The Experience of University Academic Staff in their use of Information Communications Technology

Submitted by

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STATEMENT OF AUTHORSHIP AND SOURCES

This thesis contains no material published elsewhere or extracted in whole or in part from a thesis by which I have qualified for or been awarded another degree or diploma.

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All research procedures reported in the thesis received the approval of the relevant Ethics Committee (Appendix 1).

Signed:_____ Date:_____

Gordon William Howell

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ABSTRACT

This research explores issues encountered by academic staff in their adoption of technology within the teaching and learning environment.

The context of this research is set within a global environment; where technology is seen as both underpinning and enabling the current period of rapid change. Both the literature and University documents purport that the use of technology is instrumental in the delivery of positive economic, educational and social change. The researcher identified a dissonance between administrative policy and practices, and academic practice in relation to the use of technology. Consequently, the purpose of this study was to explore the experiences of academic staff in their adoption of technology within the teaching and learning environment.

The literature review generated following research questions:

1. Why do academic staff use information communication technology (ICT)?
2. How do academic staff use ICT?
3. What are the barriers to the use of ICT that have been identified by academic staff?
4. How do academic leaders promote the use of ICT in teaching and learning?

As the adoption of technology is essentially a social process, the epistemological position of constructivism, using an interpretative perspective, was adopted for this research. The methodology of case study is utilised as it allowed detailed exploration of self-perceptions and lived experiences of the participants in relation to their use of technology within their professional practice. 21 participants were initially selected for this study. From this group of participants Rogers' Theory of Diffusion was used to select those participants who could provide the most useful insights; resulting in the seven case studies documented in this thesis. Participants within the case studies ranged from those who were highly innovative, to those who were late technology adopters.

This research concluded that for the academic mainstream, the deployment and availability of technology had reached a stage where hardware, software, internet connectivity and projection capability were no longer seen as impediments to their use of technology. All participants, ranging from the highly innovative to the late technology adopters, used technology for email, the world wide web (WWW), administrative tasks, and the preparation and presentation of their lectures. While the use of various technologies was universal among the participants, the predominant use of technology was to support the transmission mode of instruction. The research concluded that a constructivist educational approach was not closely linked to early technology adoption, but to the participants' individual educational beliefs. The educational beliefs of the participants were in conflict with their experience of the University's practices, which reflected a lack of instructional leadership in relation to the use of technology.

Glossary Of Terms

AARNET	Australian Academic and Research Network
ACU	Australian Catholic University
ASCILITE	Australasian Society of Computers in Learning and Tertiary Education
ATM	Automatic Teller Machine
AUQA	Australian Universities Quality Agency
Blog	A web log which provides commentary or news on a particular subject
CBAM	Concerns Based Adoption Models
CD	Compact Disk
DEST	Department of Education, Science and Training
DETYA	Department of Education, Training and Youth Affairs
EFTSU	Effective Full Time Student Numbers
HoS	Head of School
HTML	Hypertext Markup Language
IT	Information Technology
ICT	Information Communication Technology
ITCS	Information Technology and Communication Services
Lecturer	Academic level B
M/S	Microsoft
OECD	Organisation for Economic Cooperation and Development
OHP	Over Head Projector
PC	Personal Computer
PDA	Personal Digital Assistant
Senior Lecturer	Academic level C
SOE	Standard Operating Environment
TV	Television
UK	United Kingdom
VCR	Video Cassette Recorder
WebCT	A software application used for online course material
WWW	World Wide Web

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Chapter 1: The Research Defined

This introduction sets the scene by describing how my personal journey led to the identification of the research problem. The chapter then details the research problem, significance of the research, the context of the research and displays the research questions. The chapter then concludes with an outline of the thesis.

1.1 Introduction

Over the past 14 years I have been responsible for numerous Information Technology (IT) projects within the tertiary education sector. From 1994 until 2000 I was the IT Manager at Australian Catholic University (ACU) responsible for McAuley Campus. From 2000 to 2006 I was responsible for technology support across ACU's six campuses (see section 1.2.3). During this time I was involved in, and observed, multiple Information Communication Technology (ICT) projects. These projects related to both administrative areas and to the support of teaching and learning in university settings.

During this time, I concluded that ICT projects that relate to administrative support at ACU are well accepted and utilised, while the adoption of technology by teaching staff in the support of teaching and learning has been less successful (AUQA, 2002, p. 28; Rebbechi, 1998). My experience is not unique, as the research literature contends that Australian academics are more likely to use ICT for administrative and personal use than to enhance their teaching (Brennan, Miller, & Moniotte, 2001; DETYA, 2000).

The observed disparity between policy directives, (both at government and institutional levels) and the lived experience of educationalists has continued, despite several decades of governmental and university policies energetically encouraging academics to use ICT in their curriculum delivery (ACU, 2003c; M. Sergiovanni, 2000).

Historically, the management approach has focused on the provision of more and more technology resources; for example, more computers in classrooms (Cuban, Kirkpatrick, & Peck, 2001). This approach is exemplified by benchmarking the number of students per computer, as a measure of progress in the adoption of ICT (Hawkins, Rudy, & Madsen, 2004). Such an approach, while delivering an increase in the number of computers to classrooms and university campuses, has been criticised for failing to generate educational outcomes (Cuban, 1986, 2001; Russell, 2001). The management approach, which is focused on technology deployment, has also been criticised for failing to address issues related to the problem of technology adoption by academics in the support of their teaching and learning (Kopye, 2006). The lack of measurable educational outcomes has been referred to as the "no-significant difference phenomena" (Russell, 2001). It is within such a context that this thesis is situated, since it focuses on how academic teaching staff adopt technology in their teaching and learning environment.

1.2 The Research Context

To understand the issues faced by ACU academic staff in their use of ICT, it is appropriate to provide some contextual understanding of the environment in which technology change is occurring.

1.2.1 Global Environment

Rapid social and technological changes on a global scale, such as those occurring in the latter half of the 20th century and into the early 21st century, provide the context in which educational change is taking place.

> Every few hundred years throughout Western history, a sharp transformation has occurred. In a matter of decades, society altogether rearranges itself—its world view, its basic values, its social and political structures, its arts, its key institutions. Fifty years later a new world exists (Drucker, 1992, p. 95).

The current transition referred to by Drucker is the movement from an economy driven by traditional manufacturing industries to an information age driven by information technology (Dearing, 1997). While information technology, and, in particular, the use of the internet is providing the current context, technological change in education is not new (Cuban, 2001). Historically, technical change has involved the introduction of film, television (TV), video, over-head projectors (OHP) and whiteboards (Cuban, 1986). What differentiates information technology from earlier educational innovations is the rapid pace of change (Gurr & Broadbent, 2004). This pace of change is exemplified by comparing the utilisation of the internet with that of the phone and television: “It is estimated that the internet reached 50 million users in 5 years compared to radio that took 38 years to reach the same number, and television which took 13 years to reach 50 million users” (Hayes, 1998).

The link between education and the future prospects of nations in response to the transformation to the information age has been recognised by leaders in developed nations for at least a decade. Within the United Kingdom, Prime Minister Blair commented: “Education is about investing in our future: and it is in the marriage of education and technology that the future lies for Britain. Young people now in school will emerge into a world dominated by information and communication technology” (Blair, 1996).

More recent comments by leaders in Australian universities recognise that education and technology play pivotal roles in the transformation of Australia to a global contributor in the information age: “It is widely accepted that education must lay the foundation for the success of the global economy, to fulfil this critical role, education must embrace new technologies” (J. Taylor, 1999).

1.2.2 Educational Environment

While the information society powered by the internet has enabled universities to expand their educational reach, it has exposed them to global pressures and an environment of rapid change: “Universities are now faced with the complexities of

increased size, increased accountability, a more competitive environment (nationally and internationally) and more demanding students" (Viljoen, 1998, p. 457).

The expanded reach of universities is attributed directly to developments in technology and the internet in particular which have facilitated the delivery of content in an environment where distance has been removed as a barrier to access (J. Taylor, 1999). Along with many universities, ACU is introducing this technology to attract additional fee-paying students, and to support teaching and learning for both distance and traditional on-campus students.

This competitive global environment was noted in ACU's strategic plan which attributed the use of technology in creating an increasingly competitive global environment "from off-shore universities and professional organisations", (ACU, 1998, p. 21). The internationalisation of education is reflected in the drive for ongoing efficiency: "Processes and structure should aim to achieve cost effectiveness and efficiency" (ACU, 1998, p. 5). This focus on efficiency is occurring in an environment of reducing government expenditure in education. With the Commonwealth Department of Education Science and Training (DEST) figures for 2002 highlighting that 82% of ACU's total funding is from Government sources, this pressure becomes acute (AUQA, 2002, p. 21). This drive for efficiency often conflicts with pressure for the teaching and learning environment to have the latest technology: "Technology will be harnessed to produce the best ways of promoting student learning" (ACU, 1998, p. 7). The changes brought about by the transition to an information economy have been reflected in both structural changes in Australian universities, and in the use of technology in teaching and learning.

During the 1990's this structural change was reflected in Australian universities by the amalgamations and the integration of colleges of advanced education into a unified university system (Dawkins, 1988a). Consequently, much of the policy regarding technology has focused on providing more computers and internet connectivity to universities (Beattie, 2000; Dearing, 1997; DETYA, 2000). In Australia, an example of this was the creation of the Australian Academic and Research Network (AARNET), the primary role of which is the provision of internet connectivity to Australia's Universities (AARNet, 2002).

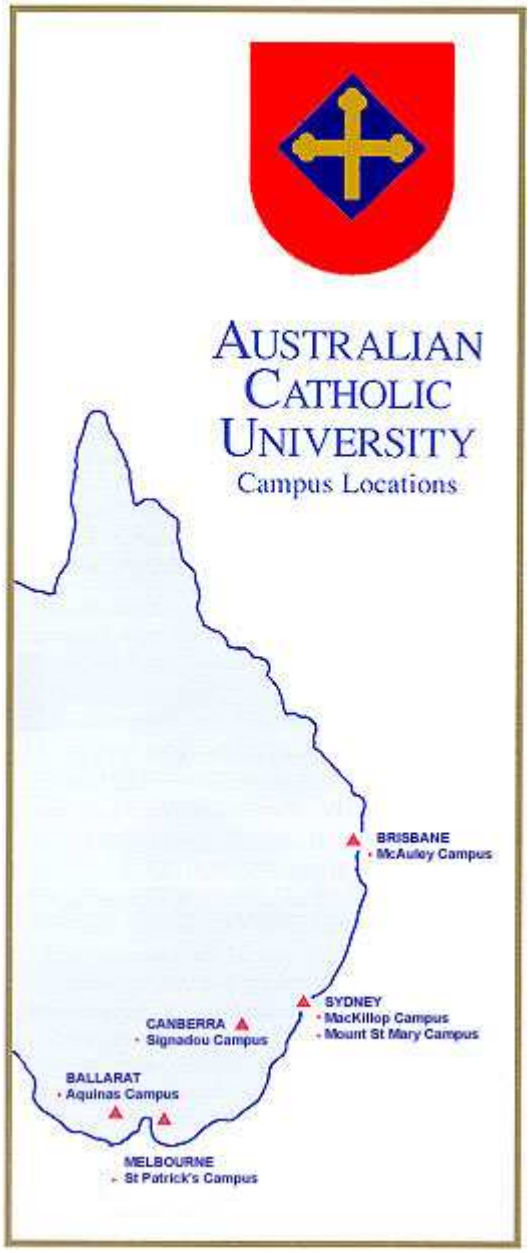
1.2.3 Australian Catholic University Environment

As a result of the Dawkins reforms, ACU was formed in 1991 from the amalgamation of the four Catholic tertiary institutions in eastern Australia. Currently, ACU has six campuses in four states, making it one of the most geographically dispersed Universities in Australia (Figure 1-1).

