing an ICT support team within their Division. In light of the rate of change in technologies themselves it would appear more practical and advantageous to be able to call upon a team of individuals who have certain expertise as opposed to calling upon only one individual, even though this individual could call upon the larger support structure. One of the essential conditions of any support system which surfaced through the data collected is the need for the support to be housed with their School/Department – easy access to just-in-time support was a major concern. The researcher strongly suggests that one structure to support these needs is clearly identified in Figure 11.2.

Resources

The effective use of ICT in teaching and learning can be strongly encouraged through the provision of certain resources, which reflects the need to have resources as one of the major components of the Curtin University Professional Learning Community Model.

ICT facilities

The data, particularly that collected through the TracIT reports, indicate that inadequate facilities have a strong affect on the morale and productivity of academic staff. If teaching staff are to integrate ICT into their teaching and learning they require appropriate hardware and software which meet these needs. As clearly evidenced through the case study participants these needs vary (i.e. some require more sophisticated software and special hardware in order to run this software), however the Information Management Services needs to support the issue of a basic system. This initiative appears to be filtering through the University with the introduction of the standard operating environment (another recommendation from the IT Review) which is installed on every new system (leased or otherwise). The concern is not with the new computers being leased – the concern is with the existing hardware many staff are having to continue to use. Now that the University has basically moved to a leasing system there should be no problem with upgrading all hardware systems. The responsibility needs to fall upon the individual Division to monitor this equipment, after all the effectiveness and productivity of individual staff will affect the culture of the Division.

ICT access in teaching spaces

If ICT is to be seen as an integral part of the teaching and learning process at Curtin University then the University must provide ample computer access and projection facilities in all teaching classrooms. Furthermore, if ICT is to be integrated into the very culture of this process then the University needs to become serious about reconfiguring many of the classrooms to facilitate computer access (provide network connections, fixed or wireless) and even consider very strongly the leasing of laptops to students. This of course would have huge implications on University infrastructure. As indicated earlier, many institutions in the USA are having to charge students an ICT levy while others are also making laptops compulsory. Perhaps this is the road Curtin University needs to travel.

Remote Access

Remote access facilities for staff need to be provided free of charge and Department/Schools should be encouraged to support leasing laptops for staff instead of stand-alone computers. This will enable staff to take advantage of the full flexibility of ICT.

There is an ongoing need to constantly monitor the needs of the University's ICT infrastructure (human and technical), similar to the IT Review. It would prove to be more productive and cost effective if the University established a strategy where such a process occurred on a regular basis instead of simply responding to a crisis situation such as the IT Review. The University's Information Management Services needs to be responsible for such a process and report regularly to the Vice Chancellor.

Support for ICT use in Teaching & Learning

As indicated earlier in this chapter, the CEA is the existing body which can provide the necessary level of resources required to support the use of ICT in teaching and learning. As it currently stands, the CEA is responsible for professional development, educational media support, distance education and WebCT support. These functions of the CEA are certainly important to the advancement of ICT in teaching and learning, however in order to be more effective a CEA representative needs to be located within a Division, ideally within every school. The CEA representative would still be part of the larger body, and be able to draw upon their support whenever required –however they would deal specifically with individuals within schools.

Another option would be that the CEA representative could be an existing academic staff member in the division/School who has successfully integrated ICT into their teaching and learning and would be able to assist others. This staff member could be seconded into such a position for a period of not less than two years. The University would have to recognise this as a valuable contribution and would have to provide some incentives for staff to apply for such a position. The research has clearly documented that the effective integration of ICT in teaching and learning involves a great deal of time and effort for individual staff, not to mention making others aware of the potential of ICT, asking them to change their existing practices and teaching them new skills. Perhaps utilising the Teaching & Learning Performance Index scheme, bonus points could be allocated to people who would take on such a role. If such a policy were in place this would encourage the perception that this was a role really valued by the University. Having an internal staff member perform such a role would be valuable as any resistance to them in their role as a change agent would be less than that of an outsider - the data clearly reflected that targeted in-house sessions were preferred to the one-off sessions conducted in a different environment with others at various levels and from other disciplines.

The role of the CEA representatives could encompass the following:

- Conduct regular needs assessments within their schools which should feed back into the staff development program of the CEA. If there was a common need across the University for certain skills or concepts, then the CEA could run some courses, or if this was not the case the CEA representative or someone else from the CEA team, could provide professional development specific to the school.
- Make appointments to see individual staff with specific needs.
- Actively promote the use of ICT by meeting with individuals and work on small incremental changes.
- Support individuals/groups meet the computer literacy standards assigned by the University.
- Establish support teams, where individuals are working on enhancing their own teaching and learning however with other members of their school.
- Publicly and individually address the need to see the benefits of actually changing.
- Share success stories, encourage small incremental changes, advise people of pitfalls and identify strategies to overcome these pitfalls. For example, the representative would try and avoid simply helping staff use WebCT for their unit,

they must share the benefits of using such a system, identify which are the most effective tools to use for certain numbers of students, warn them of the problems associated with such a system – discussion board and email netiquette, time frame for the turnover of messages, information overload, the need to teach students how to use the system, and that there is a huge learning curve for them as well. All of these issues tend not to be dealt with under current guidelines.

Ultimately the role of the CEA representative is to serve as the change agent.

Staff participation in ongoing professional development is simply assumed and taken for granted by the University. Time to undergo professional development is usually assigned to semester breaks. The results of the present study clearly suggest that the University should integrate regular professional development within the normal working environment of all staff. Further, any model or plan for ICT integration for the University should establish strategies and provide resources whereby individuals can analyse their own professional development needs and identify the most effective method of meeting these needs. A comprehensive set of University performance standards in this area would aid such a process as well as the introduction of a monitoring system such as the TracIT reporting system. Initiating such mechanisms would demonstrate that the University valued reflective practice as part of an individual's own professional development progression. This process could clearly involve the CEA representative.

The University also needs to develop its professional development initiatives from a wider variety of sources and in a variety of formats. More specifically, a range from short 1-2 hour courses to regular ongoing courses over five to ten weeks, where people are able to practise in between sessions. For the last two years Curtin University has produced a very useful CD ROM "Curtin Star up CD" which provides software and excellent tutorials for many useful software applications. The CD ROM, which is also available online, is obtainable free for any Curtin University student and member of staff. This is an excellent resource – the continued production and market of such a resources is invaluable. There are many other online resources where staff can participate in interactive tutorials to learn new skills which are software specific. The University needs to tap into these existing resources and make staff aware of them. This could be through establishing a Website, CD ROM or even hard copy pamphlets.

In the near future, the researcher envisages that specific skill-based courses will be redundant as more and more individuals will choose to learn specific skills from a variety of other sources when they have a specific need – the so called "just-in-time" paradigm. However as more individuals adopt technology and as new technologies are introduced into higher education institutions, there will be constant need to participate in sessions and forums where the effective use of ICT is being modelled and critically evaluated. Electronic communication has greatly increased access to a community of learners. Listservs can be established where members participate in ongoing discussions while they support each other by problem-solving together. These may be moderated by other individuals depending on the subject matter. Such a discussion list would enable individuals to form their own subgroups which would be more focused, beneficial and more importantly less time consuming.

Technical support

It has been clearly documented in this study, that for effective use of ICT in teaching and learning, high quality technical support is crucial. More importantly the evidence from this study is that such technical support needs to be sourced within the Department/School and that the people who are providing the service need to adopt a more 'humanistic' approach to those they are helping. The range and varied use of ICT across the University also calls for different levels of ICT support. In other words, those individuals who engage in more sophisticated use (there certainly appear to be many of these within the University) than the average user at the University, should be able to contact a more sophisticated help system. It is no longer appropriate to have a "one size fits all" approach. This can be rectified by making sure that the ICT support team located within Divisions be constructed of individuals with expertise in various areas.

Student support service

An important outcome of the study was that the use of Web-based material at Curtin University has dramatically increased over the period of the study. This increase in use has placed more pressure on existing resources. If an online environment is to be encouraged it needs to be technically supported not only for University staff but also for students. As more staff adopt Web-based environments the need to support students will be magnified. Staff engaged in such units should be able to refer students to a specific help line and not have to deal with technical problems students may be experiencing.

People

At the individual level, teaching staff need to demonstrate their commitment as members of a professional learning community. First, by viewing themselves as professionals and participating in the following key practices – reflective practice, receptivity to change, positive attitude toward ICT, work toward teaching credentials, maintenance of computer literacy standards, attention to professional development, model best practice and negotiation of their teaching/research ratio. The final component, "People", is once again a vital component in the development of a Curtin University Professional Learning Community Model.

Reflective practice

Engaging in reflective practice is commonly viewed as an important part of the professional development of all teachers and hence a key element of this component. The research data has demonstrated that many of the Curtin University teaching staff involved in this study were truly reflective about their use of ICT. The evidence is that through use of and reflection about ICT, teaching staff can integrate ICT in a manner which encourages deep and meaningful learning.

Receptive to change

There is a real need for individual teaching staff to develop a sense of professionalism by questioning their own receptivity to change and personal attitude toward the adoption of ICT. This is vital as nearly half of the CUIT survey sample at Curtin University indicated that they needed to see a proven need for ICT in their own discipline. Another key finding was that 40% of the same sample noted that they felt uncomfortable with the technology itself, while the level of ICT expertise of these individuals ranged from very low to very high. Questioning one's receptivity to change and attitude will only occur through an awareness of the change process and a sensitivity to the needs of the environment.

Teaching credentials

The issue of working toward teaching credentials surfaced in this study through incidents raised through the TracIT reports by the case study sample, most of which simply reflected lack of knowledge about fundamental teaching and learning principles. For instance, with few exceptions the staff introduced new technologies to their courses assuming that the students would be able to use the technology. When adopting new technology into their teaching practices, teaching staff need to employ sound andragogical principles which recognise the interests, needs and developmental readiness of their students – importantly these will differ depending on the group of students at that specific time. It is important for individual staff to continue their journey of life long learning and work toward enhancing their teaching and learning skills which will hopefully be strongly supported and encouraged by the University (indicated in the "Policy" component).

Professional development

Time is a precious resource and individual staff need to continue to be resourceful as they have shown in the past, and engage in appropriate professional development activities. Becoming part of a professional learning team is an effective way of creating an ongoing support structure which builds in professional development for life-long learning, such as those witnessed in Curtin University's LEAP project. It is important that staff recognise the need for ongoing professional development and with the help provided by the University continue to participate in such activities as conferences, training sessions, workshops and show case demonstrations.

Computer literacy standards

This element needs to be closely linked to an individuals self assessment of their ICT skills, attitudes and application and followed by designing a realistic plan of attack which would enable the individual to best achieve this plan. The CEA representative could aid in this process. The most important belief is that the individual recognises the need for such standards.

Modeling best practice

A powerful tool in this specific area of professional development is the modeling of effective use of ICT in teaching and learning. The Innovative Teaching Practice Awards are a useful start in this area, however universities need to tap into as many sources of innovative practice as possible. From evidence drawn from this study, forums which encourage on a regular basis a 'show-casing' and subsequent discussion of effective use of ICT in teaching and learning within School/Departments and across disciplines, are likely to be an effective professional development strategy. The CEA representative could be responsible for identifying examples of best practice in the use of ICT and in asking individual staff to contribute in a 'show-casing' forum.

The teaching/research/community service ratio

This has been addressed earlier in the "Policy" component of the Model. If such a policy were in place individual staff would feel empowered by asserting some level of control over their teaching and researching distribution for that particular year. Individual staff need to understand that the needs of the particular School/Department must be fulfilled also and compromises need to take place.

Time management

What appears to be happening at the University is that academic staff are opting to combine the two environments of face-to-face and online, in order to cater for various learning styles and to meet individual needs. The lure of providing an environment which enables easy communication between staff and students, as well as providing effective course management facilities has also strongly influenced their selection. This combination also gives rise to an increase in workload. Academic staff are adopting a Web-based environment to complement their already existing face-to-face unit without having altered the amount of time allocation to their face-to-face sessions. In general the University does not prescribe to staff the specific contact hours for face-to-face sessions however, recommendations are usually provided by the individual Schools/Departments. Academic staff at Curtin University need to manage their time more efficiently and effectively and determine how best to spend their time (face-to-face and online).

The study clearly reveals that individual teaching staff need to be able to manage their time more efficiently and effectively as global factors continue to impact on higher education institutions and in turn on their local working environment. Spender (1998) used the term 'learning managers' which certainly appears to be appropriate for future educators.

Professional Learning Community Model

The Professional Learning Community Model which is identified in Figure 11.3 (on the following page) is designed following the same principles as the Curtin University Professional Learning Community Model. The model has been simplified in order to reflect the ultimate driving force, commitment - strong commitment by the University and strong commitment by individual staff. The circle representing University Commitment has absorbed the key components of *policies, structures* and *resources* of the previous model, while individual commitment has absorbed the component termed *people*. The Professional Learning Community Model suggests more generic strategies as opposed to the CUPLCM which recommends specific strategies applicable to Curtin University of Technology.

Final Comment

This study has attempted to examine the adoption and use of ICT in teaching and learning across a university. From these data sets an empirical framework or model called the Curtin University Professional Learning Community Model has been introduced. The data collected in this study indicates that Curtin University of Technology has demonstrated its commitment to the use and encouragement of ICT in teaching and learning through a number of initiatives implemented in recent years. For instance, the establishment of the Office of Teaching and Learning, a parallel division to the Research and Development Division. The variety of professional development courses (*Surviving IT, Computer Literacy for Academics, WebCT, Teaching & Learning @ Curtin*) established for Curtin University staff is yet another example of the University's commitment. The introduction of the Innovative Teaching Practice Award (ITP) program at Curtin University was initiated by the Office of Teaching and Learning to provide recognition and reward for exemplary teaching by individuals, teams and Schools. The Learning Effectiveness Alliance Program (LEAP) is one of the major strategies implemented by Curtin University of Technology in response to the key strategic priority "Introduce reward mechanisms for good teaching" (Curtin University of Technology, 2000f).

Figure 11.3

Curtin University employed an outside contractor to conduct a review of the Information Technology & Telecommunications (IT&T) service delivery (the IT Review) at Curtin University. Further commitment was evident in the policy and planning process Curtin University adopted, as it appears to have adopted a more 'entrepreneurial' approach to Strategic Planning and hence management of the University (Strategic Plan 2000 – 2005).

Many of the teaching staff at Curtin University involved in this particular study have clearly demonstrated their commitment to the adoption of ICT in their teaching and learning. The detailed case study data have also revealed that many of the teaching staff possess professional attributes which would be admired and valued in any university. Through the data derived from the various instruments the researcher was able to identify the factors which hindered the adoption of ICT at an individual level; time, skills, resources, facilities, technical support, software support, recognition, reward structures, a favourable attitude, and perceived benefits. These outcomes are consistent with previous studies of tertiary environments (Baldwin, 1998; McNaught et al., 1999; Bates, 2000; Fox, 2001).

The problem universities face today and in the future will not just be about creating strategies to encourage the adoption of ICT in order to achieve a preconceived 'critical mass' – the challenge will be how to keep up with the demands these changes place on the overall system. How will universities provide the appropriate infrastructure and support for academic staff to continue integrating ICT effectively in their teaching and learning? If this support is not provided teaching staff will simply return to what they know works for them (Fullan, 1992). What we do not want to promote is the following view from a university teaching staff.

> *Basically I have decided that the use of technology is not worth the effort - my workload and stress levels will be reduced and my well being will be enhanced by not using the technology any more. So unless things change I will not be using any technology in any of my units from second semester 2000.*
>
> *Whilst I have been trying to use the web for some time other colleagues have ignored it and have been able to concentrate on other areas that promote their career or are rewarded - the opportunity cost has proved to be far too great for me to continue on this route. So my plan is to use the web this semester then go back to traditional methods for second semester.* *(ID:375January2000).*

The study has identified that commitment needs to come from two levels – the university and the individual – and if this does not occur, the University will be faced with individual staff feeling frustrated and unsupported. If individuals are unable to commit to their role in developing a professional learning community then the University may not be able to meet the needs of the current environment, hence putting at risk the teaching quality of the whole University. This study has clearly shown that it is only through the synergy of university commitment and individual commitment that real change can actually take place, the change in this case being the adoption of ICT in teaching and learning practices. The strategies suggested by the participants in this study and formalised by the empirically derived model can be the beginning of the journey to teaching professionalism at the university level.

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Index – Authors

APPENDIX A

Instruments

A.1. Curtin University of Technology Survey (CUIT survey)

A.2 Pilot - Curtin University of Technology Survey (CUIT survey)

A.3 Interview Schedule

A.4 TracIT

A.5 Instructions for the TracIT

A.6 Sample Emails to Case Study Participants

APPENDIX B

Correspondence

APPENDIX C

Coding Structures

C.1. Coding Structure - CUIT survey Data

C.2 Coding Structure - Interview Data

APPENDIX D

Sample of Data

D.1. Individual TracIT Report for the 12 Month Period

D.2 Database of a Focus Area (Teaching) for A Division

D.3 Researcher Designed Individual Profiles

D.4 TracIT report - One Month Period

D.5 IT Review Comments - Interviews

D.6 Curtin University of Technology Courses - Comments

D.7 Comments Reflecting Teaching Initiatives & Existing Patterns

D.8 Comments Reflecting Change & Existing Patterns - Students

D.9 Comments Reflecting Change & Existing Patterns - ICT Support

D.10 Comments Reflecting Change & Existing Patterns - Facilities

APPENDIX E

Significant Studies

E.1. Studies Utlising the Diffusion of Innovation Theory

E.2 Key ICT Studies Linked to this Thesis

Curtin University Information Technology Survey

SECTION 1: DEMOGRAPHICS

1. Name (Optional) ______________________________

2. Age:
- 20 – 29 ❑
- 30 – 39 ❑
- 40 – 49 ❑
- 50 – 59 ❑
- 60 – over ❑

3. Male ❑
Female ❑

4. School/Department ______________________________

5. Current Position ______________________________

6. Main Teaching Subject(s) ______________________________

7. How many years have you been teaching at this University?

0 – 5 years	❑	11 – 15 years	❑
6 – 10 years	❑	16 – over	❑

8. Are you currently employed by the University:

tenured ❑ contract ❑ sessional ❑

9. Which level of students do you teach? ***(Select more than one if appropriate)***

undergraduates ❑ post-graduates ❑

10. Which of the following teaching mode(s) do you utilize in your teaching?
(Select more than one if appropriate)

Lecture	❑	Workshop	❑
Tutorial	❑	Laboratory	❑

Other ______________________________

SECTION 11: TECHNOLOGY ACCESS

11. Do you use a computer?
No ❑ ***Please GO to Question 12.***

Yes ❑
11.1 at home ❑ ***circle how often*** frequently/sometimes/rarely
11.2 at work ❑ ***circle how often*** frequently/sometimes/rarely

12. Do you have access to the Internet?
No ❑ ***Please GO to Question 13.***

Yes ❑
12.1 at home ❑ ***circle how often used*** frequently/sometimes/rarely
12.2 at work ❑ ***circle how often used*** frequently/sometimes/rarely

13. Do you have access to Email?

No ❑ ***Please GO to Question 14.***

Yes ❑

13.1 at home ❑ ***circle how often used*** frequently/sometimes/rarely

13.2 at work ❑ ***circle how often used*** frequently/sometimes/rarely

SECTION III: TRAINING

14. What (if any) information technology training have you received?
(Select more than one if appropriate)

None/Self Taught ❑

General Courses ❑

Specific Software Courses ❑

Integrating into teaching and learning ❑

Other ____

15. Which of the following training options are you aware that Curtin University offers its academic staff?
(Select more than one if appropriate)

Short courses ❑

All day sessions ❑

General Courses ❑

Specific Software Courses ❑

Integrating into teaching and learning ❑

Other ______________________

SECTION IV: INFORMATION TECHNOLOGY IN TEACHING & LEARNING

16. Within your School/Department to what degree do you rate yourself regarding the integration of information technology into your teaching?

Very Low (1-10%) ❑ ***Please (√) only one response.***

Low (11-25%) ❑

Medium (26-50%) ❑

High (51-75%) ❑

Very High (top 25%) ❑

17. Please indicate the type of software you: - frequently use

- expect your students to use in your course.

Place a tick (√) in the appropriate column/s.

Software *(Examples)*	To prepare for my teaching I use	During my teaching session I use	I expect my students taking my courses to use
Wordprocessing *(e.g.Word))*			
Spreadsheet *(Excel)*			
Database *(Access, Foxpro, Oracle)*			
Statistics *(SPSS, Minitab)*			
Communication - email *(Eudora, Pine)*			
Communication *(Video Conferencing)*			
Web Browsers *(Netscape, Explorer)*			
Internet Tools *(Web CT, Front Page)*			
Presentation Software *(PowerPoint)*			
Desktop Publishing *(Publisher)*			
Compilers *(Fortran, Visual Basic, C)*			
Graphics *(PhotoShop, CorelDraw)*			
CDROM's			
Courseware			
FTP (File Transfer Protocol)			
Other:			

Please circle the number on the scale (Strongly Disagree – Strongly Agree) which reflects how strongly you feel about the following statements.

I'd be more likely to use technology in my teaching, if I:	Strongly Disagree	Disagree		Agree	Strongly Agree
18. could collaborate on using information technology with colleagues who teach in my area	1	2	3	4	5
19. had access to more computers in my classes	1	2	3	4	5
20. received more technology training	1	2	3	4	5
21. had up-to-date information on best usage in my area	1	2	3	4	5
22. was given some incentive to do so	1	2	3	4	5
23. had access to the Internet in my teaching room	1	2	3	4	5
24. got more technical support	1	2	3	4	5
25. felt more comfortable with the technology itself	1	2	3	4	5
26. had access to more up-to-date equipment	1	2	3	4	5
27. had more time to learn about using technology effectively	1	2	3	4	5
28. saw a proven need for technology in my teaching area	1	2	3	4	5

On a scale of 1 – 5, where 1 is the ***Least Important (LI)*** and 5 is the ***Most Important (MI)***, which information technology issues are currently confronting you in your work:	**Least Important**				**Most Important**
29. Technical Support	1	2	3	4	5
30. Access to the Internet	1	2	3	4	5
31. Assistance with integrating technology into teaching and learning	1	2	3	4	5
32. Development of on-line courses	1	2	3	4	5
33. Replacing aging hardware/software	1	2	3	4	5

SECTION IV: POLICY FRAMEWORK

34. Are you aware that Curtin University has an Information Technology (IT) Strategic Plan?

No ❑

Yes ❑

35. Does your School/Department have an IT plan?

No ❑ ***Please GO to Question 36.***

Yes ❑ **35.1** Have you had any input into the current plan?