At the time of the university's formation, ACU's predominate use of technology was for administrative purposes, such as payroll and student administration. The technology used in the promotion of student learning was confined to the video cassette recorder (VCR), TV, OHP, blackboard, whiteboard and print material. The first major technological advance past this stage was its connection to the internet in 1993. The ICT initiative undertaken since ACU's formation (see Table 1-1) has included initiatives that support both its administrative functions and its teaching and learning delivery.

Since its formation, ACU has committed large amounts of funding to the implementation and support of ICT. In 2003, ACU spent in excess of $6,000,000 on ICT. To date this funding has contributed to each staff member having an internet enabled multimedia computer and students having access to approximately 650 internet enabled multimedia computers. The teaching and learning environment still includes VCR/TV's and OHP's; however, it currently includes lecture rooms with technology such as internet enabled computers connected to data-projectors. The percentage of rooms with projection and internet connectivity at ACU in 2003 of 40% was comparable to the United States university average of 45.5% (Hawkins et al., 2004, p. 31).

Figure 1-1 Location of ACU's Campuses



In terms of technology supporting online learning, ACU has officially trialled three shells since 1997; Lotus learning space (1997), Blackboard (1999), and WebCT (2003). Along with the official trials, individual academic staff have tried a range of technologies such as individual web pages, library sponsored digital repositories, and a range of other commercial learning shells. These learning shells are not currently

linked to ACU's administrative systems, making the student electronic interaction with the university disjointed. ACU's approach and management of learning shells, along with other changes, were commented on in the 2002 AUQA report as requiring that "explicit project management is necessary to ensure those innovations are fully understood and implemented across ACU". (AUQA, 2002, p. 22)

However, as the pace of change in technology increases and the globalisation of education intensifies, due to advances in technology, project management alone is unlikely to provide adequate answers to foster and sustain the required technological innovations, unless administrative structures and leadership are also considered (Kanter, 1999).

The number and outcomes of ACU's administrative and infrastructural information technology projects indicate that ACU's project management approach to technology has delivered successful technical outcomes. The success in the technical implementation of ICT innovations is a cause for concern when the projects in the teaching and learning area, while successfully implemented in a technical sense, appear not to be widely adopted.

Since amalgamation, the administrative support units at ACU have been structured along administrative functions (HR, Finance, Library, Information Technology and Communication Services (ITCS)), creating a functional based hierarchy. The current structures, while effective in delivering efficiency in administrative areas, appear to be inadequate in the delivery of information technology in the area of teaching and learning (AUQA, 2002).

While technology can drive incremental increases in efficiency, technology is viewed also as a source of innovation, enabling universities to compete globally, and provide new ways of teaching and learning that in the past were both geographically and in terms of time bound (Dolence & Norris, 1995; Ehrmann, 1995; Ehrmann & Collins, 2001).

It is within this global environment, with conflicts between the need to be innovative and the need for efficiency, that ACU academic staff attempt to make sense of their world.

Table 1-1 ACU's Major Technology Projects

1993	Connection of ACU to Internet (AARNET)
1994	Cat5 Ethernet network, fibre backbone, 10M Switched network
1995	Dial-in access using PPP
1995	University's Web presence commenced
1996	Banner project started (national student administration system)
1997	University's flexible delivery (learning space)
1997	Lotus Notes email
1997	Video conferencing introduced
1999	Student Administration system upgrade
2000	University's postgraduate flexible delivery (ACUWeb/Blackboard)
2000	Helpdesk system (HEAT)
2000	Microwave Wide area network, Gigabit LAN environment
2001	IP Telephony
2002	E-podiums universally introduced
2003	New online learning shell (WebCT)
2003	New Corporate web site
2004	IP Video Conferencing

1.3 The Research Problem

The increasing globalisation and funding imperatives require universities such as ACU, both to attract students and to gain economic efficiencies (J. Taylor, 1999). This necessitates the use of ICT to address the needs of students regardless of their geographic location, while maintaining the academic standards expected of an Australian university.

Australian universities have embraced this challenge by investing significant funds to ensure that staff and students have access to the latest technology hardware along with high speed internet connectivity (DETYA, 2000). This investment in technology creates a large ongoing financial commitment as most computers are replaced every three years (Hawkins, Rudy, & Madsen, 2003a). In an era of government driven reform of the sector (that is reducing government funding levels), it is essential that expenditure on technology contributes positively to educational outcomes. Given the ongoing commitment of universities to increase the ubiquitous nature of technology, it is important to ensure that the rationale for the implementation of technology is realised to its potential.

ACU has been an early adoptor of ICT, successfully delivering technology initiatives in administrative areas such as internet connectivity to the desktop and internet based telephony (IP telephony). Ironically, ACU has also demonstrated a less successful record in implementing IT initiatives that involve teaching and learning beyond the early endeavours of a few individuals. This has been demonstrated with the multiple attempts at implementing online learning at ACU since 1997. The lack of success was noted by Australian University Quality Agency (AUQA) as being “less successful than expected” (AUQA, 2002, p. 33). The research problem underpinning this research is the disparity observed between the successful adoption of technology for administrative purposes and the less than successful adoption of technology with regards to teaching and learning.

The adoption of ICT by academic staff for administrative and lesson preparation purposes are positive outcomes. Examples of this are the exponential growth of email, (Messing, 2002) and the widespread use of Microsoft Powerpoint. The universal uptake of technology to support administrative processes, sending emails, and searching the web, and lesson preparation has been widely observed (Cuban, 2001; Kopye, 2006) and reflects the ACU experience. The observations also suggest that the use of technology in the teaching and learning process in universities has been limited to a small percentage of teaching staff (Cuban, 2001; Kopye, 2006; Selwyn, 2002b).

My observation is that academic staff engage with technology when it meets a particular need, and has personal meaning to them. The apparent use of technology when personally meaningful is more consistent with living systems and complexity theory than with mechanistic models (Fullan, 1999; Kopye, 2006). A mechanistic model would suggest that it is used because staff have been directed to use it. The failure to use technology by many academics in the teaching and learning process is of particular concern.

The implication for leaders in the delivery of IT services in a university environment is that to meet the reform agenda, not only must they provide administrative solutions that deliver administrative efficiencies, but also create an environment that appropriately supports technological innovation in the university's teaching and learning.

Consequently, the purpose of this study is to explore the experiences of academic staff in their adoption of technology within the teaching and learning environment.

1.4 The Research Questions

An extensive literature review resulted in the development of a conceptual framework underpinning an understanding of the research purpose (see section 2.2). This synthesis resulted in four major themes. These themes are:

Catalysts for Change,
Diffusion of Technology,
Impediments to Use,
and Management and Leadership.

It was from these four clusters that the complexity of the issues become apparent and from which the research questions emerged.

1.4.1 Research Question One

Why do academic staff use ICT?

The literature identified three catalysts for utilising technology in education. These catalysts are economic, educational and social. Research question one seeks to understand the personal belief and values of academic staff as they relate to their use of ICT. An understanding of their beliefs and values is essential in developing an in-depth understanding of why they are using technology in their teaching.

1.4.2 Research Question Two

How do academic staff use ICT?

Through the exploration of academics' values and beliefs in the importance of ICT in teaching and learning and the analysis of how technology is used, the lacuna between their espoused beliefs and their lived experience will be explored. This disparity will be examined in the light of both the technological environment, and their technological innovativeness.

1.4.3 Research Question Three

What are the barriers to the use of ICT that have been identified by academic staff?

This question seeks to understand academics' explanations for the disparity identified in research question one and two. The question seeks to explore links between impediments to ICT use and first and second order change. The impediments they

identify will lead to an in-depth understanding of academics' beliefs in the importance of ICT in teaching and learning and illuminate the discrepancy between their espoused beliefs and their lived experience. This lack of correspondence will be explored along their technological environment, and their technology innovativeness.

The observations also suggest that the use of technology in the teaching and learning process in universities has been limited to a small percentage of teaching staff (Cuban, 2001; Kopye, 2006; Selwyn, 2002b).

1.4.4 Research Question Four

How do academic leaders promote the use of ICT in teaching and learning?

The current management practice of delivering ICT projects in the support of teaching and learning has been described as "less successful than expected" (AUQA, 2002, p. 33). Having identified the barriers to ICT instructional integration in research question three, this question seeks to explore how academic leaders address the incongruence between the organisations espoused beliefs in the importance of ICT, and the observed lack of success in the use of technology to support teaching and learning.

1.5 Significance of the Research

This research is significant in at least three areas.

Firstly, this research is important because of its current relevance. The use of technology in education is touted by governments as essential, if Australia is to compete successfully in the global information economy. This importance is reflected in ACU's strategic plan as creating an increasingly competitive global environment.

Secondly, as universities are increasingly investing in information technology to deliver educational material, both on and off campus, it is important that expenditure on technology contributes to educational outcomes. This is particularly important at

small boutique institutions such as ACU, where the innovative use of technology provides opportunities to compete competitively with larger institutions.

Thirdly, there is a lacuna in the literature which reports on the delivery and support of technology and the use of technology in the context of teaching and learning (Kopye, 2006; Tong & Trinidad, 2005). While there is considerable literature on the management of technology from the business world, and several professional organisations focusing on the use of technology in teaching and learning, there is a discrepancy between the two. This was identified by the The Campus Computing Project (US higher education) as the most important IT issue facing universities over the next two to three years: "…assisting faculty integrate technology into instruction as the single most IT issue confronting their campuses over the next 2 to 3 years" (K. Green, 2003).

Subsequently, this research assists in addressing the discrepancy between technology and service delivery, and academics' use of technology in teaching and learning. By exploring the issues academic staff face in their professional practice in adopting technology and giving them a voice through this research, it assists in shaping future practice in the delivery of technology.

1.6 The Research Design

This research explores the experiences of academic staff in their adoption of technology within the teaching and learning environment, and also the adoption of technology as essentially a social process (Rogers, 1995); the epistemological position known as constructionism (Crotty, 1998; Schwantd, 1997) using an interpretative perspective has been adopted.

Constructionism espouses "that meanings are constructed by human beings as they engage with the world they are interpreting" (Crotty, 1998, p. 43). Constructionism is an important lens through which to view the adoption of technology, as academic staff not only have the ability to adopt or reject the use of technology themselves, but

also have the ability to influence the adoption or rejection of technology by their peers (Rogers, 1995).

The interpretive perspective offers the researcher access to understanding how academic staff have constructed events and experiences in their lives relating to the adoption and use of technology (Crotty, 1998). The interpretive perspective also recognises that the researcher is part of the research and the researcher's presence impacts upon the participants and research process (Morrison, 2005).

Symbolic interactionism formed the theoretical perspective through which meaning was explored from the participants' perspective. The three premises outlined by Herbert Blumer (1969) which define Symbolic Interaction closely align with Rogers' (1995) theories on innovation diffusion as outlined in Table 3-2.