No ❑

Yes ❑

36. What are your personal goals regarding integrating information technology into your teaching?

____

____

____

37. In what ways can Curtin University help you achieve these goals?

____

____

____

38. I would be interested in a brief follow up interview.

No ❑

Yes ❑ I can be contacted on: Phone ______________________

Email ______________________

Thank you very much for your time and cooperation.

Tertiary Level Information Technology Survey

This survey is designed to find out how academic staff at Curtin University of Technology are using Information Technology in their teaching and learning. In this context the term Information Technology refers to *"the application of computer and communications technologies for the electronic storage and transmission of information in order to solve problems in a wide range of human endeavours"*.

Confidentiality: You can be assured that all of the information supplied will be treated in a professional and confidential manner. Your name is not essential but would be helpful for possible follow-up on a later date.

Please answer each question by placing a tick (√) in the relevant box.

1. Name (Confidential) ____________________

2. Age:
- 20 – 29 ❑
- 30 – 39 ❑
- 40 – 49 ❑
- 50 – 59 ❑
- 60 – over ❑

3. Male ❑
Female ❑

4. School/Department ____________________

5. Current Position ____________________

6. Main Teaching Subject(s) ____________________

7. How many years have you been teaching at this University?

0 – 5 years ❑ 11 – 15 years ❑
6 – 10 years ❑ 16 – over ❑

8. Are you currently employed by the University:

tenured ❑ contract ❑ sessional ❑

9. Which level of students do you teach?
(Select more than one if appropriate)
undergraduates ❑ post-graduates ❑

10. Which of the following teaching mode(s) do you utilize in your teaching?
(Select more than one if appropriate)
Lecture ❑ Workshop ❑
Tutorial ❑ Laboratory ❑

Other ____________________

11. Do you use a computer?
No ❑ ***Please GO to Question 12.***

Yes ❑ **11.1** at home ❑***circle how often*** frequently/sometimes/rarely
11.2 at work ❑***circle how often*** frequently/sometimes/rarely

12. Do you have access to the Internet?
No ❑ ***Please GO to Question 13.***

Yes ❑**12.1**at home❑***circle how often*** frequently/sometimes/rarely

12.2at work ❑ ***circle how often*** frequently/sometimes/rarely

13. Do you have access to Email?

No ❑ ***Please GO to Question 14.***

Yes ❑ **13.1** at home ❑ ***circle how often*** frequently/sometimes/rarely

13.2 at work ❑ ***circle how often*** frequently/sometimes/rarely

14. What (if any) information technology training have you received?
(Select more than one if appropriate)

None/Self Taught ❑ Specific Software Courses ❑

General Courses ❑ Integrating into teaching and learning ❑

15. Which of the following training options are you aware that Curtin University offers to its academic staff?
(Select more than one if appropriate)

Short courses ❑

All day sessions ❑

General Courses ❑

Specific Software Courses ❑

Integrating into teaching and learning ❑

Other ________________________________

16. Please indicate the type of software you: - frequently use
- expect your students to use in your course.

Place a tick (√) in the appropriate column/s.

Software *(Examples)*	To prepare for my teaching I use	During my teaching session I use	I expect my students taking my courses to use
Wordprocessing *(e.g.Word))*			
Spreadsheet *(Excel)*			
Database *(Access, Foxpro, Oracle)*			
Statistics *(SPSS, Minitab)*			
Communication - email *(Eudora, Pine)*			
Communication *(Video Conferencing)*			
Web Browsers *(Netscape, Explorer)*			
Internet Tools *(Web CT, Front Page)*			
Presentation Software *(PowerPoint)*			
Desktop Publishing *(Publisher)*			
Compilers *(Fortran, Visual Basic, C)*			
Graphics *(PhotoShop, CorelDraw)*			
CDROM's			
Courseware			
FTP (File Transfer Protocol)			
Other:			
Other:			

17. Within your School/Department in which category would you rate yourself regarding the integration of information technology into your own teaching? ***Please (√).***

Very Low (1-10%) ❑ High (51-75%) ❑

Low (11-25%) ❑ Very High (top 25%) ❑

Medium (26-50%) ❑

Please circle the number on the scale (Strongly Disagree – Strongly Agree) which reflects how strongly you feel about the following statements.

I'd be more likely to use technology in my teaching, if I:	Strongly Disagree	Disagree		Agree	Strongly Agree
18. could collaborate on using information technology with colleagues who teach in my area	1	2	3	4	5
19. had access to more computers in my classes	1	2	3	4	5
20. received more technology training	1	2	3	4	5
21. had up-to-date information on best usage in my area	1	2	3	4	5
22. was given some incentive to do so	1	2	3	4	5
23. had access to the Internet in my teaching room	1	2	3	4	5
24. got more technical support	1	2	3	4	5
25. felt more comfortable with the technology itself	1	2	3	4	5
26. had access to more up-to-date equipment	1	2	3	4	5
27. had more time to learn about using technology effectively	1	2	3	4	5
28. saw a proven need for technology in my teaching area	1	2	3	4	5

On a scale of 1 – 5, where 1 is the ***Least Important (LI)*** and 5 is the ***Most Important (MI)***, which information technology issues are currently confronting you in your work:	**Least Important**				**Most Important**
29. Technical Support	1	2	3	4	5
30. Access to the Internet	1	2	3	4	5
31. Assistance with integrating technology into teaching and learning	1	2	3	4	5
32. Development of on-line courses	1	2	3	4	5
33. Replacing aging hardware/software	1	2	3	4	5

34. Are you aware that Curtin University has an Information Technology (IT) Strategic Plan?

No ❑

Yes ❑

35. Does your School/Department have an IT plan?

No ❑ ***Please GO to Question 36.***

Yes ❑ **35.1** Have you had any input into the current plan?

No ❑

Yes ❑

36. What are your personal goals regarding integrating information technology into your teaching?

____

____

____

37. In what ways can Curtin University help you achieve these goals?

____

____

____

38. I would be interested in a brief follow up interview.

No ❑

Yes ❑ I can be contacted on: Phone ____________________

Email ____________________

Thank you very much for your time and cooperation.

Interview Schedule

Name: «Title» «First_Name» «Name» Date ________________
School: «School» Time ________________
Phone: «Phone»
Email: «Email»

IT Skills and Training

1. How would you rate your information technology (IT) skills on a scale of 1 – 5 where 1 is poor and 5 is excellent.

1 2 3 4 5

2. What is your reasoning there?

____
____
____
____
____

3. Given you didn't rate yourself excellent which specific skills would you like to improve?

____
____
____
____
____

4. How do you expect to go about improving these skills?

____
____
____
____
____

5. In the questionnaire you indicated that you had received **«Training»** training.

5a. *(Some/Much Training)*

When and what was the last training session you attended? Or

5b. *(No Training)*

How did you teach yourself to use IT?

6. Have you been able to incorporate what you learnt in that training into your teaching and learning?

7. How would you rate the IT skills of the majority of the students entering your courses.

7a. If you were forced to rate your students, using the same rating scale as before where 1 is poor and 5 is excellent, what would it be?

1 2 3 4 5

8. Which skills would you like your students to have that they don't have now?

Integrating IT

In your questionnaire you have indicated the software that you generally use:

- to prepare for your teaching ❐
- during your teaching ❐
- and the software you expect your students to use ❐

9. Can you give some specific examples of how this software is used in your units?

10. What do you see as the benefits of integrating IT into your teaching for:
Yourself

Your students

11. In the questionnaire you placed yourself in the «**Rating**» category regarding the integration of IT into your teaching and learning, why did you place yourself in this category?

12. From your observation do many of your colleagues in this school use IT in their teaching and learning?

Yes ❒
No ❒
Unsure ❒

13. What do you see as the main barriers to further uptake of IT in your school?

IT Facilities

14. Could you describe your IT facilities?
At Home

At Work

15. How would you rate the adequacy of your work facilities on a scale of 1 – 5, where 1 is poor and 5 is excellent?

1 2 3 4 5

16. Why do you rate them as such?

16a. *If 1, 2 or 3*
What would improve your situation?

17. Describe the IT facilities for the students in your school?

18. How would you rate the adequacy of these facilities on a scale of 1 – 5, where 1 is poor and 5 is excellent?

1 2 3 4 5

18a. *If 1, 2 or 3*
What would improve the situation for your students?

19. What do you do when you need IT help at work?

20. How effective is this process, on a scale of 1 – 5, where 1 is ineffective and 5 is extremely effective?

1 2 3 4 5

21. *If 1, 2 or 3*
Which strategies would you like to see in place for your school regarding IT support?

22. In your opinion how committed is your school to integrating IT into teaching and learning?
What is the evidence of this?

23. On questionnaire you said that the most important IT issues currently confronting you are: **«IT_issues»**
Could you expand on this/these?

24. You said that Curtin can help you achieve your personal goals by: **«Curtin_University_HelpQ37»**:
Could you expand on your comment?

TracIT Report

Name:

Teaching	Students	Training	IT Support	IT Facilities

Tracking Changes in IT Use

The purpose of this form is to briefly document any **changes** in your IT use and application to your teaching and learning over a month.

For example:

10. Any course changes regarding IT use,
11. Interacting with students through Email.
12. Allowing students to submit assignments electronically.
13. Using PowerPoint for lectures.
14. Providing students with the opportunity to present information using PowerPoint or other Multimedia software.
15. Using specific software to teach/emphasise a concept.
16. Include internet sites as resources.
17. Develop an on-line course.
18. Attend training session – usefulness of training.
19. Helping colleagues use IT.
20. Frustrating incidences with information technology.
21. New equipment – hardware/software.

You may wish to use an electronic, hard copy, or even an audio recording of the Tracking Changes in IT Use Form. Please note these entries will be a valuable contribution to your teaching portfolio, which I will happily present to you in an organised electronic format for your future use.

Once again I would like to thank you very much for assisting in this study and I appreciate and value your contribution. For any queries or concerns please contact:

Lina Macchiusi
Curtin University of Technology
Faculty of Education
501.108: 9266 2169
L.Macchiusi@educ.curtin.edu.au

,12/10/99 2:09 PM +0800,Changes in IT Use 1

To:
From: Lina Macchiusi <L.Macchiusi@educ.curtin.edu.au>
Subject: Changes in IT Use
Cc:
Bcc:
X-Attachments:

Hi

Hope you are well. This message is a gentle reminder.

Instead of sending an attachment I thought it might be easier for you to simply reply to this message. Remember if things haven't changed simply return this message as is. If some things have changed the headings are as follows:

Teaching:

Students:

Training:

IT Support:

IT Facilities:

Thanks again for your time - have a good month! :)

,7/9/99 11:30 AM +0800,Changes in IT Use Form 1

To
From: Lina Macchiusi <L.Macchiusi@educ.curtin.edu.au>
Subject: Changes in IT Use Form
Cc:
Bcc:
X-Attachments: Changes in IT Use (6.0/95)

Hi

Hope the semester is being kind to you. Just a reminder about the Changes in IT Use Form. I don't want this to be a chore for you - some brief comments if there have been any changes, otherwise return the form as is.

Many thanks

,12/10/99 2:09 PM +0800,Changes in IT Use 1

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From: Lina Macchiusi <L.Macchiusi@educ.curtin.edu.au>
Subject: Changes in IT Use
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Teaching:

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Many thanks

Tracking Changes in IT Use

The purpose of this form is to briefly document any **changes** in your IT use and application to your teaching and learning over a month.

For example:

8. Any course changes regarding IT use,
9. Interacting with students through Email.
10. Allowing students to submit assignments electronically.
11. Using PowerPoint for lectures.
12. Providing students with the opportunity to present information using PowerPoint or other Multimedia software.
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Once again I would like to thank you very much for assisting in this study and I appreciate and value your contribution. For any queries or concerns please contact:

Lina Macchiusi
Curtin University of Technology
Faculty of Education
501.108: 9266 2169
L.Macchiusi@educ.curtin.edu.au

March 9, 1999

Professor Ian Reid
Deputy Vice Chancellor of Teaching & Learning
Curtin University of Technology

Dear Professor Reid,

Please find enclosed my research proposal that has been recently accepted for candidacy, titled, *Implementing Innovative Information Technology: Towards the Transformation of a University.* You may recall I spoke with you prior to receiving my scholarship about the major thrust of my research. At the time you also shared interest and concern regarding the same issues I proposed to raise in my study. I am now writing to you to inform you of my progress, as stated in my proposal concerning ethical issue, and to confirm your support for the study.

I am about to embark on the initial data collection, which will involve distributing a survey instrument (refined after a pilot study in other universities) issued to teaching staff at Curtin University of Technology. The purpose of this survey will be to establish baseline data about the teaching staff at Curtin University with regards to their use of information technology in their teaching and learning. The survey data will also identify individual and group profiles of information technology attitude, awareness and uptake, and from this information a stratified sample will be selected for in-depth case study. Teaching staff will have the choice of completing the survey via the Web, email (as an attachment), or a hard copy.

At this point I am about to approach each Head of School to obtain permission to approach their staff. In turn I will then approach individual staff. Clearly the support of each Head of School is vital for this data collection phase and I feel that with your support this permission may be more forthcoming.

I include a copy of this first survey instrument for your perusal.

Regards,

Lina Macchiusi
PhD Student
Faculty of Education
Curtin University of Technology
501.108
L.Macchiusi@educ.curtin.edu.au

Office of Teaching and Learning
Professor Ian Reid
Deputy Vice-Chancellor

curtin
University of Technology
Western Australia

GPO Box U 1987
Perth 6845
Western Australia

Tel (08) 9266 4222
Fax (08) 9266 4166

International
Tel +61 8 9266 4222
Fax +61 8 9266 4166

Email
ianreid@otl.curtin.edu.au

11 March 1999

TO WHOM IT MAY CONCERN:

I am please to lend my support to Lina Macchiusi's request for access to Curtin staff in connection with her data-gathering for her doctoral project on "Implementing Innovative Information Technology".

While supervised through the Faculty of Education, this project is being carried out with the endorsement of the Office of Teaching & Learning. I anticipate that the eventual findings will be useful to the University in general.

Professor Ian Reid
Deputy Vice-Chancellor
Teaching & Learning

March 23rd, 1999

Curtin University of Technology
Bentley Campus

Dear ,

I am currently a PhD scholarship (APAWS) holder and staff member in the Faculty of Education at Curtin University of Technology. The title of my PhD study is *Implementing Innovative Information Technology: Towards the Transformation of a University* (abstract attached).

I am about to embark on a survey of all teaching staff at Curtin University. The purpose of this survey will be to establish baseline data about the teaching staff at the University with regard to their use of information technology in their teaching and learning. The instrument (see attached) took only 5-10 minutes to complete in recent trials and staff will be given the choice to respond on an electronic (via the Web) or hardcopy version of the questionnaire.

Please find attached a letter from Professor Ian Reid (Deputy Vice Chancellor of the Office of Teaching and Learning) acknowledging the need for such a study at Curtin University of Technology and his endorsement. I am writing to notify you that within the next few weeks I will be sending out the survey instrument to your teaching staff and I hope that you are able to support such a study in your school. Please don't hesitate to contact me if you have any queries.

Many thanks in anticipation of your support.

Yours Sincerely,

Lina Macchiusi
Faculty of Education,
Curtin University of Technology
501.108; Phone: 9266 2169
Email: L.Macchiusi@educ.curtin.edu.au

March 30th, 1999

Dear Colleague,

I am currently a PhD scholarship (APAWS) holder and staff member in the Faculty of Education at Curtin University of Technology. The title of my study is *Implementing Innovative Information Technology: Towards the Transformation of a University.*

I am about to embark on a survey of all teaching staff at Curtin University. The survey is designed to find out how teaching staff at this University are using Information Technology in their teaching and learning. In this context the term Information Technology means *"the application of computer and communications technologies for the electronic storage and transmission of information in order to solve problems in a wide range of human endeavours"* (Curtin IT Strategic Plan, 19991). This is where you come into the picture. I really need your help to complete and return the survey. The instrument took only 5-10 minutes to complete in recent trials. If you wish you may prefer to complete an electronic version to be found on the Web site (http://www.iinet.net.au/~humbert/survey.html).

You can be assured that all the information supplied will be treated in a professional and confidential manner. Your name is not essential to the study but would be helpful for possible follow-up at a later date.

My study will depend on people like yourself completing and returning the survey. Please note that there are no right or wrong answers only a description of your situation and your views. I thank you very much in anticipation of your support.

Yours sincerely,

Lina Macchiusi
Faculty of Education,
Curtin University of Technology
501.108; Phone: 9266 2169
Email: L.Macchiusi@educ.curtin.edu.au

May 31st, 1999

Dear Bob,

As you aware from my letter of the 29th March, I am currently a PhD scholarship (APAWS) holder and staff member in the Faculty of Education at Curtin University of Technology working on a PhD thesis concerning Innovative Information Technology at Curtin University.

No, this isn't deja vu! You have read a similar letter before and seen the accompanying questionnaire. I have received an excellent response from many schools however I would really like a greater response from your School. Whether you are using information technology or not I would really like to hear from you. Some people have chosen to respond anonymously, and if you are one of them please allow me to take this opportunity to thank you very much and request that you please ignore this further plea.

As before, if you wish you may prefer to complete an electronic version to be found on the Web site (www.iinet.net.au/~humbert/survey.html).

You can be assured that all the information supplied will be treated in a professional and confidential manner. Your name is not essential to the study but would be helpful for possible follow-up at a later date.

I have already received many valuable contributions, however I would greatly appreciate YOUR contribution. My study will totally depend on people like yourself completing and returning the survey. If you aren't currently in a teaching role could you please return the uncompleted survey. I thank you very much in anticipation of your support.

Yours sincerely,

Lina Macchiusi
Faculty of Education,
Curtin University of Technology
501.108; Phone: 9266 2169
Email: L.Macchiusi@educ.curtin.edu.au

«Title» «Name»
«School»
Curtin University of Technology

13th July, 1999

Dear «First_Name»

Thank you very much for completing my Curtin University Technology Survey and returning it so promptly. There was an excellent response, indicating that the academic staff at Curtin University are genuinely concerned about the Information Technology issues pertaining to their teaching and learning.

I am now at the second phase of data collection and as you may remember you kindly agreed to a brief interview. This note is to advise you that I will be calling you within a few days to organise an appropriate time for us to meet. I thought this may be an ideal time prior to the commencement of second semester before we all need to get back to teaching. The interview will only take about 20 minutes and I am happy to send you a copy of the questions prior to the interview if you so wish.

Yours truly,

Lina Macchiusi
Curtin University of Technology
Faculty of Education
501:108; Phone: 9266 2169
Email: L.Macchiusi@educ.curtin.edu.au

Confidentiality & Permission Statement

The interviewee acknowledges that the researcher has guaranteed the confidentiality and anonymity of all information provided. This information has been given voluntarily.

Name: «Title» «First_Name» «Name»
«School»

Signature: ___________________________

Date: ___________________________

CODING STRUCTURE - CUIT survey

SECTION 1: DEMOGRAPHICS

1. Name (Optional) ID No Allocated

2. Age:
- 20 – 29 ❑ 1
- 30 – 39 ❑ 2
- 40 – 49 ❑ 3
- 50 – 59 ❑ 4
- 60 – over ❑ 5

3.
- Male ❑ 1
- Female ❑ 2

4. School/Department ______________________________

Anonymous	1
Curtin Business School	2
Engineering & Science	3
Health Science	4
Humanities	5
Kalgoorlie	6
Muresk	7

5. Current Position ______________________________

Anonymous	1
Senior Research Fellow	2
Associate Lecturer	3
Lecturer	4
Senior Lecturer	5
Associate Professor	6
Professor	7

6. Main Teaching Subject(s) Not Coded Numerically

7. How many years have you been teaching at this University?

0 – 5 years ❑ 1 11 – 15 years ❑ 3

6 – 10 years ❑ 2 16 – over ❑ 4

8. Are you currently employed by the University:

tenured ❑ 1 contract ❑ 2 sessional ❑ 3

9. Which level of students do you teach? ***(Select more than one if appropriate)***

undergraduates ❑ 1 post-graduates ❑ 2 Both 3

10. Which of the following teaching mode(s) do you utilize in your teaching?
(Select more than one if appropriate)

Lecture	❑ 1	Workshop	❑ 3
Tutorial	❑ 2	Laboratory	❑ 4

Other ______________________________ 5

SECTION 11: TECHNOLOGY ACCESS

11. Do you use a computer?
No ❑ 1 ***Please GO to Question 12.***

Yes ❑ 2
11.1 at home ❑ 1 ***circle how often*** frequently 1/sometimes 2/rarely 3
11.2 at work ❑ 2 ***circle how often*** frequently 1/sometimes 2/rarely 3

12. Do you have access to the Internet?
No ❑ 1 ***Please GO to Question 13.***

Yes ❑ 2
12.1 at home ❑ 1 ***circle how often used*** frequently1sometimes2rarely 3
12.2 at work ❑ 2 ***circle how often used*** frequently1sometimes2rarely 3

13. Do you have access to Email?
No ❑ 1 ***Please GO to Question 14.***
Yes ❑ 2
13.1 at home ❑ 1 ***circle how often used*** frequently1sometimes2rarely 3
13.2 at work ❑ 2 ***circle how often used*** frequently1sometimes2rarely 3

SECTION III: TRAINING

14. What (if any) information technology training have you received?
(Select more than one if appropriate)

None/Self Taught	❑	1
General Courses	❑	2
Specific Software Courses	❑	3
Integrating into teaching and learning	❑	4

Other ____ 5

15. Which of the following training options are you aware that Curtin University offers its academic staff?
(Select more than one if appropriate)

Short courses	❑ 1
All day sessions	❑ 2
General Courses	❑ 3
Specific Software Courses	❑ 4
Integrating into teaching and learning	❑ 5

Other __________________________________ 6

SECTION IV: INFORMATION TECHNOLOGY IN TEACHING & LEARNING

16. Within your School/Department to what degree do you rate yourself regarding the integration of information technology into your teaching?

Very Low (1-10%) ❑ 1 ***Please (√) only one response.***
Low (11-25%) ❑ 2
Medium (26-50%) ❑ 3
High (51-75%) ❑ 4
Very High (top 25%) ❑ 5

17. Please indicate the type of software you: - frequently use

- expect your students to use in your course.

Place a tick (√) in the appropriate column/s.