The in-depth study of the research problem which illuminates the "how" and "why" story of academics' adoption of technology from their perspective lends itself to the methodology of case study (Yin, 1994). Essential features of case studies are the in-depth exploration of a bounded system, based on extensive data collection, where research is conducted in its natural context (Bassey, 1999; Denscombe, 2003; Merriam, 1998).

This case study involved the purposeful selection of 21 academic staff from across the three faculties at the McAuley Campus of ACU. Heads of School were invited to nominate staff who they believed ranged from Early Technology adopters to Laggards. The nominated academic staff were then invited to participate in the research. All of the invited staff accepted the invitation to participate.

A series of semi-structured interviews, and informal interviews were undertaken from January 2005 until May 2006. During this period artefacts to support the participants' comments were collected. Throughout the data collection period the researcher also maintained a reflective diary. From these interviews seven cases were selected which aligned with Rogers' (1995) technology adopter categories. These cases are presented in Chapter 3.

1.7 Outline of the Thesis

This study explores the experiences of academic staff in their adoption of technology within the teaching and learning environment. This introductory chapter has established the context of this research, defined the research problem, and established the issues raised in the literature regarding the technology adoption by academic staff in their professional practice.

Chapter two analysises and synthesises the literature pertinent to this research. Synthesis of the literature generated 4 themes: Catalysts for Change, Diffusion of Technology, Impediments to Use, and Management/Leadership. These themes form the four sections within this chapter. Section one identifies the catalysts which are driving technology's introduction from the perspective of governments, educators, and society. Section two investigates the current deployment of technology in the higher education sector, Rogers' theory of innovation (Rogers, 1995), Welliver's instructional transformational model (Welliver, 1990), and the concept of first and second order change. Section three examines the impediments to technology adoption. It shows that first and second order impediments are complex and interrelated. Section four examines the management and leadership issues relating to both the deployment of technology and to instructional leadership. It highlights the shortcoming of traditional hierarchical management, and identifies new paradigms.

Chapter three presents and justifies the research design for the study. This study utilises an interpretative approach which provides constructivism as its epistemological framework and symbolic interactionism as the theoretical perspective through which the data are analysed. The case study approach deliberately selected 21 academic staff from across the three faculties at the McAuley Campus of ACU. This purposeful selection allowed the researcher to collect data from those who most could be learnt. Data collection included semi-structured interviews, the collection of artefacts, and a reflective journal. The semi-structured interviews were taped and transcribed generating a large amount of raw data. These data along with the reflective journal were analysed using the "constant comparison method" (Merriam, 1998, p. 158).

Chapter four presents the seven detailed case studies and a synthesis of the findings. The drafts of these case studies were provided to the participants for their approval prior to detailed analyses. This verification process provided the participants with an opportunity to withdraw consent for part, or all of the study, as well as verifying the trustworthiness of data. Not one participant withdrew consent, and all verified that the study was an accurate reflection of their story.

Chapter five offers a discussion of the findings and provides conclusions.

Chapter six provides a synthesis of the study and suggests appropriate conclusions as well as offering recommendations to better facilitate the use of technology by academic staff and for further research.

Chapter 2: Review of the Literature

2.1 Introduction

The purpose of this study is to explore the experiences of academic staff in their adoption of technology within the teaching and learning environment. The purpose of this chapter is to present a critical synthesis of the literature that underpins the research purpose.

The literature recognises that the western world is in a transition phase between the Industrial Age and the Information Age, with much of this transition being facilitated by ICT (AVCC, 2000; Capra, 2002; J. C. Taylor, 1999; Tong & Trinidad, 2005). This view is consistent with statements from governments, business leaders, educators, and social commentators who advocate that technology has unique attributes which can be harnessed positively to effect such change (Cuban, 2001).

While each of these groups sees technology as having attributes which can deliver educational outcomes, the desired outcomes are often different. Governments plan for economic prosperity underpinned by a skilled and technologically educated workforce; likewise governments and social groups seek opportunities to address social disadvantage relating to access to education (DETYA, 2000; Katz, Rice, & Aspden, 2001). Many educators believe in the potential of technology to support a constructivist approach to education (ACU, 2003a; Cuban, 2001). Each of these desired outcomes offers catalysts for the use of technology within education. In addition, they likewise offer perspectives through which to synthesise the literature concerning the adoption of ICT, or lack of it, in a university context.

2.2 Conceptual Framework

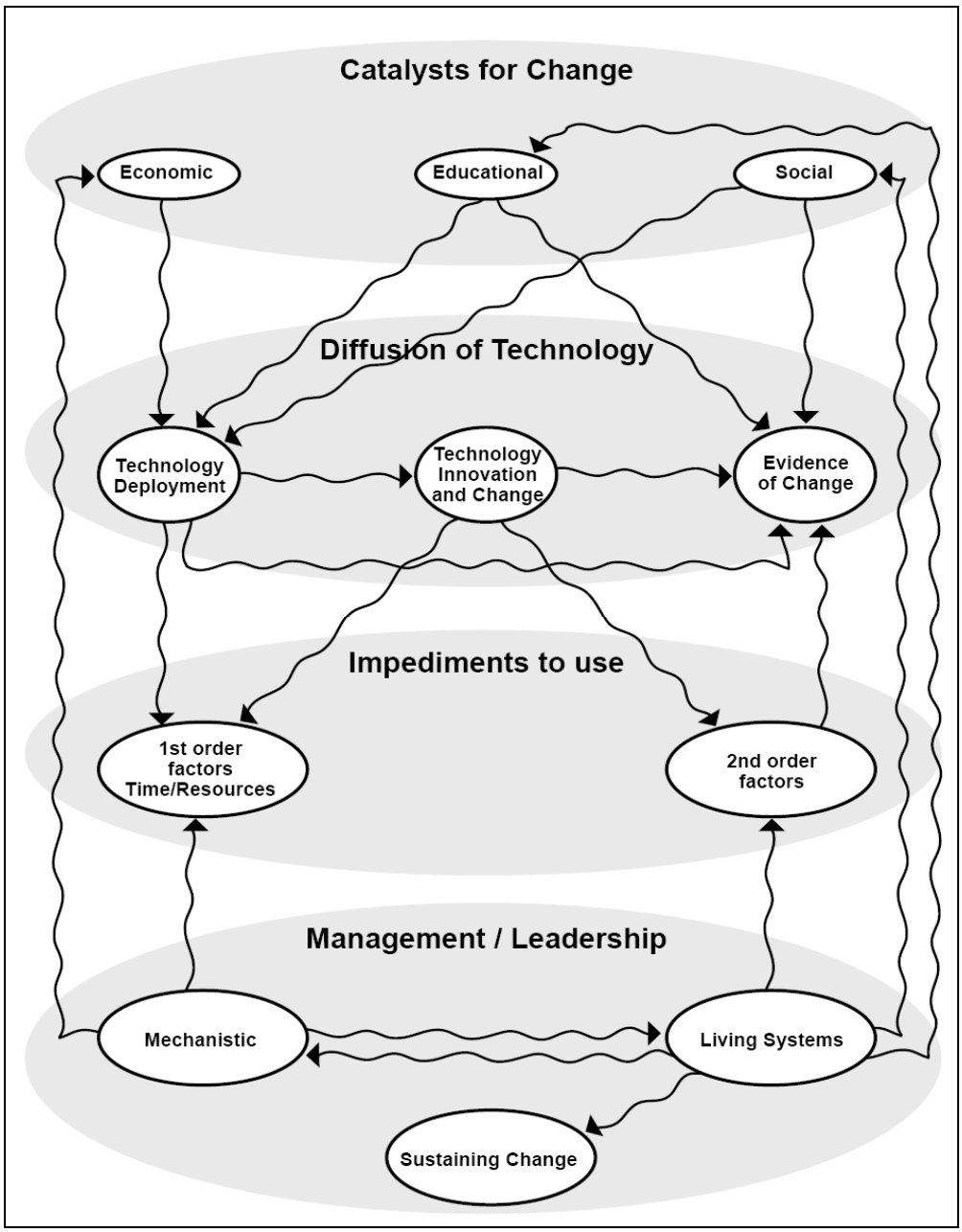
The issues identified in the literature are clustered into four themes. These are:

Catalysts for Change,

Diffusion of Technology,
Impediments to Use,
and Management and Leadership.

These clusters are highlighted as shaded areas in the conceptual framework diagrammatically illustrated in Figure 2-1. It is from within these clusters that the complexities of the issues emerging from the literature become apparent, and from which the research questions emerged.

Figure 2-1 The conceptual framework of the literature review



The economic, social and educational catalysts for change have led governments and universities to adopt policies and allocate funds in an attempt to realise their desired outcomes. The conceptual framework of the literature review (Figure 2-1) illustrates the multiplicity of issues in the adoption and use of technology to meet these objectives. The use of 'wavy lines' indicates complex rather than linear linkages between the catalysts for change and the observed outcomes. In delivering outcomes, various management approaches are evident. The mechanistic management approach is to measure ICT's physical deployment in terms of hard technology which is defined as computers, data projectors, internet access and physical infrastructure (Cuban, 2001), and is easy to measure. These measures mostly reported the student/computer ratio and the percentage of rooms fitted with internet and data projection capability (Newhouse, Trinidad, & Clarkson, 2002). This approach to managing progress is quoted often by governments and universities as evidence of technological progress in schools and universities (Bligh, 2002). Where the measured technological progress is perceived as lagging behind the planned use, impediments are identified, and additional resources are allocated to ensure it meets the desired level of outcomes. This approach to technology deployment and use has been viewed as problematic in achieving both social and educational outcomes. While this approach may have addressed many of the first order impediments to change, dissenting voices have referred to educational outcomes underpinned by technology as showing *no-significant difference* (Russell, 2001; Tagg, 2003). The *no-significant difference* studies are consistent with the literature suggesting that despite the ubiquitous deployment of technology in the university sector, its primary use is for administrative purposes and the preparation of lectures. The literature identifies that social inequalities have been reinforced rather than diminished with the introduction of technology (Rogers, 1995).

An alternate view to the *no-significant differences phenomenon* is that the values and beliefs of academic staff need to be addressed if sustained change is to occur (Capra, 2002; Ertmer, Addison, Lane, Ross, & Woods, 1999; Fullan, 1993). It contends that providing additional hard technology will not result in sustained change.

The work of the sociologist Everett Rogers (Rogers, 1995) offers a theoretical framework to understand technological innovation in an educational context. Under

Rogers' model for significant change to occur, a sufficient number of individuals must adopt the innovation so that its adoption becomes self-sustaining. Rogers refers to this number as a "critical mass" (Rogers, 1995, p. 313). Self-sustaining or cultural change within the educational sector has also been linked to professional development (Fullan, 1993). Exploring the values and beliefs of academics may be as important as achieving a critical mass of technology users. The concept of critical mass as essential for the success of innovation, along with the necessity of positive beliefs in professional development, are best explained by the literature on learning communities and living systems. While learning communities are concerned with sustained change, the mechanistic management approach to technology adoption focuses on technology deployment. Cuban observed that the mere provision of "hardware or software seldom leads to widespread teacher and student use" (Cuban et al., 2001, p. 813). This observation leads to the conclusion that developing and sustaining learning communities is not consistent with mechanistic top-down management models (Wheatley, 1999).