Software *(Examples)*	To prepare for my teaching I use	During my teaching session I use	I expect my students taking my courses to use
17.1 Wordprocessing *(e.g.Word))*	1	2	3
17.2 Spreadsheet *(Excel)*	1	2	3
17.3 Database *(Access, Foxpro, Oracle)*	1	2	3
17.4 Statistics *(SPSS, Minitab)*	1	2	3
17.5 Communication - email *(Eudora, Pine)*	1	2	3
17.6 Communication *(Video Conferencing)*	1	2	3
17.7 Web Browsers *(Netscape, Explorer)*	1	2	3
17.8 Internet Tools *(Web CT, Front Page)*	1	2	3
17.9 Presentation Software *(PowerPoint)*	1	2	3
17.10 Desktop Publishing *(Publisher)*	1	2	3
17.11 Compilers *(Fortran, Visual Basic, C)*	1	2	3
17.12 Graphics *(PhotoShop, CorelDraw)*	1	2	3
17.13 CDROM's	1	2	3
17.14 Courseware	1	2	3
17.15 FTP (File Transfer Protocol)	1	2	3
17.16 Other:	1	2	3

Please circle the number on the scale (Strongly Disagree – Strongly Agree) which reflects how strongly you feel about the following statements.

I'd be more likely to use technology in my teaching, if I:	Strongly Disagree	Disagree		Agree	Strongly Agree
18. could collaborate on using information technology with colleagues who teach in my area	1	2	3	4	5
19. had access to more computers in my classes	1	2	3	4	5
20. received more technology training	1	2	3	4	5
21. had up-to-date information on best usage in my area	1	2	3	4	5
22. was given some incentive to do so	1	2	3	4	5
23. had access to the Internet in my teaching room	1	2	3	4	5
24. got more technical support	1	2	3	4	5
25. felt more comfortable with the technology itself	1	2	3	4	5
26. had access to more up-to-date equipment	1	2	3	4	5
27. had more time to learn about using technology effectively	1	2	3	4	5
28. saw a proven need for technology in my teaching area	1	2	3	4	5

On a scale of 1 – 5, where 1 is the ***Least Important (LI)*** and 5 is the ***Most Important (MI)***, which information technology issues are currently confronting you in your work:	**Least Important**				**Most Important**
29. Technical Support	1	2	3	4	5
30. Access to the Internet	1	2	3	4	5
31. Assistance with integrating technology into teaching and learning	1	2	3	4	5
32. Development of on-line courses	1	2	3	4	5
33. Replacing aging hardware/software	1	2	3	4	5

SECTION IV: POLICY FRAMEWORK

34. Are you aware that Curtin University has an Information Technology (IT) Strategic Plan?

No ❑ 1

Yes ❑ 2

35. Does your School/Department have an IT plan?

No ❑ 1 ***Please GO to Question 36.***

Yes ❑ 2 **35.1** Have you had any input into the current plan?

No ❑ 1

Yes ❑ 2

36. What are your personal goals regarding integrating information technology into your teaching?

Remain up to date	1
Encourage/help others to become involved in IT	2
Provide relevant experiences to the outside world/profession	3
Develop high quality on-line material	4
Attend more training	5
Use technology appropriately and effectively with students	6
Access appropriate information on the net	7
Integrate technology throughout units	8
Develop/improve appropriate skills	9
Use PowerPoint to enhance lectures	10
Access appropriate equipment	11
Use WebCT	12
Time	13
Use Spreadsheets/databases	14
Develop/use CAL software	15
Develop IT skills/concepts in students	16
Other	17

37. In what ways can Curtin University help you achieve these goals?

38. I would be interested in a brief follow up interview.

No ❑ 1

Yes ❑ 2 I can be contacted on: Phone ___________________________

Email ___________________________

Thank you very much for your time and cooperation.

CODING STRUCTURE - Interview

Q 1 - How would you rate your IT skills on a scale of 1 - 5 where 1 is poor and 5 is excellent.

Code	Category
1	1 (very low)
2	1 - 2
3	2 (low)
4	2 - 3
5	3 (medium)
6	3 - 4
7	4 (high)
8	4 - 5
9	5 (very high)

Q 2 - What is your reasoning there?

Code	Category
1	Limited skills
2	Adequate skills
3	Wide Range of skills
4	Awareness of the skills they don't have
5	formal training
6	self taught
7	unfamiliar with IT
8	level of IT use
9	Compared to others
10	Level of Interest

Q 3 - Given you didn't rate yourself excellent which specific skills would you like to improve?

Code	Category
0	no response
1	PowerPoint
2	Word Processing
3	Internet use/Web CT
4	Creating Web Pages
5	Excel
6	Endnote
7	Databases
8	Graphic Packages
9	Things that I don't know
10	Windows Environment

Q 4 - How will you improve?

Code	Category
0	no response
1	Short courses - when required
2	Courses - non teaching time
3	Computing Centre
5	Computing person
6	Ask colleagues
7	Practice - play
8	Manuals/Books
9	Time
10	Leadership/ commitment

Q 5a - When and what was the last training session you attended?

Code	Category
0	no response
1	Web CT
2	Windows
3	Internet
4	Introduction
5	Word
6	Email
7	Formal
8	Endnote
9	Self training practice
10	PowerPoint
11	Library Databases
12	Short Courses
13	Student One

Q 5b - No Training/ How did you teach yourself to use IT?

Code	Category
0	no response
1	Worked things out myself
2	Other People
3	Books/manuals
4	Time
5	Interest

Q 6 - Have you been able to incorporate what you learnt in that training session into your teaching & learning?

Code	Category
0	no response
1	No
2	No time
3	Restricted by equipment
4	Yes

Q 7 - How would you rate the skills of the majority of the students entering your courses?

Code	Category
1	below 1
2	very low 1
3	1 - 2
4	low 2
5	2 - 3
6	average 3
7	3 - 4
8	high 4
9	4 - 5
10	very high 5
12	don't know
13	varied

Q 8 - Which skills would you like your students to have that they do not have now?

Code	Category
0	no response
1	Wordprocessing
2	Spreadsheets
3	Email
4	PowerPoint
5	Basic programming
6	Industry Standard Design Software
7	Access to hardware
8	Web based learning/development
9	Windows Operating System
10	Generic Skills -managing data, installing software, problem solving
11	IT Searching
12	Graphics Calculator

Q 9 - Can you give some specific examples of how this software is used in your units?

Code	Category
1	Wordprocessing
2	Spreadsheets
3	Email
4	Web Browsers
5	Presentation
6	Graphics
7	Web CT
8	Web publishing
9	DTP
10	VAX
11	Statistics
12	Databases
13	CD ROMS
14	compilers CAL
15	FTP
16	Video Conference
17	Messaging software

Q 10a - What do you see as the benefits of integrating IT into your teaching for Yourself?

Code	Category
0	no response
1	Student Expectations
2	More Professional
3	Easy access to information/ communication
4	motivating
5	efficient
6	Flexible
7	Essentail
8	Relevance to society
9	no benefits
10	effective

Q 10b - What do you see as the benefits of integrating IT into your teaching for your students.

Code	Category
0	no response
1	Enhances Services
2	More Professional
3	Easy access to information/ communication
4	Motivating
5	Effective
6	Easier to read
7	Increases Confidence
8	Relevance to society
9	Integral & embedded
10	Flexibility

Q 11 - Integration Rating

Code	Category
0	no response
1	below 1
2	very low 1
3	1 - 2
4	low 2
5	2 - 3
6	average 3
7	3 - 4
8	high 4
9	4 - 5
10	very high 5
11	no response

Q 12 - From your observation do many of your colleagues in this school use IT in their teaching and learning?

Code	Category
1	yes
2	no
3	don't know
4	varies
5	improving
6	think so
7	minority
8	slow
9	not much

Q 13 - What do you see as the main barriers to further uptake of IT in your school?

Code	Category
0	no response
1	attitude
2	support
3	resources
4	reward
5	time
6	skills
7	policy/leadership

Q 14a - IT Facilities at home

Code	Category
1	No computer
2	No internet access
3	Standard equipment
4	Curtin Remote access
5	Internet access
6	Laptop
7	Scanner
8	Fax
9	Digital camera
10	Computer network
12	More than one computer
13	Computer
14	Colour printer

Q 14b - IT Facilites at work

Code	Category
1	Computer
2	Networked printer
3	Printer
4	Colour printer
5	Internet access
6	Laptop
7	Scanner
8	Overhead projector
9	Digital camera
10	CD Burner
11	Graphic Image Workstation
12	Nothing
13	Standard
14	More than one computer

Q15 - How would you rate the adequacy of your work facilities on a scale of

1 - 5?

Code	Category
0	no response
1	below 1
2	very low 1
3	1 - 2
4	low 2
5	2 - 3
6	average 3
7	3 - 4
8	high 4
9	4 - 5
10	very high 5
11	no response

Q 16 -Why do you rate them such?

Code	Category
0	no response
1	no printer
2	scanner
3	purchase own equipment
4	lack of policy
5	the equipment is adequate
6	equipment not available in classrooms
7	many issues need to be addressed
8	the equipment is inadequate

Q16a - What would improve your situation?

Code	Category
0	No response
1	Equipment - printer, computer, scanner,
2	Effective Infrastructure
3	Organisation of equipment
4	Commitment from leaders through policy
5	Staff training

Q 17 - Describe the IT Facilities for the students in your school.

Code	Category
1	computer lab
2	no lab
3	area for post grads
4	laptops
5	printer
6	swipe cards
7	fine-no complaints
8	I've heard grumbles
10	excellent
11	unsure
12	lab assistant
13	scanner
14	digital camera
15	camera/video

Q 18 - How would you rate the adequacy of these facilities on a scale of 1 - 5?.

Code	Category
0	no response
1	below 1
2	very low 1
3	1 - 2
4	low 2
5	2 - 3
6	average 3
7	3 - 4
8	high 4
9	4 - 5
10	very high 5
11	unable to

Q 18a - What would improve the situation for your students.

Code	Category
0	no response
1	more computers
2	reasonable quality computers
3	night access to labs
4	upgrades hardware/software
5	not an issue

Q 19 - What do you do when you need IT help at work?

Code	Category
1	Solve the problem myself
2	Colleague
3	Lab technician
4	IT Officer - PT (School/Dept)
5	IT Officer - FT (School/Dept)
6	2 IT Officers - FT (School/Dept)
7	IT Help Desk (team) (School)
8	Web CT Help Desk (team) (School)
9	IT Help Desk (Division)
10	Shared Facilities
11	Computer systems/network administrator
12	Computing Centre
13	Software manager

Q 20 - How effective is this process, on a scale of 1 - 5?

Code	Category
0	no response
1	below 1
2	very low 1
3	1 - 2
4	low 2
5	2 - 3
6	average 3
7	3 - 4
8	high 4
9	4 - 5
10	very high 5
11	no response
12	varies 1 - 4
13	university 1

Q 21 - Which strategies would you like to see in place for your school regarding IT support?

Code	Category
0	no response
1	Full time support in School
2	Dedicated technical support for students working on line
3	Support team with varied specialist skills
4	Help Desk
5	Reliable Equipment
6	Training
7	Re-open help desk
8	Work in collaboration with other schools

Q 22 - In your opinion how committed is your school to integrating IT into teaching and learning?

Code	Category
1	Unknown
2	No
3	Encouraged, however
4	Yes
5	Mixed
6	Developing

Q 23 - IT Concerns - linked to the survey data

Code	Category
0	no response
1	Technical support
2	Software support
3	Time Release
4	Integrating IT
5	On-line Courses
6	IT Review
7	Standard IT Equipment
8	Recognition
9	Critical use of IT
10	Equipment
11	Flexible IT Policy
12	Training
13	Internet access
14	Research vs Teaching
15	Access to expertise
16	Evaluate on-line courses

Q24 - Curtin University can help by:

Code	Category
1	Provide IT expertise
2	Training
3	Recognition
4	Student tech support
5	Evaluate effectiveness of on-line units
6	Provide time
7	Provide encouragement
8	Space for equipment
9	Long term plan & commitments (funding)
10	Administration staff role
11	Danger to assume IT is the panacea
12	Resources & support are in place
13	Adequate equipment
14	Policy

Individual Profile ID 375

Position: ***
Department: ***
Division: ***

Age: ***
Years at the University: ***

Teaching Mode: Lecture + Workshop + Tutorial + Laboratory + Web

Access/Use: *** uses the computer frequently at home and at work. He also has internet and email access at home and at work. He did not identify the frequency of use.

Training: He has not had any training and is totally self taught.

Technology Integration Rating: medium (3), skill 4
*** identified using the following software to prepare for his teaching: database, communication, web browsers, internet tools, presentation, DTP and FTP. He expects his students to use many of the software packages he uses himself: word processing, spreadsheet, communication, web browsers, internet tools and presentation.

He is one of the few of the case studies who identified this software use during his teaching sessions: web browsers, internet tools, and presentation software. The interview data confirms how he applies the software identified in his teaching and learning.

*** has rated himself too low and has shown through his interview data that he is an innovator and his University rating would be very high (5).

Conerns/Issues:
*** strongly agreed that he would use more technology in his teaching if he was given some incentive to do so, got more technical support (in the interview he rated his technical support 5 – *** *has got a wonderful system. They are the best in the University*) and had more time to learn. Other issues he agreed with were collaboration with colleagues, access to computer in classes, more training, and *saw a proven need for technology.* This attitude is also reflected through out the interview data, but especially in his response to the benefits of integrating IT into teaching: *"None. It takes more time, it creates more work. It would be far easier for me to just ignore it and do what most people do and just do lectures and concentrate on other things. There is no benefit whatsoever." Q10*

The main issues confronting him were assistance with integrating technology into T & L and development of on-line courses.

Personal Goals: *Develop on-line course eventually!*

Curtin: Give me time – *increase time commitment. Not decrease it – I just do not have the time.* This is also emphasised in the interview data Q24

TracIT:

In August 99 ID 375 implemented an Online search facility of the data base of references he had developed for overseas students only. He created this because they didn't have access to the Curtin Library. He also maintained, made additions and modifications to the Web resources he provides for his students. ID 375 was also working on developing an online marking system. During this time there was an increased use of email with his overseas and in house students, for discussions and assignment topic approval. In this report ID 375 noted some of the technical problems he had encountered: unable to access email while teaching in Singapore as an incorrect link had been inserted by the Internet Support Group and wasn't able to run his software (***) on his desktop machine. During this time he assisted colleagues in a variety of ways: set up and learn how to transfer files via the internet using FTP, setting up Excel spreadsheets, format Word documents, and develop access data base for HOS to record information on overseas students, their projects and supervisors.

During September 99 ID 375 marked Web pages which had been developed by students. The structure of the IT support changed and one person left, leaving a very high work load for the others, hence a particular piece of software which was required wasn't installed on time. This lead ID 375 to rearrange the unit and marking, as well as the assessment process.

October 99 – ID 375 created a new links page for a class and had to familiarise a new employee of the internet support group with all of his projects. ID 375 noted that the change of the IT support structure had caused some delays as the new employees were getting settled and appointments were constantly getting broken. He expressed his frustration about his computer which kept crashing and that the technicians weren't able to identify the problem. While he was marking student web pages he also noted that some of the overseas students had sent disks with viruses. One of the items he flagged as a concern, was the issue of upgrading software. *"Upgrading software to more recent versions is becoming a problem – the standard web editors are not that good – so the more powerful ones I use are not supported by IT, and upgrading them is costly".*

January 2000 – This report clearly indicated how frustrated ID 375 was with the lack of time he had and the lack of support he was receiving. He notes that the IT support try however they are overwhelmed by the amount of work they need to do. *"If you are pushing the technology then it gets worse and there is insufficient support".* He also comments that he had helped colleagues with IT and that it would be the last time that he did because it was too time consuming and there was no reward. He also expressed his frustration with the amount of help he had to give to his students over the last summer semester in order for them to access his Web Page ID 375 noted that he hadn't attended any training sessions because he didn't have the time.

ID 375 noted that he had redesigned his Web pages but doubted that he would be using them much longer. He states that this would likely be the last semester in which he would attempt to use web based material. He said it was *"too stressful, time consuming, not worth the effort and there is inadequate support at all levels".*

These last comments sum up his sheer frustration with Web based material:
I have decided that the use of technology is not worth the effort - my work load and stress levels will be reduced and my well being will be enhanced by not using the technology any more. So unless things change I will not be using any technology in any of my units from second semester 2000.

Whilst I have been trying to use the web for some time other colleagues have ignored it and have been able to concentrate on other areas that promote their career or are rewarded - the opportunity cost has proved to be far too great for me to continue on this route. So my plan is to use the web this semester then go back to traditional methods for second semester. January 2000.

March/April 2000 – ID 375 was involved in the development of an Online Journal, with interactive articles. The first edition would be in September/October. He was conducting a survey of some students regarding their use of the Web pages. He taught himself how to use Net fusion, Allaire Web Editor; and Dream weaver. This report indicates how the new IT support structure was to operate. He notes that you now needed to go through a few committees to get a project approved. He comments *"basically bureaucratic response that means I I have what looks like a 2 to 3 month wait to get something approved – useless for a fast paced environment".*

July 2000 – The interactive peer marking project had been stopped because the software was too complex to implement. It had been withdrawn from the market. ID 375 still had all of his units linked to his home page. He also mentioned that Web CT wasn't capable of ******

The interview data and the TracIT reports demonstrate some innovative projects ID 375 had attempted, some were successful and others not so successful. This data also revealed his high level of frustration with the lack of time he had to accomplish tasks and the lack of support he was given. Even though he rated his support structure 5, in the end it still wasn't enough. He ended up giving up in sheer frustration – there were no rewards, incentives and recognition. He questioned the whole use of IT and he would be like his colleagues and use the tradition methods of teaching in second semester. He made these comments in January 2000 after teaching through the summer break - which reflects a heavy work load. In July he doesn't make any mention of how he is using technology in his teaching and learning. He simply indicated his Web Page which have all of his units linked to this one page they cover the unit outlines.

ID 375's university rating would be a 5.

IT Review Comments – TracIT Reports

ID No. & Month		IT Review Comments
ID 252 August 99	Centralising ICT Support	*Centralising IT is currently considered very damaging to **** which has some highly specialised needs in this area*
ID 252 September 99		*- Divisional changes mean that we may end up with better facilities. It appears that our computer-assisted language learning lab will be networked in October. This adds a new dimension to language teaching. We are also working on an IT committee for our new school. It's early stages only.*
ID 375 October 99		*Change of structure to IT is causing a bit of a hold up as the new employees get settled in - and the appointments keep getting broken }:-(*
ID 218 June 2000		*This has gone backwards in our School with one IT support staff going on long service leave at short notice and another finding a MUCH better deal in another School! I'm not sure what we are going to do here. We are looking to employing a part timer to fill in gaps but we are in a real pickle because of funding.*
ID 218 July 2000		On the IT support side we have had a further downgrade of support. We have a temporary guy helping out for 3 months but then I fear we will have to draw our support from a Divisional Team. I fear the worst but we'll hopefully cross that bridge when we come to it.
ID 241 July 2000		*Out technician still available in the School but with the move to Divisional IT support we will lose out substantially (have had some experience of this over past month when our technician on leave) with staff not knowing how to satisfy my request and taking a number of days to deal with an issue. Management overkill strikes again!*
ID 181 July 2000		*I recently had to use the IT support provided within the University, I have heard mixed reports however it is fairly new. I did get a quick response, but had a few problems.**** Still the biggest problem seems to be getting computers fixed - I got a quick response from the IT help line and someone came straight out, however I ended up not having a computer for a long time, due to a mistake that was made. I realize mistakes happen, but it is really hard to do your work without a computer now.*
ID 251 July 2000		*We have not yet had any feedback on the Division IT support plan and when it will be implemented. They do however want to meet with our IT committee soon.*
ID 237 July2000		*Up to now I've got the support* *I have needed as before though the new queuing system being introduced might slow down the service - time will tell.*
ID 375 October 99	SOE	*Upgrading software to more recent versions is becoming a problem - the standard web editors are not that good - so the more powerful ones I use are not supported by IT, and upgrading them is costly.*
ID 15 February 2000		*Seems to be a Mac phobia often when I want something done I get a response – oh you're a Mac user or oh yes you're a Mac. So that when things are changed the fact that people a Macs doesn't come into consideration or affect the changes. So that is slightly annoying – what we need is someone who knows about Macs and says oh yes, you can do this, this and this.*

ID 217 June 2000		*The main thing this month has been the change-over of computers to the new leased SOE ones. They look good and the change-over went fairly smoothly except that the day chosen was the last day that exam results were due. As we were without computing facilities for more than a day, it was a bit irritating. Are we depending too much on computers with our work?. When they go down everything seems to stop.*
ID 335 July 2000		*My main criticism is that our School with others in *** were forced to change to inferior ACER computers from AppleMacs. The reason given was to to make it more efficient for IT to service the machines. No thought was given to the productivity of the academic staff. My research has shown high levels of dissatisfaction from those academics who were forced to make the change.*
ID 119 July 2000	**Corporate Leasing of Equipment**	*This new computer Leasing" arrangement is not going to work, especially when it comes to acquiring computers for simple **** Projects which are used to interface with hardware, such as mobile robots, control systems, sensors, motors, and other types of automation hardware...* *Talk to **** the course coordinator for Mechantronics Engineering, and he has a lot to say about the "standardization" rules being enforced throughout this campus, as high-end "networked" computers are too expensive for purchasing in large numbers, and all their features are not necessary.*
ID 252 March 2000		*The move to leasing is good, but slowness of planning processes and lack of consultation with the staff using the computer labs etc is a worry.*
ID 251 March 2000		*A major barrier to IT use in our School has suddenly appeared on the horizon. It appears the University's desire to make business connections with the community may result in a monopoly-like situation that increases the financial burden on the Schools while removing their autonomy. The computer leasing policy will freeze out Mac users, cost the School twice as much as our current budget for IT while forcing us to lease rather than purchase. This will have significant implications for part time staff and students, particularly graduate students. Currently our approach is to replace full time staff computers and to move the old computers down the line to part time staff and graduate students. This is done frequently and as a result we have been able to maintain a high level of usability in terms of hardware in these areas. The leasing model will force us to require staff and graduate students to share significantly fewer computers. We are currently waiting for the dust to settle on this issue.*
ID 15 June 2000	**Planning**	*Another issues was the debate regarding the refurbishment of building 501 – and placing the computer facilities here. It was quite interesting to have the debate and listen to people from the sort of IT background saying, try to look to the future and the sort of infrastructure we need to be able to support our teaching and research in the future and whether anything will come of that we will have to wait and see the report.*

Attitude toward Curtin University Training Options (Interview)