It is through these conflicting models of management and leadership that the inconsistency between the espoused views on the use of technology and the observed reality can be better appreciated.

2.3 Catalysts for Change

The largely unchallenged use of technology to drive change has been promoted since the 1920's (Cuban, 1986, 2001). Historically, such innovative technology has involved radio, overhead projectors, film, TV, and more recently, computers (Cuban, 2001). The internet has revolutionised the application of technology with the adoption of internet-enabled computers creating a second wave in the deployment of technology in education (Zandvliet, 1999). The experience of this second wave is reflected in students' perceptions of "real computers" as being internet connected multimedia computers (Cuthell, 2002, p. 34). Despite the enhanced capability of real computers, and the widespread adoption of the world wide web (WWW) and the internet, the catalysts for change have remained constant (Cuban, 2001; Dede,

1989). This bias towards technology has been referred to as “technological determinism” and refers to the belief that the provision of technology delivers beneficial social change (Surry & Land, 2000, p. 146). An objective view suggests that the success of technical innovation needs to be assured in terms of the initial educational rationale for investing in technology. Thus to observe any research on technology utilisation in education, it is important to understand the drivers behind its introduction in order to avoid skewed observations which may result from technological determinism. The drivers for the introduction of ICT in education are clustered around three reasons (as shown in Figure 2-1). They are:

(1) the necessity to produce technically skilled labour to underpin economic prosperity;
(2) the premise that ICT offers potential to improve the quality of education; and
(3) the ability of technology in education to meet social objectives.

Each of these clusters is discussed in the following sections.

2.3.1 The necessity to produce technically skilled labour to underpin economic prosperity

This reason for the introduction of ICT into education is generally reflective of government policy perspectives, as governments seek to ensure economic prosperity in a rapidly changing global environment, as societies are undergoing a fundamental transformation from the Industrial Age to the Information Age (Dearing, 1997; Drucker, 1992). This is a global phenomenon with nations competing economically against each other.

> 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).

This phenomenon creates a view that ICT offers a competitive economic advantage. This is reinforced by the Organisation for Economic Cooperation and Development (OECD) reports that "Information and communication technology is of great importance, with the potential to contribute to more rapid growth and productivity gains in the years to come" (OECD, 2001, p. 21). This statement is consistent with other OECD reports which links ICT to economic advancement (OECD, 2000; Trimmer & Van Ark, 2005): "The function of schooling is seen as providing personnel and fuel to run the economic engine of State – to enable a State to be, as far as possible self-sufficient, and, if not, to give it a leading edge of economic competitiveness in the world's economic market place" (Aspin, 1996, p. 99).

Within Australia, statistical data indicates that university participation rates have incremented from 10% to 18% for the ten year period 1992-2002 (Nelson, 2003). This increase in university student numbers and their increased use of computers and the internet is evidence of Australia's progress in becoming a knowledge economy. At both state and national levels, governments across Australia are investing significant funds to provide schools and universities with appropriate connectivity to the internet (DETYA, 2000). This pattern of investment is reflected throughout the western world. Government programs in Great Britain, Canada, and the USA have focused on providing internet connected computers to schools and universities (A. Brown, 1994; Zandvliet, 1999).

Australian government education policy espouses that students should exit schools, "confident, creative, and productive users of new technology" (Toomey, 2001, p. 2). The commitment of governments over the last two decades to provide funding for computers and internet connectivity reflects their belief in the correlation between technology, education, and national prosperity (Dawkins, 1988b). Educationists anticipate that technology will deliver economic efficiencies (Twigg, 2005). This belief is espoused by ACU (ACU, 1998), and is identified as a way of improving "the efficiency of their business practices" (Robertson, Grady, Fluck, & Webb, 2006, p. 72). While educationalists expect technology to deliver efficiencies, they also express the notion that technology has the potential to contribute to higher quality education, and to provide greater accessibility to a broader section of the community. These three expectations have been referred to as the triple constraint (Twigg, 1999,

2005). The potential for technology to improve the quality of education is discussed in the following section.

2.3.2 The premise that ICT offers potential to improve the quality of education

The axiom that technology enhances teaching and learning has been accepted for most of the twentieth century. Thomas Edison predicted in 1922 that "the motion picture is destined to revolutionize our education system and in a few years it will supplant largely, if not entirely, the use of textbooks" (Oppenheimer, 1997, p. 45). Since then, a succession of new technology such as radio, film and television has been introduced to enhance teaching and learning (Cuban, 1986), likewise current technology is perceived as having "unique attributes that can be exploited as tools for learning" (Surry & Land, 2000, p. 146), and as offering measurement improvement in the quality of student learning (Oppenheimer, 1997). The belief that technology is the driving force in educational change has been referred to as "technological determinism" (Surry & Land, 2000, p. 146). This view supports a belief that simply providing access to technology will result in academics and students automatically taking advantage of the benefits it affords.

Within ACU, this belief is embedded in the university's *Strategic Plan*. "Technology will be harnessed to produce the best ways of promoting student learning", (ACU, 2003b, p. 10). This perspective is reinforced in ACU's *Teaching and Learning Plan*, which seeks to "increase the information technology sophistication of our university" (ACU, 2003c, p. 1) as one of its priorities. ACU's position aligns closely with the Australian government policy which lists the goal of integrating ICT to "improve teaching and learning" by producing "confident, creative and productive users of new technology" (Toomey, 2001, p. 2).

While the literature generally supports the view that technology improves the quality of student learning, there are dissenting positions (Twigg, 2005). One such view has been described as the "blame cycle" (Cuban, 1986, p. 22), and has been reported in numerous literature reviews as the "no significance difference phenomenon" (Russell,

2001). The blame cycle begins with the technology developer producing info-commercials which promised technology led educational outcomes. Early adopters embrace the technology and produce further publications which enthusiastically support the technology. The majority of teachers however, fail to embrace the new technology initiatives and ultimately no measurable outcomes could be attributed to the introduction of technology. Historically, administrators for these technology projects blamed the lack of progress on the teachers' resistance to change (Cuban, 1986; Oppenheimer, 1997).

The views on the ability of technology to improve the quality of learning have resulted in generating contrasting bodies of research. The first body of research contends that use of technology has produced improvements in learning. The opposing corpus of research contends that it makes "no-significant difference" (Dynarski et al., 2007; Russell, 2001). The research which endorses technology as a tool for enhancing learning is referenced in governmental sponsored reports such as the McKinsey Report published by the Clinton administration, and referenced on the Canadian Tele-Education web site (Russell, 2003). Much of the literature referring to the "no-significant difference" phenomena refers to the work of Roger Clark (1983), who highlighted the need to differentiate clearly between the medium (technology innovation) and the message. Clark proposed that technology provided the "mere vehicles that deliver instruction but do not influence student achievement anymore than the truck that delivers our groceries causes changes in our nutrition" (R. Clark, 1983, p. 445). Clark's assertion is supported by a wide body of empirical research (355 comparative studies) over the past 25 years, which concluded that using technology (online learning) produced no significant difference in learning outcomes. Today, the same "no-significant difference" phenomenon still persists and supports Clark's assertion that technology mediated instruction makes no-significant difference over traditional teaching methods (R. Clark, 1994; Dynarski et al., 2007; Joy & Garcia, 2000; Ramage, 2002; Russell, 1997, 2001).

The proponents of the no-significance difference assertion argue that "it takes time to discover and invent the advantages of a new technology" (White, 1999), and that for technology to overcome the no-significance difference phenomenon it must be used in new and innovative ways, not just to reinforce the existing teaching modes (Tong &

Trinidad, 2005). These arguments contend that ”when we strive to recreate the classroom experience we limit teaching and learning to what works best in face to face situations” (MacDonald 2002), and hence “as long as we continue to replicate traditional approaches online, we will once again find the no significance phenomenon” (Twigg, 2001).

The premise that technology improves the quality of teaching and learning has been demonstrated where technology has supported active learning in a way which was not possible in the traditional lecture (Dori & Belcher, 2005; Goldberg, Haase, Shoukas, & Schramm, 2006): “It has been shown that the comprehension of information is enhanced when students are encouraged to engage actively in the learning process” (Goldberg et al., 2006, p. 124).

The positive educational gains achieved using technology have been linked to new paradigms, rather than reinforcing the existing pre-technology practices. The traditional paradigm in universities is the instructional model (Barr & Tagg, 1995), which has also been described as the transmission model (Laurillard, 2002; Tagg, 2003). The transmission/instructional model is epitomised as “the lecture, the book, and the marked assignment” (Laurillard, 2002, p. 140).

New paradigms based on a constructivist approach to learning have resulted in movement away from the transmission paradigm (Lambert, Collay, Dietz, Kent, & Richert, 1996; Newhouse et al., 2002). A constructivist approach is based around learning theory and cognitive development (Vygotsky, 1978), where “knowledge is not a static body of information that is passed on to learners but rather a process” (Lambert et al., p. 16). The constructivist model is not driven by technology, but grounded in theories of learning, where students construct knowledge, based on “their previous knowledge, beliefs and experiences” (Lambert et al., p. 18).

With the generally accepted view that universities are places of learning (Tagg, 2003), the constructivist approach has been considered by some as self-justifying: “Leaving aside the political and economic justification for restructuring, it is possible to mount a convincing case on educational grounds, and in particular, on the need to

reform the approach of schools to teaching and learning" (O'Donoghue & Dimmock, 1998, p. 10).

While the constructivist approach is not dependent on technology, educators have identified attributes of ICT which enable students to investigate issues and construct knowledge individually and in groups, in a way which may not have been possible with earlier technologies (Cuban, 2001; Surry & Land, 2000). Having discussed the espoused beliefs in technology's ability to offer increased economic efficiency and increased educational quality improvements; the third driver for technology deployment in education is discussed next.

2.3.3 The ability of technology to meet social objectives in education

Education has been viewed as a means of achieving social objectives. Within the United States links between participatory democracy and education have been made which demonstrate that social and civic objectives can be advanced through the educational process (Katz et al., 2001).

The Dearing Report in the United Kingdom also linked such democratic ideals, along with the opportunity to remedy social disadvantage, to ongoing education underpinned by ICT. Internet enabled technology was seen as a means of reaching those who would otherwise not have had access to education, and as a delivery mechanism for life long learning (Dearing, 1997).

In Australia, as in other developed nations, the deployment of ICT was considered to be critical in addressing both educational, economic and such social issues (DETYA, 2000). Internet enabled technology has been utilised by Australian Universities to enhance access to their courses and as a cost reduction strategy (J. Taylor, 2003). The increase in revenue resulting from attracting additional online-students, combined with the promise of reducing costs, has enticed universities to embrace ICT (Draper, 1999; Twigg, 2001a). This strategy of utilising ICT to enhance the reach of their courses while providing opportunities to achieve efficiencies aligns with the social and economic objectives of both Universities and Governments.

Despite the social objective of utilising ICT to expand the reach of higher education to remote students, there is evidence to suggest that inequitable access to the internet has resulted in the perpetuation of disadvantage rather than overcoming it (Selwyn, Gorard, Furlong, & Madden, 2003). This inequitable access is commonly referred to as the digital divide. Disadvantage as a result of the digital divide is not limited to remote communities as evidenced from a survey of 2000 first year students at Melbourne University in 2006, which showed that 14% of students had no access to broadband internet (Kennedy, Krause, Judd, Churchwood, & Gray, 2006).