ID	Comment
ID 237 Q 3 Q 4	*I am aware of facilities that are there that I don't make use of and I'm just too lazy to try and use them.* *I really should take the trouble to go and get some training. But every time I look at the courses that are advertised. Particularly the university courses. They are in what I regard as work time. So its cutting into things I would do. I've considered going and doing it in the evening, to TAFE, ... but again I tend not to get around to doing that. But I should because its very frustrating to learn on your own*
ID 214 Q 4	*I don't rate them high enough for me to warrant me doing it because I would love to use PowerPoint, I would like to be using PowerPoint presentations but I haven't learnt how to do it and as far as I am concerned it is not that important to me to go to a course, and they are offering courses more frequently here now.*
ID 255 Q5b	*I am aware of them but I just haven't taken the time to do it. Too lazy that's what it is basically. I think that if I was more organised I could do it, they don't take that long, most of the sessions are two to three hours.*
ID 99 Q 4	*Well I mean it would be nice to say that I will go to a course but I don't have time to go to a course.*
ID245Q 5a Q24	*I think spending a whole day is a bit of a waste of time for me, I need to go two half days. By three o'clock on the day my mind is blank so I really need to do a morning session and then follow up the following week rather than do a whole day.* *to pay for my own training I think is just ridiculous.*
ID241Q 24	*I go to Canning College at least two hours a week to train myself into some of these things because these half day courses are useless to me we actually need more structure two hour a week training courses around this campus. I need to practice a bit but that is no way of learning.*
ID292 Q25	*Well there is the hardware side of things and then there is the actual how do I use these things and Curtin's answer at the moment is to run courses on the things that they have brought, but to me that is preaching to the converted already.*
ID27 Q2, Q5a	*What I've often found is you go to a course and they tell you stuff and you think that sounds cool but if you don't immediately use it then it is gone.* *I went to a word series over at tech park and did a couple of mornings there and that was fine. Yes I found that quite useful, they invariably tend to tell you more than you able to remember and then use, but what that does, the effect of that is to show you what is possible and so you hope to remember what is possible and then you think where is this possible and then you think oh yes it is possible then you find out how to do it.*
ID15 Q4	*a lot of training you go to they give you all these things and because you never need to use them at the time you forget about how to do it.*
ID375 Q5b	*Yeah I've gone to the sessions on **** and I have gone to the sessions on **** and they were terrible. Almost worse than useless. And invariably your classes tend to be at the same time as your teaching, I'm sure they do it deliberately.*
ID211 Q5a	*I've attended the odd one or two but they are always so badly run, and badly taught and they suffer from that audience problem with the levels of ability which is varied too widely.* *I have to say that that is not the case with the Student One training that I have just been undertaking, which is extremely good. But in part because the stuff that I was doing was the courses management elements and the target market was much more closely defended, but the trainer did an extremely good job.*
ID215Q 5a	*The last training was in June 99. That was an on-line delivery training workshop. WebCT, I found that was great.*
ID92 5a	*it was a very useful session held at Kalgoorlie. It was a full day.*

Comments Reflecting Teaching Initiatives & Existing Patterns

Comments Reflecting Real Change	Comments Reflecting Existing Pattern of Behaviour
I am busy trying to convert two units for Web delivery using Frontpage. We will be converting or rewriting all of our units for Web-based delivery over the next twelve months (ID241:Aug99). *I am using the Student 1 system for course planning since last we spoke. This system has, buried within it, the capacity for significant pedagogical thought / planning: many of my colleagues don't interact with data about course and unit structures in the way that allows them, conceptually, to take advantage of S1 in this manner (ID211:Jan2000).* *I now use peer marking using web pages in which the 'markers' can insert their comments (ID375:Jan2000).* *Also have done a demo lecture on CD-ROM for a grammar unit in a GradDip for Japanese English teachers (ID252:Feb2000)* *Become a Dreamweaver convert. I used to web develop exclusively using a text editor (and will still continue to do so for small tasks) but now I realize that managing large tasks requires a better management tool. Dreamweaver appears to fill that need quite well (ID218:April2000).* *Developing a CD-Rom based set of Tutorials to teach 1st year Engineering Students (ID119:July/Aug2000).*	*What I am not able to do because of lack of a portable computer and projector is to show the students the material, demonstrate what I think are the good bits and incorporate this material into the workshop sessions with the students (ID15:May2000)* *I am making a lot of use of overheads to illustrate legal aspects connected with the law of meetings. In the past I relied on a limited number of OHs but this semester I have produced a large number (ID335:March2000)* *Nothing has been organised in the field of putting material on the Web page. I am still of the opinion that my students should attend lectures and tutorials because of their often very weak background in mathematics (ID337:June2000).* *I am now thinking about getting into distance education in a bigger way using computer technology due to my experiences with WebCT and the ecircles. However I have a hard time managing so many emails that I get from students and admin. (ID255: July/August 2000)*

Comments Reflecting Changes & Existing Patterns - Students

Comments Reflecting Real Change	**Comments Reflecting Existing Pattern of Behaviour**
About 10 -15% of students could not do these. This week we have set up remedial classes to help these students. Initially we have allocated 10 hours of instruction (ID217:August1999) *I initiated the formation of the Food Science Club and act as club 'staff facilitator' I recommended students create a website for the club. They liked the idea and instead set up a communication site similar to WebCT for social, professional, and academic exchange. The site is part of a webservice called eCircle it has a chat function, email, discussion group, games, gifts virtual, a place to share files, and a list of favourite website functions. We are thinking of having a virtual club meeting on a Sunday and they thought it was a good way to keep in touch during holidays (ID255:August1999).* *I have helped more students over this last summer semester - to the point where I have had to diagnose their organisations systems problems so that they can access my units pages (ID375:Jan2000).* *Using Web-based assessment software (ID119:March2000).* *(students) Are decidedly more computer literate than last year's first year cohort. This means real change for teaching because students expect staff to be there especially in a university of technology. The change hurts when you can't put a brake on the speed (ID252:April2000).* *(developed an innovative desktop help system for students) I will tread carefully to start with because it could easily become a nuisance (ID249:June2000).*	*Students used the tests (WebCT quizzes). Some errors occurred and students complained about lateness and accuracy (ID317:August1999)* *Confirmation with students on email that assignments received and marks obtained (ID214:September 1999)* *Initially for Eco (Micro) 203 I planned not to provide lecture slides on Web, but students preferred to have this access so I did do this. I was concerned that students tend to use slides from web page as = 'lecture notes' and don't attend class (ID111:March 2000)* *Some students still ask me if I want to put the lecture notes on the Internet. I have no intention as yet to do it although I feel that the time is drawing near that it should be done (ID337:April 2000).* *Discussing graduate student work over the phone based on emailed material (ID94: May2000)* *The students enjoyed the management course online and did excellent journals and workbook exercises, plus a school scenario planning workshop (ID94:July/August 2000).* *(ID253:August1999) Encouraging students to use email to send in assignments and to communicate. I'm often out of my office and if they send an email to me it is "in my face" more and I can respond in writing and answer their whole query. If they leave messages on my voice mail I do not know the full extent of their query and when I try to return their telephone call they are often not in. Email is sent and the job is complete.*

Comments Reflecting ICT Support Changes & Existing Patterns

Comments Reflecting Real Change	**Comments Reflecting Existing Pattern of Behaviour**
We are disappointed with the divisional support, as no-one turned up to assist the lecturers set up the thin-client lab, in spite of making appointments. … The staff fear that inadequate support will not encourage confidence in the use of IT, and result in delays in implementing IT in the curriculum (ID252:August1999) *To replace the single staff member who was in charge of managing IT in the school we proposed a committee. The committee has representatives of academic and general staff. I currently chair this committee. So far the mandate has been to look at computer allocations, to evaluate and propose spending for 2000 and 2001 with the aim of upgrading our MacLab to iMacs, Implementing a standard operating environment(SOE) for all staff (standard OS, versions of software applications) and upgrading computers where necessary to ensure efficient use of the SOE (ID251:Feb2000)* *Laughable - now need to go through a few committees to get a project approved. basically a bureaucratic response that means I have what looks like a 2 to 3 month wait to get something approved - useless for a fast paced environment (ID375:April2000)* *A staff member at **** has set up an E-group called ****WebCT which I have joined. It is a mutual self-help group for those who are going to use WebCT (ID217:May2000).* *This has gone backwards in our School with one IT support staff going on long service leave at short notice and another finding a MUCH better deal in another School! I'm not sure what we are going to do here. We are looking to employ a part timer to fill in gaps but we are in a real pickle because of funding (ID218:June2000).* *Seems to be going downhill. In our area almost every machine seems to be set up differently. I can't access one computer from mine. Another staff member can't see the transfer disk, so I can't transfer files to him. Don't seem to be able to get enough priority to get this sorted out (ID25:June2000).*	*The support from colleagues is great, that is very good (ID15:October2000).* *we are actually going to appoint a .5 (I think) especially for computer/computer graphics, so that is a good thing, in this way it frees up our computer technician, who works non stop (ID181:October 1999).* *Still very limited. Our Systems Administrator is still too busy to look after all computer facilities within our school to pay a lot of attention to my personal needs. And if one would experience certain difficulties then you develop ways and means to get around these problems. Often rather exciting! (ID337:Oct1999)* *IT Support helped develop personal web page (ID111:Jan2000* *Used IT support to assist with students getting access to Web CT page (ID111:March2000).* *Have had problems installing @Risk, an Excel add-on, which our technicians haven't been able to solve yet. This has derailed its use in one of my classes so I have had to implement my contingency plan (ID217:April2000).* *Individual support is good but there are problems in peak times. (ID252:May2000)* *As usual – they are good (ID259:June2000).* *No problems in this regard (ID335:July2000)* *we have one IT school support person. Busy with staff and students so does not have much time for individual support. (ID94:July/Aug2000)*

Comments Reflecting Changes & Existing Patterns - Facilities

Comments Reflecting Real Change	**Comments Reflecting Existing Pattern of Behaviour**
We have set up a server to store meeting minutes and other Dept info. (ID218:September1999). *We have created a new 6 seat computer lab for the first time - Masters entry students (a new course). I acquired a Zip drive for large sound files. I have also acquired Claris organiser to help me with my comlex lists of things to do and other responsibilities (ID283:January2000).* *Setting up an information infrastructure: very difficult because it means changing people's routines and assumptions. This infrastructure includes: generic unit email addresses; website for exchanging information between staff; email lists for staff and students (ID211:January2000).* *A major barrier to IT use in our School has suddenly appeared on the horizon. It appears the University's desire to make business connections with the community may result in a monopoly-like situation that increases the financial burden on the Schools while removing their autonomy. The computer leasing policy will freeze out Mac users, cost the School twice as much as our current budget for IT while forcing us to lease rather than purchase (ID251:March2000).* *Campus servers upgraded. They are now more reliable and have a higher level of built-in redundancy. However the download/upload speed has not increased and this can be a hindrance to online activities (ID92:May2000).* *Trialling 'blackboard' with a view (longer term) to perhaps using a 'content supplier' for courses. BB seems to have some advantages over Web CT (ID111:July/August 2000).*	*Computing not printing much of the time (ID101:October1999).* *WebCT server is very slow. This problem needs to be addressed as wait time is excessive (ID317:October1999)* *My Machine keeps crashing, and they don't know why - makes it difficult to create web pages for a class (ID375:October1999).* *Student One package is NOT very user-friendly or intuitive for a beginner to use, and it is poorly documented, with little (if not ANY) on-line help(ID119:Jan2000).* *we need more multimedia items, I want to add sound and video but can not no sound card and no digital camera or video and if we do have them I don't know where to find them (ID255:March2000).* *projection equipment in teaching rooms is inadequate for use with new initiatives (ID283:March2000).* *The CD's and computer support material … I ordered over a year ago, they are gradually coming into the ****. I'm trying to make the students aware that they are there and to be used as resources. What I am not able to do because of lack of a portable computer and projector is to show the students the material, demonstrate what I think are the good bits and incorporate this material into the workshop sessions with the students (ID15:May2000).* *Doing programs for verbal presentations the School's laptop -more power than mine! (ID94:May2000).* *Email not working/system down frequently (ID214:June2000).*