DETYA (2000) has identified that disparity in cost and access between urban, rural and regional areas perpetuates equity issues, reinforcing social inequalities which may even be greater after the adoption of the innovation than before: "We often find that the diffusion of innovations widens the socioeconomic gap between the higher and lower status segments of a system" (Rogers, 1995, p. 125).

Though the introduction of new innovations using technology is perceived as being universally beneficial, the consequences of the innovation often result in reinforcing the existing inequalities in the community rather than overcoming them. The reinforcement of social inequalities, despite the introduction of innovations, dampens the potential benefits of using technology to address social objectives (Selwyn et al., 2003).

2.3.4 Justification for research question one

As the western world continues to be transformed into the information society, government, business leaders, educators, and social commentators are uniform in their belief that technology has unique attributes which can be harnessed to facilitate social and educational change (Cuban, 2001). The outcomes anticipated by members of society, however, vary. Governments believe a skilled workforce should underpin economic prosperity; government and social groups seek opportunities to use technology to address social disadvantage; and educators believe in the ability of technology to support a constructivist approach to learning. The catalysts for the

introduction of ICT and the anticipated benefits varied between governments, educators and social groups. The researcher believed that just as there was a range of expectations of ICT from educational stakeholders, there would also be a range of beliefs and expectations from academic staff. Understanding the personal beliefs of academic staff as they relate to ICT, and how technology has diffused throughout the teaching environment, are expected to be essential in developing an in-depth knowledge of how they are using ICT and the impediments they face in adopting ICT in their teaching and learning. This leads to the generation of the first research question: **Why do academic staff use ICT?**

2.4 Diffusion of Technology

The catalysts for change have provided the impetus for governments, schools, and universities to fund significant technological investments in schools and universities. However, the deployment of internet enabled technology continues to reflect the pattern observed in the last century (Cuban, 1986).

> Historically, each of the technologies went through a cycle of expectations, rhetoric, policies and limited use. The cycle began with extravagant claims for the revolutionary power of the machine to transform teacher practice and student learning. Predictions that radios would replace teachers, or that motion pictures would make textbooks unnecessary, were common. Reformers, ranging from public officials, foundation executives, school administrators, and wholesalers, fastened onto the innovation and promoted it as a solution for school problems. School boards and superintendents adopted policies and allocated dollars to secure hardware. Not long after the machines appeared in schools, academic studies established that the new technology was as effective as a teacher using conventional practices. Shortly afterwards, scattered complaints arose from teachers about the logistics of use, accessibility, and the compatibility with the existing program, marring the mantle of scientific credibility that began to settle over the innovation. Later, surveys documented infrequent teacher use of the machines. Such results triggered criticism of both

> administrators and teachers. Once limited use had been confirmed, a series of analyses blamed teachers for blocking the advancement of technology and classroom improvement. As a convenient shorthand, I called this the exhilaration – scientific credibility – disappointment – blame cycle (Cuban, 1986, p. 218).

Contrary to the expected outcome that using ICT enhances the quality of both teaching and learning, more recent literature continues to reflect Cuban's observations of the cycle of exhilaration, scientific credibility, disappointment, and the apportioning of blame (Dynarski et al., 2007; Tong & Trinidad, 2005).

Within ACU, this cycle is exemplified in instructional learning technology reports which document expected outcomes being less successful than anticipated (AUQA, 2002; Rebbechi, 1998). The disparity between the deployment of internet based technology and its adoption by teaching staff is examined in the next section which reviews the literature relating to the deployment of technology.

2.4.1 Technology deployment

The diffusion of technology connects both the deployment of hard technology (computers, projectors and network connectivity), and how it is used. The deployment of technology is measurable and is used by governments and universities as an objective indicator of supposed progress. A United Kingdom (UK) governmental report recommended that all UK universities and schools have access to appropriate internet connectivity, and that by 2004 all students would have their own laptop computer (Dearing, 1997). Within Australia, governmental reports echoed the same objective, recommending that all schools and universities have internet connectivity (DETYA, 2000).

In 2002, the Australian Government committed $A42.5million to Australian Universities over two years to enhance internet connectivity (AARNet, 2002). This has been reflected at ACU where high speed microwave links connecting each campus to the internet via AARNet (Australia's Academic and Research Network)

were installed. This funding continues with the Australian Government announcing $A84million expenditure on upgrading the AARNet network (AARNet2) to a fibre based national network (AARNet3) (Bishop, 2006). Additionally; ACU has provided all staff with a multimedia, internet connected computer. This provision of a networked computer in each academic's office is currently accepted practice (Cuban, 2001).

While the deployment of ICT in universities for the support of teaching and learning is uneven, the deployment of hard technology within the university environment is regarded as having reached the state referred to as "ubiquitous computing" (D. Brown & Petitto, 2003, p. 25). The conclusion of ubiquitous computing is drawn from surveys which measure the physical deployment of computers and network access, which are then reported in measures such as percentage of teaching rooms with internet connectivity and the student-computer ratio (K. Green, 2001). An example of Universities commitment to the collection of data regarding technology deployment is the *EDUCAUSE Core Data Project* which has surveyed over 600 colleges and universities in the US, Canada, Australia, and other western nations annually for over 20 years on the use of information technology (Hawkins & Rudy, 2006; Hawkins, Rudy, & Madsen, 2003b). The results of these surveys offer benchmarks against which the deployment of technology at ACU may be compared.

Table 2-1 Comparison of and EDUCAUSE core data service (2002)

Survey results for Classrooms	EDUCAUSE Average	ACU
Classrooms with wired internet connectivity	81.5%	100%
Classrooms with Data Projectors	39%	37.5%
Classrooms with Computers	31%	37.5%
Classrooms with TV/VCR	33.7%	100%

ACU's deployment of hard technology in teaching spaces is comparable with other tertiary institutions as shown in Table 2-1. This equipment is predominately used by teaching staff in the delivery of lectures and tutorials. This comparison illustrates that

the availability of technology at ACU for teaching purposes is comparable with international standards making lack of equipment a facile argument in explaining the hesitancy by some academics to use technologies in their teaching.

Student access to technology may be a factor in the adoption of ICT by teaching staff. The Dearing Report recommended that all students have laptops by 2004, and several private colleges in Australia had adopted this approach. Universities typically measure the availability of computers for students by recording the ratio of students per computer. In a survey of 17 Australian and New Zealand universities (Burgess, McPhail, & Fitzsimmonds, 2003), the average ratio of students per computer was 9.48. In ACU, this ratio was 12.01. This ratio is slightly higher than the national average. Statistical data on the deployment of ICT at ACU suggest that, while ACU had not reached a state of ubiquitous computing, its deployment of technology was favourably comparable with other universities in Australia.

The availability of off-campus ICT facilities impacts upon the adoption of technology (Cuthell, 2002), with a greater percentage of students having access to more technology resources at home, than their teachers (Cuban, 2001; Cuthell, 2002). Despite this finding, a recent 2006 survey of first year students at Melbourne University concludes that 14% do not have access to broadband internet (Kennedy et al., 2006). Consequently, while off-campus technology deployment is widely available, it is not yet universal.

Where the beliefs in the deployment of ICT are based on “technological determinism”, the near ubiquitous deployment signals success, with beneficial social change being assured (Surry & Land, 2000, p. 146). The belief in technological determinism, however, is challenged in the next section which suggests that the deployment of technology and beneficial social change are not necessarily linked.

2.4.2 Technology innovations and change

Despite the fact that considerable investment in technology has occurred within the higher education sector, with much of this technology being seen as innovative, it is

arguable whether this is concomitant with educational reform (Cuban, 2001). While innovation and change are closely linked, they are distinct concepts. An innovation has been defined as "an idea, practice, or object that is perceived as new" and offers an individual or organisation new alternatives for solving problems (Rogers, 1995, p. 11). Rogers' definition of what constitutes an innovation aligns with the way ICT is perceived as providing new ways of addressing economic, social and educational issues. Change is the adoption of an innovation, and refers to a process in which behaviours, attitudes, and processors also undergo transformation (Williamson, 1999). However, as Cuban (1986) demonstrates, in his extensive review of technical innovations, innovations do not necessarily lead to change.

Diffusion of innovations

Rogers (1995) has identified in excess of 4,000 research reports concerning the adoption of innovations which has been described as "the process by which an innovation is communicated through certain channels over time among members of a social system" (Rogers, 1995, p. 5). This definition demonstrates that the adoption of innovations and the subsequent change process flowing from it is multifaceted. It involves the elements of the innovation itself, communication channels, time, and the social system.

In this thesis, the innovation examined is the application of ICT and the resulting change or diffusion is the degree to which academic staff at ACU have adopted ICT in their teaching and learning. Rogers (1995) asserts that any innovation presents individuals or organisations with alternatives for solving problems. In terms of technological innovations, Rogers (1995) notes that the innovation: "…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).

To reduce uncertainty about the innovation, potential adopters seek information from various sources in an attempt to reduce the uncertainty. Communication channels (the way information is sought) range from interpersonal communication through to the use of mass media. In the research reviewed by Rogers (1995), there is a

suggestion that while the earliest adopters of an innovation are influenced by mass media, for most the communication on whether to adopt or not is gleaned from the perceptions of their peers who have already trialled the innovation. The personal approach to gaining information on the benefits of an innovation is particularly prevalent among individuals who share common social backgrounds: "…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, p. 18).

Once people have become aware of an innovation, change is not automatic or synchronised. Just as individuals need time to become aware of an innovation, it also takes time for them to be persuaded to adopt the innovation, time to implement the innovation, and finally, time to change their behaviour permanently (Rogers, 1995). Therefore, time is an important element in the process of change. How much time is required varies according to the characteristics of the innovation.

These characteristics are defined by Rogers (1995) as:

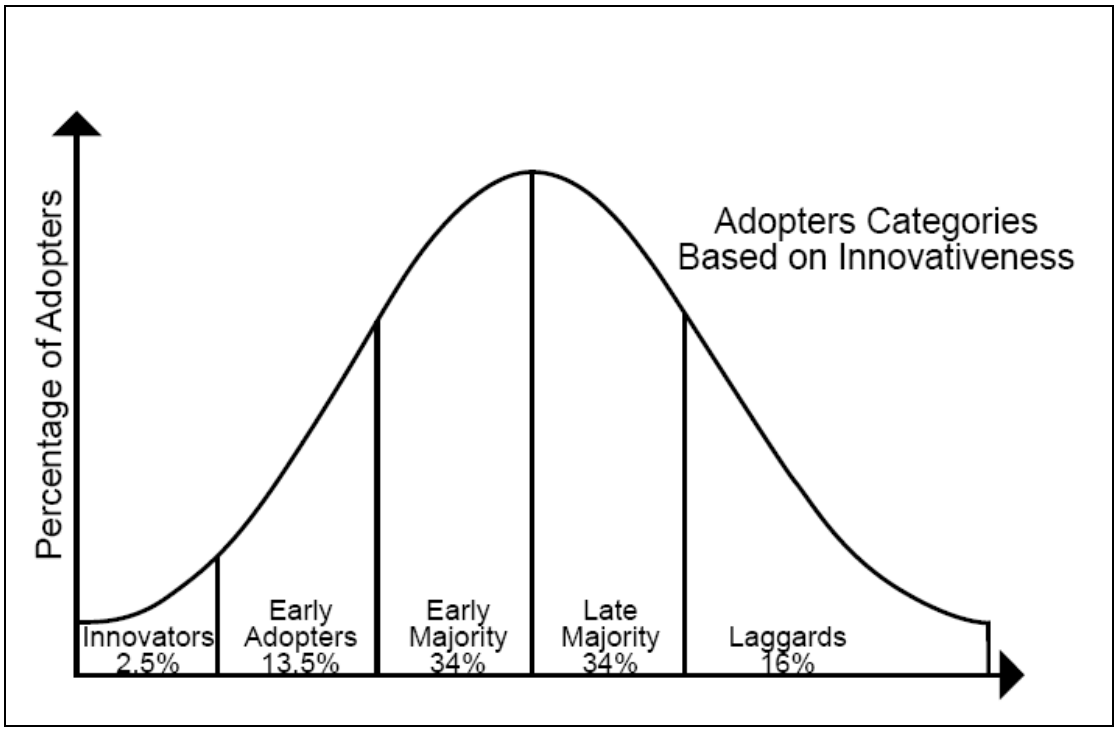
- Relative advantage (to what extent is the innovation better than one it is replacing),
- Compatibility (the level to which the innovation is consistent with the needs, culture, and values of the adopters),
- Complexity (the degree an innovation is perceived as difficult to use),
- Trialability (the degree to which the adopter is able to experiment with the innovation), and
- Observability (the level of which the results are observable to others).

Rogers (1995) contends that relative advantage is the most important factor in the speed of adoption. Rogers' (1995) research, however, also highlights examples where innovations have been rejected due to other factors such as poor cultural fit. This has been despite the relative advantage of the innovation. Within the education sector, school culture may assist or prevent the implementation of new initiatives, and that the rate of adoption of technology is directly related to the congruence of the innovation and the prevailing culture (Cavanagh, 1997).

Just as the adoption of innovations is not synchronous for individuals, different individuals within a social system adopt innovations at various points in time. This phenomenon is known as “innovativeness” (Rogers, 1995, p. 22). Rogers (1995) grouped the different rates of adoption into five groups. He classified these groups as Innovators, Early Adopters, Early Majority, Late Majority and Laggards. An understanding of these groups is important for this thesis as ACU has implemented several technology based learning initiatives that have been judged as being less successful than anticipated (AUQA, 2002; Rebbechi, 1998). This has occurred despite the initial enthusiastic embrace of these new technology initiatives by several academic staff.

A fundamental concept in understanding the nature of the diffusion process is the notion of “critical mass“ (Rogers, 1995, p. 313). Critical mass occurs when 10 to 20% of the social system has adopted the innovation. At this level enough individuals have accepted the innovation to the point that it becomes self-sustaining (Rogers, 1995). Where this critical mass stage is not reached, the innovation is not adopted and change does not occur. According to Rogers (1995) this critical mass occurs between the adoption of the innovation by Early Adopters and the Early Majority.

Figure 2-2 Adopter Categorisation on the basis of Innovativeness



(Rogers, 1995, p. 262)

Individuals who identify with the attributes of a particular adopter category have different attributes from the other categories and therefore are motivated to accept innovation differently (see Table 2-2 General Attributes for Adopter Categories). To address these "less successful than anticipated" (AUQA, 2002) technology outcomes, ACU ought to consider the motivations as well as the impediments to the adoption of this technology for lecturers within each adopter category.

Table 2-2. General Attributes for Rogers' (1995) Adopter Categories

Adapter 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 setbacks. 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- 'localities'. 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 late adopters.
Early Majority	Interact frequently with their peers. Seldom hold positions of leadership. The decision to adopt is usually longer and may be willing to follow but will not lead.
Late Majority	Interact frequently with their peers. Seldom hold positions of leadership. 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)

For sustained change to occur within ACU, technical innovations need to reach the critical mass. While providing assistance to the initial academic innovators continues to be important, the attributes of the early adopters and early majority need to be identified and addressed if change is to be sustained.

2.4.3 Evidence of change

Empirical data on the deployment of the technology into schools and universities are routinely used to show evidence of progress (K. Green, 1996-2002; Hawkins et al., 2003b). The underlying assumption is that high levels of technology deployment positively align with change (Surry & Land, 2000). Surveys typically scrutinise the deployment of hard technology and invite comparisons between institutions. High levels of technology deployment imply progress towards the provision of ubiquitous computing, while personal use is often based on inferred measures such as the percentage of staff that have internet enabled computers at home, and use applications such as email and Microsoft Powerpoint.

Rogers' theory of diffusion offers insights into whether adoption of technological innovation will progress past the initiatives of a few early adopters. For change to be sustained, the use of technology must reach a critical mass, at which time the change becomes self-sustaining. This is consistent with Fullan's position (1982), who emphasises that educational change is a process, and not a single event. In the university context, positive change in ICT utilisation is not initiated from above but rather it occurs at the individual level.

The adoption and use of presentation software and email within ACU as recorded in a 2002 survey were in excess of the critical mass as highlighted in Rogers' theory of diffusion (Maguire, Gronn, Herbert, & Robson, 2003). Other sector-wide surveys have shown that the use of ICT in the preparation of lectures has become widely accepted as the norm (Cuban, 2001; Hawkins et al., 2003b; Pew, 2001). This evidence suggests that the use of technology by academic staff has passed the critical mass resulting in sustained change. In this case the use of technology has been observed as supporting traditional modes of teaching (Ehrmann, 2002; Surry &

Land, 2000). While this change may allow benchmarks to be met in terms of the deployment of technology, it is difficult to argue that using Powerpoint slides fundamentally changes how students participate in the learning process (Jacobsen, 1998). This observation of technology adoption without change needs to be addressed, if the educational and social objectives for the implementation of ICT are to be realised.

Change has been classified as either “first order” or “second order” (Cuban, 1988; Fullan & Stiegelbauer, 1991). *First order changes* are those that do not alter existing organisational structures, nor substantially alter the roles of students or teachers. These changes are usually related to efficiency and effectiveness. *Second order changes* involve altering the fundamental organisational structures including their roles and goals (Sarason, 1990). Most of the changes in education have been of the first order category with second order changes being largely ineffective (Cuban, 1988).

> Most reforms floundered 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. 341).

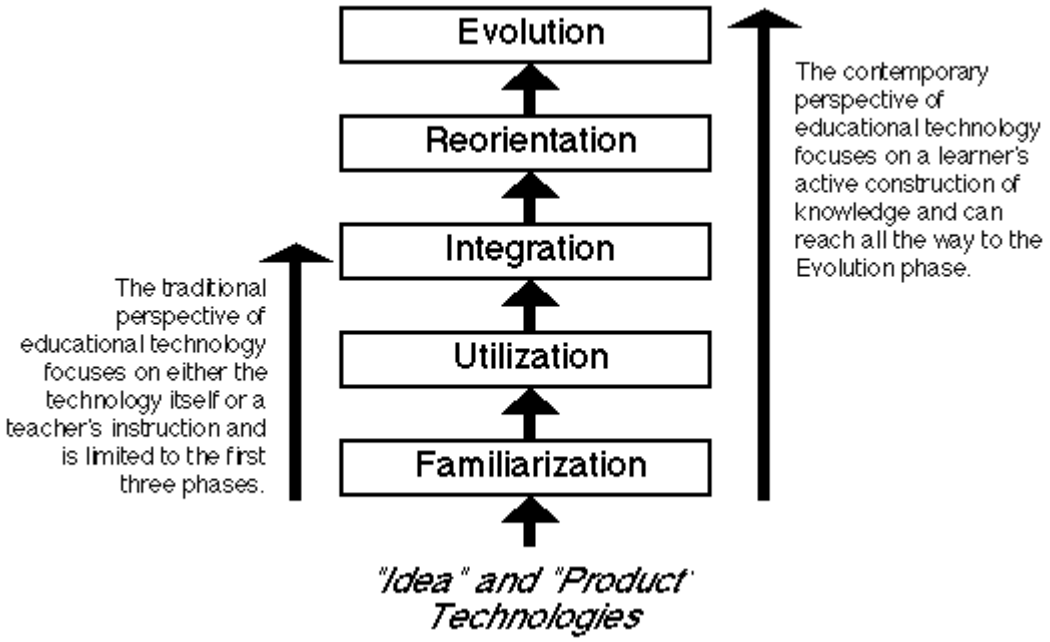
Academic staff are more likely to adopt ICT for administrative and personal use than to enhance their teaching (Brennan et al., 2001; Cuban, 2001; DETYA, 2000). This is consistent with first order change which suggests that academic staff distinguish between those technological innovations which assist their personal and administrative functions, and the use of technology that facilitates the constructivist approach to teaching and learning. It identifies a dissonance between the deployment of technology and the resulting first order change and changed practices.

Concerns arising from this dissonance have resulted in new models such as Concerns Based Adoption Models (CBAM) being developed (Marcinkiewicz, 1994; Newhouse, 2001). These models focus on the effectiveness of using computers to

support learning, rather than the provision of hard technology. One enduring model has been Welliver's model (Welliver, 1990), (Figure 2-3).

Figure 2-3 Welliver's Instructional Transformation Model

(Hooper & Rieber, 1995, p. 156)



Welliver's model is concerned with sustained or second order change, which can transform the teaching and learning process through the use of technology. It is based on the premise that sustained change and improvements to the learning process can only occur through "a paradigm shift in school pedagogical practice" (Tong & Trinidad, 2005). This premise is aligned to an educator's beliefs in the ability of technology to support a constructivist approach to education.

Welliver's model identifies five stages which educators progress through. It departs from Rogers' model in that it emphasises how educators use technology in their teaching practice. Welliver's five stages are, familarisation, utilisation, integration, reorientation and evolution as illustrated in Figure 2-3.

The *familiarisation* stage identifies the educators' first exposure or experience of a new technology. An example of this could include a presentation or introductory course on the university's learning shell.

Utilisation occurs when “teachers make use of computers for many educational activities but are not committed” (Rieber & Welliver, 1989, p. 28). The distinction between utilisation and integration is that during this phase, educators are not totally committed to the innovation and “If the technology were taken away on Monday, hardly anyone would notice on Tuesday” (Hooper & Rieber, 1995, p. 157).

Integration is defined as “the critical turning point of fully implementing the computer in education” (Rieber & Welliver, 1989, p. 28), so “if the technology is suddenly removed, the teacher cannot proceed with the instruction as planned” (Hooper & Rieber, 1995, p. 158). A further defining identifier for this stage is the educators “emergent self awareness of a role change in teaching from teacher-centred to learner-centred” (Newhouse, 2001).

The *reorientation* phase occurs when educators “reconsider and reconceptualise the purpose of the classroom”, and where the focus is now on student learning, and not on “the delivery of content” (Hooper & Rieber, 1995, p. 158). The progression from the integration phase to reorientation phase is characterised by the transition from an instructional to a constructivist mode. Educators who have not reached the reorientation stage with their technology use have been referred to as the “sage on the stage” (King, 1993; Mazzolini & Maddison, 2003), while those who have embraced a constructivist, student-centred approach being referred to as “the guide on the side” (King, 1993; Mazzolini & Maddison, 2003).