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Teaching	Students	Training	IT Support	IT Facilities
AUGUST 99 Began using listserv or email list to communicate with the entire class concerning assignments, ideas, due dates etc. Used internet site as information resource. Students submitted work via email.	Students use email very often to arrange appointments, request notes, ask about concepts from readings. I initiated the formation of the *** Club and act as club 'staff facilitator' I recommended students create a website for the club. They liked the idea and instead set up a communication site similar to WebCT for social, professional, and academic exchange. The site is part of a webservice called eCircle it has a chat function, email, discussion group, games, gifts virtual, a place to share files, and a list of favourite website functions. We are thinking of having a virtual club meeting on a Sunday and they thought it was a good way to keep in touch during holidays. They plan to create a formal Website later.	I am starting to find this actually fun and as a good management tool for my time.	No change	No change
SEPTEMBER 99 No changes	No changes	No changes	No changes	No changes
October 99 There have been no changes. However, I have had several request for distance ed units in my field.	No changes	No changes	No changes	No changes

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Teaching	Students	Training	IT Support	IT Facilities
NOVEMBER 99 This time of year is very very busy with marking etc...not much time to do anything on the pc...although I feel the pc should make things more efficient	No changes. The only new thing would be that I had all my postgrads do a departmental seminar in powerpoint using the projector pad and powerpoint software.	No changes	No changes	No changes
JANUARY 2000 I am using Web CT this semester for a third year *** unit. That is the only new development since last semester. See ya.				
FEBRUARY 2000 No change	No change	No change	No change	No change
MARCH 2000 Teaching: started two units on Web CT. It is very time consuming creating these pages so if they want me to continue to do this...they have to make it easy for me ....so I wont have many excuses not to do it....some of the students are not used to this	Students: had to show them how to use the web, powerpoint and excel...big learning curve and many student complaints about computer access at home and printing costs	Training: none...I just read the instructions and played around until I created the web site using the tutorials provided	IT Support: excellent, answered my questions on the spot most times at the Web CT service center	IT Facilities: we need more multimedia items, i want to add sound and video but can not no sound card and no digital camera or video and if we do have them I don't know where to find them...and we only have 1 scanner

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Teaching	Students	Training	IT Support	IT Facilities
MARCH 2000 Cont'd. manner of teaching so they complained a bit...but that phase is over now.....				
APRIL 2000 No change	No change	No change	No change	No change
MAY 2000 No change	No change	No change	No change	No change
JUNE 2000 No change	No change	No change	No change	No change
JULY 2000 No real changes in July....not teaching formal lectures...only using something called an Ecircle to help me manage the labs and research students I am in charge of. I am now thinking about getting into distance education in a bigger way using computer technology due to my experiences with WebCT and the Ecircles. However I have a hard time managing so many emails that I get from students and admin. They take up lots of time....and it is difficult to prioritise them all.		No change	No change	No change
AUGUST 2000 No change	No change	No change	No change	No change

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Teaching	Students	Training	IT Support	IT Facilities
AUGUST 99 No changes	No changes	No changes	No changes	No changes
SEPTEMBER 99 No change	No changes	No changes	No changes	No changes
OCTOBER 99 No changes	No changes	No changes	No changes	No changes
NOVEMBER 99 No change	No changes	No changes	No changes	No changes
JANUARY 2000 No change	No changes	No changes	No changes	No changes
MARCH 2000 Teaching:nothing	Students: nothing	Training:none done but should really both on web/library and powerpoint	IT Support: still ok	IT Facilities:moved house and can't use modem from new address
APRIL 2000 no changes except Library offering some useful looking courses for me!	No changes	No changes	No changes	No changes
MAY 2000 STILL DONT FEEL I GET THE BEST OUT OF THINGS BUT STRUGGLE TO FIND TIME TO LEARN/DO TRAINING			No changes	No changes
JUNE 2000 nothing to report though computing support likely to be centralised on division and am not sure it will be as good as now.				

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Teaching	Students	Training	IT Support	IT Facilities
JULY 2000			I think it was due to the Review. Up to now I've got the support I have needed as before though the new queing system being introduced might slow down the service - time will tell.	
AUGUST 2000 No change Good luck with the thesis. No other changes to report.				

Teaching	Students	IT Support	IT Facilities
AUGUST 99 Now using Web CT to coordinate a 3rd year research unit which involves group work and other faculty as consultants to the groups. Students required to submit both electronic and hard copies of assignments. Web CT will allow students to access assignments submitted by other groups and thus expand their understanding of research designs. Used MS Word's mail merge feature to streamline development of a group contribution survey which was then uploaded into WebCT Tried to embed a Quicktime move into a Powerpoint presentation but on the day had to use Quicktime movie player Other frustrating experience was with MS Word chopping off half of text objects which are pasted from other programs eg Excel. Submitted an application to the Apple University Development Fund to partially fund a mulitmedia development for teaching and learning in Physiotherapy	Included some internet resources in a unit. **Training** No change	Used a 3D figure modeling program (Poser 3) to create a figure for a colleague for a journal submission.	Received a computer upgrade to a Mac Blue and White G3, also received upgrade in RAM to 128MB in order to run specific graphics intensive programs (eg Poser 3). The inclusion of a zip drive also made it easier for me to take work home to my iMac.

Studies Utilising the Diffusion of Innovation Theory

Study	Key Focus	Methodology	Findings	Links to this thesis
McNaught, Phillips, Rossiter & Winn (1999).	The adoption of computer facilitated learning resources.	Multiple case study design Semi-structured interview Focus group Sample selection based on a modified version of Rogers (1995) categories – innovators + early adopters; mainstream + later adopters; resistors. N=81	ASCILITE (N=73) members considered themselves to be in the group of innovators or early adopters. These people had developed significant projects with little support. The majority of the staff at their university were in the mainstream of ICT adoption.	Case study (five Australian universities) Sample selection – degree of adoption of new technology. Findings of particular relevance.
Geoghegan (1995)	Characteristics of adopter categories.	Identified the early adopters and mainstream users.	Early adopters: strong technology focus; visionary; experiments; takes risks; favours revolutionary change and are self sufficient. Mainstream users: problem and process focused; conservative; realistic/practical; favour evolutionary change; typically requires a great deal of technical support.	The focus of the study - identifying characteristics which reflected a particular adopter category.
Casey (1994)	Characteristics of adopter categories for school councilors.	Rogers' (1995) adopter categories.	Innovators: advanced, self-taught power users, able to author programming languages. Laggards: technophobes. Early adopters as being more mainstream than the innovators, demonstrating leadership skills by providing workshops and publications for their colleagues.	Similar to Geoghegan (1995) – common characteristics of adopter categories.
Adam & Wilson (1996)	Examined the adoption and diffusion of ICT among Australasian educators in higher education.	Mail survey – Australian and New Zealand educators. Attempted to identify: the usage of 32 technologies; specific software applications; how the students of the educators currently used ICT; whether the educators would recommend the adoption of certain resources.	Educators in the higher education sector were not using ICT to the fullest advantage in their teaching role. Almost half of the educators were unable to identify how their students were utilising ICT. In mid-1995 the educators were not planning to use ICT resources with their students in the near future.	Australian higher education sector Adoption and diffusion of ICT.

Continued: Studies Utilising the Diffusion of Innovation Theory

Study	Key Focus	Methodology	Findings	Links to this thesis
Starweather & Clark (1999)	Attitudes of university staff to the computer-based information resources provided by academic libraries.	Focus groups and interviews. Screened participants in order to establish a level of homogeneity by selecting staff who reflected Rogers' (1995) adopter categories. Six staff (3 innovator/early adopters and 3 laggards) were interviewed and 26 participants were divided into three focus groups (early adopters, early/late majority and laggards). The interviews lasted one hour while the focus groups were 90 minutes in duration.	Emerging themes: obstacles to use; convenience and portability; relevance to the library; validity of information on the internet and equitable access; change; with few differences between focus group participants and interviewees. Skills were sought when required and really needed. Barriers to Adoption - lack of time, campus computing difficulties, printing problems, and limited library hours. Success Factors: The convenience of access to electronic resources was a major contributor to the adoption. Important Note: Participants in the study were experiencing the effects of the transition period of print to electronic material. All staff acknowledged the effect and the influence of the pace of technological change in higher education (students, staff, libraries).	Focus of the study. higher education sector. Findings - Emerging themes and the identifiable barriers to the adoption of the technology. The effect of the transition from print to electronic media on staff.
Goldenfarb (1995)	"test if critical success factors in diffusing innovation, identified in the literature and at other universities played key roles in diffusing the Campus Wide Information System (CWIS)".	Ten departments across an Australian university. Initially a steering committee was set up to pilot various options which resulted in the recommendation that each department be responsible for establishing, updating and maintaining their own server.	Factors aiding in adoption: the 'product champion' and the degree of support from their leaders. Common success factors were: having lead users who drove the project; recognition that publishing could be difficult for those staff who had limited ICT skills; at the initial stages the product champion was responsible for publishing or the publishing was outsourced until the others were able to acquire the skills; and that department leaders provided long term commitment and support. Support from those in leading positions in the university. Collaboration involving all departments through sharing of useful resources. Barriers - departments relied too heavily on the product champion, they were unable to address the problem of low ICT skills, and the perceived low relative advantage of adopting CWIS.	Australian higher education sector Findings – Common success factors and the barriers to the adoption of the technology.

Key ICT Studies Linked to this Thesis

Study	Focus	Methodology	Key Findings	Links to this thesis
McNaught, Phillips, Rossiter & Winn (1999).	The adoption of computer-facilitated learning and, investigating the setting up of an inventory of CFL resources.	Online surveys – 28 Australian universities. Literature survey A case study – five Australian universities (focus on projects, staff and the institution).	Low uptake of CFL in Australian universities. Academic staff have not yet adopted the full range of technology available to them.	Similar methodological approach. Australian, higher education Sector Relevance of findings. Developed a model.
International Society for Technology in Education (ISTE, 1999)	Technology use by teacher preparation institutions.	N=446 respondents were surveyed – representing 416 USA institutions.	Teacher training institutions are inadequately preparing pre-service teachers to effectively utilise ICT in the classroom. Most academic staff do not model effective use of ICT skills in teaching.	Is lack of modeling effective use of ICT a key factor to the adoption of ICT?
Taylor, Lopez & Quadrelli (1996)	Academic views of flexible modes of delivery.	Case studies at Queensland University of Technology and Griffith University.	Increasing support for flexible modes of delivery from both educational and professional perspectives. Issues: academic work load, opportunities for academic staff to collaborate and the need to focus on the educational benefits of using ICT in teaching and learning.	Are these same issues pertinent to Curtin University?
Jacobsen (2000)	Investigate the differences between those academic staff who readily adopt ICT for teaching and learning and those who do not.	Rogers' (1995) theory of the diffusion of innovations – adopter categories. Survey (N=76), sample taken from two large North American universities. Semi-structured interview (N=7).	90% respondents use ICT for research and professional tasks. Close to 85% used computers in some way for their teaching tasks. Those who have not adopted ICT were yet to identify a strong enough reason for integrating ICT. Relative advantage was not identified.	Similar methodological approach. Relevance of findings.
Fox (2001)	The adoption of new technology.	Interviewed 75 respondents across two Australian higher education institutions.	Developed a model – the model consists of four elements which need to be addressed when making decisions about adopting and reviewing any new technology. Elements: pedagogical opportunities, changed work practices, technology (non) neutrality, and unintended consequences of new technology adoption.	Australian, higher education context. Developed a model.