Evolution is possibly the stage which can never be reached, and is placed in the model to remind us that “the educational system must continue to evolve and adapt to remain effective” (Hooper & Rieber, 1995, p. 159).

2.4.4 Justification for research question two

To understand the diffusion of technology in ACU, it is important to understand the dissonance between the academics' lived experience and how the university has reported success. The data on the deployment and availability of ICT to staff and students suggest that internet connected computers are universally available on Australian university campuses with a high percentage of staff and students also having access from home. Surveys consistently conclude that students have more access to internet connected technology from home than their teachers, and that academics are more likely to adopt technology for personal use than for teaching and learning.

The universal availability of internet enabled technology has reached a point where the availability of "hard technology" could not be considered a major impediment to its use. Rogers' theory on diffusion suggests technology deployment has reached a *critical mass*, where the deployment of technology becomes self-sustaining. The pressure from academic staff for access to rooms with newer technology, and the ability to display material from the internet, would indicate that the deployment of technology and the use of technology in support of the transmission model may be self-sustaining. The self-sustaining nature of technology deployment and its predominant use in the support of the traditional mode of teaching (the lecture) point to a disparity emerging between economic and educational catalysts for change. The emerging dissonance can be viewed in terms of Sarason's (1990) *first* and *second order change*. Because personal use of ICT and its use in the production of lectures are first order changes, they do not result in fundamental organisational or learning changes. First order change as a result of technology adoption is linked to the *no-significant difference* studies, and brings into question the educational benefit gained by the significant investment in technology.

The educational catalysts for change, involving the use of technology to undertake novel tasks and to facilitate a more constructivist approach, appear to have been less successful. This reflects Cuban's observation that on the whole, second order change has been unsuccessful. Previous studies at Curtin University using Rogers'

theory of diffusion suggest that the use of technology for teaching and learning has not yet reached a self-sustaining level (Pelliccione, 2001).

Rogers' model suggests that academic staff have reached a critical mass in the adoption of information technology, when its use in teaching and learning becomes self-sustaining. Welliver's model, however, suggests that a transformation of one's teaching and learning philosophy from an instructivist to constructionist approach is necessary if sustained order change is to be achieved. **Consequently, the dissonance between Rogers' and Welliver's model leads to the second research question which is, "How do academics use ICT?**"

The first research question sought to explore academics' beliefs and values relating to **why** academics use ICT, while this question will explore **how** academics utilise ICT. Exploring **how** (academics use ICT) and understanding **why** (academics use ICT) will lead to an in-depth understanding of academics' beliefs in the importance ICT in teaching and learning, and clarify the dichotomy between the espoused importance and academics' lived experience. This dichotomy is explored by investigating how academic staff utilise ICT (at home, for administrative and teaching purposes), understanding their technology adopter categories, and identifying impediments they face in the use of ICT.

2.5 Impediments to use

The study of barriers or resistance to change is not new. Much of the early research on the adoption of (or resistance to) change has its roots in anthropology (Cuban, 1986; Rogers, 1995) with diffusion studies in education dating from the 1920's (Rogers, 1995). The rate of adoption of an innovation, or resistance to an innovation, is linked to the individual's perception of the innovation "having greater relative advantage, compatibility, trialability, observability and less complexity will be adopted more rapidly than other innovations" (Rogers, 1995, p. 22).

When specifically scrutinising the impediments to the introduction of educational technology, Donald P. Ely is widely referenced (Ely, 1990, 1999). Ely's eight factors that contribute to the successful introduction of technology innovation are: the dissatisfaction with the status quo, expertise, resources, time, rewards or incentives, participation, commitment, and leadership. Ely's eight factors have been replicated in a number of studies (Surry & Ensminger, 2003; Wilson, Sherry, Dobrovolny, Batty, & Ryder, 2001). Unlike the adoption model of Rogers (1995), Ely's eight factors do not attempt to explain the diffusion process, but rather indicate that where more of these conditions exist, the more likely the initiative will succeed (Ely, 1990, 1999). The eight conditions that facilitate the implementation of educational technology innovations have been expanded with linkages to factors that are influenced by management and leadership practices in Table 2-4 (Wilson et al., 2001).

Table 2-3 Eight conditions that facilitate the implementation of educational technology innovations

Condition	Description	Linked to…
Dissatisfaction with the status quo	Feeling a need to change.	Leadership
Expertise	Access to the knowledge and skills required by the user.	Resources, rewards & incentives, leadership, and commitment.
Resources	Things needed to make it work—funding, hardware, software, tech support, infrastructure, etc.	Commitment, leadership, and rewards & incentives.
Time	Prioritised allocation of time to make it work.	Participation, commitment, leadership, and rewards & incentives.
Rewards or incentives	Internal and external motivators preceding and following adoption.	Participation, resources, time, and dissatisfaction w/status quo.
Participation	Shared decision-making; full communication; good representation of interests.	Time, expertise, rewards & incentives.
Commitment	Firm and visible evidence of continuing endorsement and support.	Leadership, time, resources, and rewards & incentives.
Leadership	Competent and supportive leaders of project and larger organisation.	Participation, commitment, time, resources, and rewards & incentives.

(Wilson et al., 2001)

Studies of the introduction of innovations are often value laden with the view that the adoption is universally beneficial, and the decision of stakeholders to reject an innovation is then seen as resistance to change (Bollentin, 1998; Oppenheimer, 1997; Wilson et al., 2001). The value laden paradigm affirming the universal benefit of technology to education has been challenged by opposing views (Nobel, 1996; Postman, 1995); nevertheless, governments and universities still continue to invest considerable funds into the deployment of technology, with the expectation that educators will implement technology into their curriculum. When this does not occur, research tends to investigate the reasons why educators have resisted implementing the available technology (Cuban, 1999; Fabry & Higgs, 1997; Spodark, 2003). These reasons are often researched as constituting barriers to the adoption of technology by educators. Barriers to the utilisation of technology for teaching may be categorised as extrinsic (first order barriers) issues, or as intrinsic issues (second order barriers) (Ertmer, 1999).

2.5.1 First order barriers

First order barriers to change have been categorised as issues extrinsic to the teacher or lecturer. These first order barriers include lack of appropriate resources (hardware and software), lack of time, and lack of technical, administrative and training support (Ertmer, 1999; P. Rogers, 2000).

Lack of Resources

The lack of resources (hardware and software) is the most highly rated barrier at both the secondary and university level (Pelgrum, 2001; Surry & Ensminger, 2003). In a survey of 143 ACU academic staff undertaken during 2002, the lack of equipment and facilities for data projection was identified by 24 staff as the major barrier for their use of technology in the classroom (Maguire et al., 2003). This perception of a lack of projection capability was despite ACU having the same projection capability as the United States University average of 39% (EDUCASE core data service, 2002).

While the lack of resources has been reported by teachers in schools, and academics in universities, the deployment of appropriate infrastructure (hardware,

software and network connectivity) has been described as largely in place (Barone, 2001). This observation is reflected in the EDUCAUSE core data service (2002) and personal observations at ACU where all staff have multimedia internet-connected computers, with 39% of all teaching spaces having data projection capability (ITCS Annual Report, 2003).

The reported near ubiquitous deployment of technology needs to be viewed from the academics' perspective to determine if the available technology is both appropriate and located where and when academic staff need it (Fabry & Higgs, 1997; Flanagan & Jacobsen, 2003). Results for the 2002 survey in ACU concluded that only 55% of the 143 academic staff used Powerpoint, with only 17% suggesting that the lack of equipment was the major impediment to its use (Maguire et al., 2003). This finding implies that there are other impediments that are unrelated to the lack of resources. This is particularly the case as the provision of resources is considered near ubiquitous. This suggests that second order barriers may explain academics' reluctance to adopt technology within their teaching environment (Ertmer et al., 1999). This perception of a lack of resources as an impediment to the use of technology will continue to be diminished as governments and universities continue to commit sufficient technology resources driven by the underlying catalysts for change.

Lack of Time

The lack of time is a consistent theme in literature looking at the use of ICT in education (Cuban, 2001; Lan, 2000; Leggett & Persichitte, 1998; Messing, 2002). The reported lack of time refers to both the time required for training, skill development, and the time required for lesson preparation.

The time taken for the preparation of online material has been reported as three times that of traditional face to face lessons (Dabbagh, 2002). At Charles Sturt University, a survey of academic email use indicated an increase between 1991 and 2001 of 645% (Messing, 2002). This resultant increase in workload has been attributed to a 40% increase in the student/academic ratio and also as a result of email becoming the predominant way of communication with students (Messing, 2002).

In a survey rating Ely's (1999) 8 conditions that facilitated the use of technology, time was identified as the second least important noted by academic staff in universities (Surry & Ensminger, 2003). This finding of time as a barrier having a low ranking was replicated at ACU (Maguire et al., 2003), with low numbers of staff reporting time as a barrier in the use of Powerpoint, incorporating web sites into curriculum, or using email for student learning. This finding, however, was not being reflected in personal communication with staff, where time was usually mentioned as an impediment to the use of technology.

The ranking of the importance of time has been linked to the teacher's perception of the importance of technology. Where teachers perceive technology as an add-on, they are more likely to consider time as an impediment to use (Ertmer et al., 1999). This contrasts with teachers who regularly engage in professional development. These teachers are more likely to have teaching philosophies congruent with constructivist learning and the educational catalyst for change resulting in increased use of technology, despite the time required for professional development (Mumtaz, 2000). This finding suggests that the majority of academic staff at ACU who completed the technology use survey have a high perception of the importance of technology, despite its low usage.

While the time to develop online material and communicate via email (Dabbagh, 2002; Messing, 2002) has considerably increased the workload of teaching academics, there is increasing pressure for academics to produce more research publications, with promotions heavily dependent on a particular academic's publication record (Wright et al., 2004). This requirement for academic staff to both teach, and to research, produces conflicting demands for time that is not evident in the P-12 educational environment.

Where the lack of time is viewed as a first order impediment (Ertmer et al., 1999), the simplistic solution is to provide more time release to allow academic staff time to train and develop teaching material. The lack of time is not just a first order impediment, as the conflicting demand for time between teaching and research may have linkages to second order issues such as personal meaning and beliefs.

Technical and administrative support

Technical support is usually defined as the staff that are available to provide one on one support using both hardware and software. Technical support is important as it provides an environment conducive to academics using technology (Spodark, 2003). The provision of technical support is closely linked to the provision of appropriate reliable resources. Both adequate resources and technical support reduce the complexity of using technology and increase the degree of trialability making the adoption of technology more likely (Rogers, 1995).

Administrative support is closely linked to the lack of time issue. Administrative support is often seen as a way of freeing academic staff from routine activities to allow them more time to concentrate on higher order activities such as curriculum development and research.

Professional Development

Much professional development and training is premised on the belief that academic staff make connections between the use of technology and improvements in curriculum (Moersch, 1995). At ACU, 51% of academic staff linked technology usage and educational outcomes (Maguire et al., 2003). This may be an issue as many decisions by academic staff to utilise technology are identified from the perceptions of fellow academics who have already trialled the innovation (Rogers, 1995). Where academic staff view technology as an "add-on", staff development may need to address this issue as a starting point (Ertmer et al., 1999). At ACU, the major impediment to using ICT identified in a 2003 report, after the lack of resources, was inadequate opportunities for professional development: "need for support for academics to enhance their skills" (Maguire et al., 2003). While time for professional development is cited as an impediment to the use of technology (Hawley & Valli, 1999), staff who regularly undertake professional development do not identify time as a factor (Mumtaz, 2000). This paradox in the literature linking time and professional development appears to be determined by the beliefs of academic staff on the value of technology to assist learning.

As professional development is accepted as essential in the implementation of technology, Rogers' theory of diffusion (Rogers, 1995) suggests that different

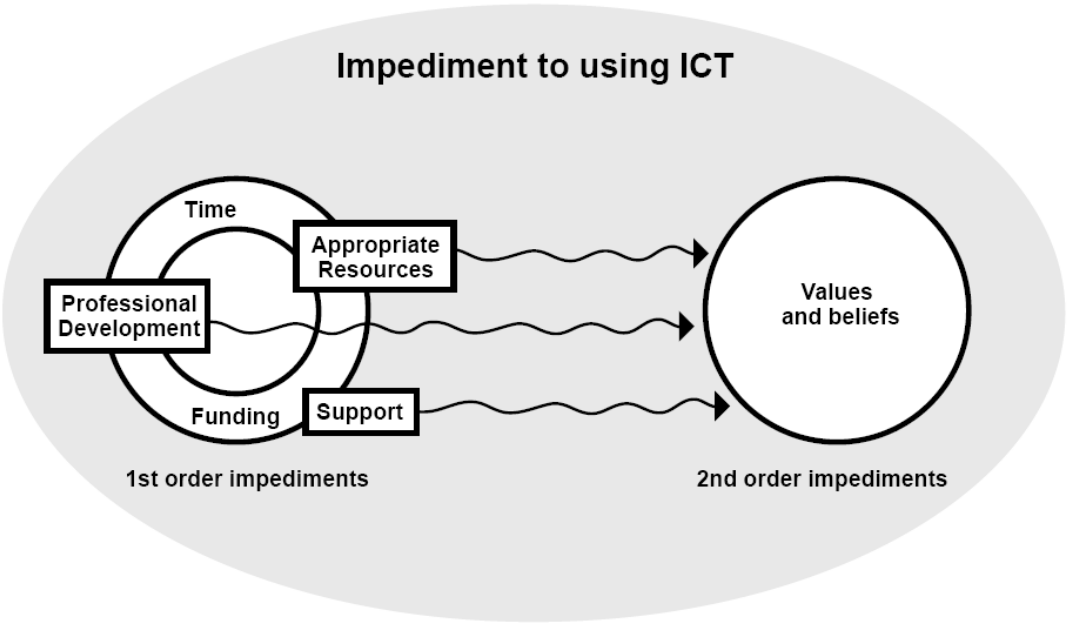
academic staff are at different stages of adoption and therefore require different support requirements, and as such one size fits all training is not appropriate (P. Rogers, 2000). The appropriateness of training is confirmed by findings that technology novices preferred to be taught basic skills before attempting to incorporate technology into curriculum (Snoeyink & Ertmer, 2001). Therefore, it is appropriate for training to be delivered at several levels, both on the application and on technology integration and design (Flanagan & Jacobsen, 2003; P. Rogers, 2000).

2.5.2 Second Order barriers

Having an enabling environment that addresses first order barriers is seen as a precondition for the adoption of technology into teaching and learning (Spodark, 2003). However, even if all the first order barriers are addressed, there is no guarantee that the teachers/lecturers would incorporate the innovation into their teaching (Cuban, 2001). Teachers and lecturers need to be convinced that their particular educational needs will be met if they are to adopt new technology (Cuban, 1986). This suggests that there be an alignment between their values and beliefs within their institution, as well as having their immediate resourcing needs addressed (Ertmer, 1999).

The belief that technology has unique attributes which may be harnessed to facilitate change is one catalyst for the introduction of technology in education (Cuban, 2001). These beliefs are reinforced when institutions provide appropriate funding, resources and technical support (P. Rogers, 2000). This linking of first and second order impediments to using ICT is represented in Figure 2-4. While recognising that the lack of appropriate resources, professional development and support, impede the adoption of ICT, it acknowledges that an individual's belief in the importance of ICT may diminish or amplify the first order impediments.

Figure 2-4 Link between 1st and 2nd order impediments to using ICT



Professional development and academics' beliefs in the capability of technology to support a learning-centred approach to education are mutually reinforced. Staff who undertake professional development reported an enhanced belief in the beneficial nature of technology (Ertmer et al., 1999). This creates a positive feedback loop where staff who believe in the benefits of technology identify the lack of time and resources as less of a barrier to the use of technology, and in turn engage in more professional development (Mumtaz, 2000).

Personal beliefs are influenced not only by institutional beliefs but also by their social and cultural environment (Merriam, 1998; Rogers, 1995). As institutions tend to allocate funds according to their beliefs and values, their allocation to resources, technical support and professional development often are linked to leadership (Wilson et al., 2001). Within ACU, this belief is espoused within the *Strategic Plan*: "Technology will be harnessed to produce the best ways of promoting student learning", (ACU, 2003b, p. 10) and prioritised in ACU's *Teaching and Learning Plan*, as "increasing the information technology sophistication of our university" (ACU, 2003c, p. 1).

2.5.3 Justification for research question three

Considering the near universal deployment of ICT, the use of technology innovation in the class and lecture room is no 'Field of Dreams'. (Field of Dreams refers to the movie starring Kevin Costner. Costner's character builds a baseball park in a cornfield with the expectation that people will come once the field is built.) This lack of use despite the available resources has been evidenced in ACU by the three online learning products; Lotus Learning Space (1997), Blackboard (1999), and WebCT (2003) that have been trialled, and reported as being less successful than anticipated (AUQA, 2002). Therefore, it is not only important to create an enabling environment, but to address the attitudes and beliefs of academic staff if technology is to be effectively adopted (Ertmer, 1999).

On the basis of Ertmer's categories of first order (extrinsic) and second order (intrinsic) barriers to the adoption of innovation, the second order issues such as attitudes, beliefs and practices need to be addressed if sustained change is to occur. As both first and second order issues are interrelated, both sets of issues need to be investigated if the barriers to the use of ICT within ACU are to be understood. As the impediments are complex and interrelated, an in-depth investigation and understanding of the impediments to using ICT are necessary. Consequently, this leads to the articulation of the third research question: **What are the barriers to the use of ICT that have been identified by academic staff?**

In researching this question, the linkages between an academic's adopter category will be explored, along with the positive conditions and impediments that facilitate or detract from their implementation of ICT. In researching academics' beliefs in relation to ICT, and understanding how they use it, their perceptions of the strengths and barriers to its use emerge. It can be expected that these findings have implications for management and leadership.

2.6 Management and Leadership Links to ICT Utilisation

The first three research questions seek to understand academics' beliefs in relation to ICT, how they are using it, and the barriers they face in its utilisation. Many of the first order barriers are related to the provision of appropriate resources, time and funds. The provision of these are management issues, with leaders in universities identifying IT funding challenges as the issue of highest priority. This issue was identified with how they spend their time, and what they need to resolve for the institution's strategic success (EDUCAUSE survey, 2003, 2004). However, US research has identified the priority issue as "assisting faculty integrate technology into instruction as the single most important IT issue confronting their campuses over the next two to three years." (K. Green, 1996-2002). Likewise, this finding has been reflected in a survey of New Zealand Principals (Selwood, 2000). These findings highlight discrepancies between IT management which tends to focus on resources, time and funding (first order impediments), as distinct from educational leaders who are focused on integrating technology into the teaching and learning process. Integrating technology requires sustained change to occur and indicates that "merely installing computers and networks is insufficient for educational reform" (Flanagan & Jacobsen, 2003, p. 125).

2.6.1 Mechanistic management approach

The findings of the EDUCAUSE survey (2003, 2004), on how IT leaders in universities utilise their time, indicate that IT leaders are operating from a control model, i.e., controlling funding and resources with little emphasis on pedagogy (R. Bates, 2001). The lack of focus on pedagogy is reflected in the introduction of technology for the pursuit of profit. This is illustrated by the universal introduction of online courses in universities (Nobel, 1999). ACU's aspirations to generate revenue from students enrolling in full fee paying postgraduate courses provided the impetus for the introduction of online learning (ACU, 2003a).

This focus by IT leaders within the higher education sector on funding and resources is a common management and government approach. The imperative is to allocate

hardware, software and network capacity at one end of the educational process, in order to produce more computer literate graduands at the other end (Cuban et al., 2001; Dearing, 1997). This is an example of a mechanistic approach. A constructivist approach, in contrast, is concerned with motivating students to come to grips with real world problems and genuine student learning (Churach, 1999).

A top-down or mechanistic approach to technology innovations is based on the assumption that academic staff will automatically use technology that has been provided, and comply with management directions on its use (Cuban, 1986; Surry & Land, 2000). While this approach has been successful in ensuring the near ubiquitous deployment of technology into universities (Barone, 2001), its use in the support of teaching and learning lags behind its use in the support of administration (Surry & Land, 2000). The considerable deployment of technology is no guarantee that educators will adopt the technology to enhance their teaching in a constructivist approach (Cuban et al., 2001; Tong & Trinidad, 2005; Zhao & Cziko, 2001): "Compliance with authority is expected in organisations. To those mandates that awkwardly fit the contours of a work setting or are inconsistent with the beliefs of the implementers, token compliance is a common response" (Cuban, 1986, p. 55).

In a top-down environment, educators may see technology more as a problem than as a catalyst to enhance the promotion of learning among their students (Aspin, 1996). From such a perspective, when viewed as a burden or as a coercion, ICT results in increased costs, as well as educators spending excessive time in developing and running programs (Dabbagh, 2002; Lan, 2000; Messing, 2002).

ACU's practice in implementing online technology has used a top-down approach, and to date, this has produced outcomes that have been described as being less successful than anticipated (AUQA, 2002). These conclusions are reflected in many universities where academics' use of ICT has not yet reached a "critical mass" (Rogers, 1995), which is required to make the use of ICT self-sustaining (Pelliccione, 2001).

The hierarchical management model with its origins in industrial thinking has delivered predictability, compliance and control in the stable environment of the past. This management style, however, "will not build organisational capacity or promote the kinds of educational change that will be necessary to prepare our students for a knowledge society" (Fink, 2005, p. 17). In the current era of rapid change, alternative approaches to management and leadership invite exploration (Fullan, 1999; Viljoen, 1998).

2.6.2 Learning Communities: a new management paradigm

The mechanistic approach emphasises funding, the allocation of hardware, software and network capacity (Cuban, 1986; Dearing, 1997). This approach has resulted in first order change, with many academic staff using technology for administrative and some teaching tasks such as email, lecture preparation, and the use of Powerpoint. This observation of technology supporting the traditional lecture, reinforces current social inequalities and does not address constructivist approaches to learning (Tagg, 2003; Twigg, 2001b). Where technology is used as in the transmission model, (Laurillard, 2002) second order change has not occurred, with academic staff remaining unconvinced of the benefits of technology in their teaching and learning: "Leaders of the old paradigm community invested a tremendous amount of time and energy in using the old rules. Consequently, they are resistant to change and less likely to look for creative, innovative approaches to new opportunities" (Twigg, 2001b, p. 3).

The lack of second order change has been linked to the *no-significant difference phenomenon* (Russell, 2001; Twigg, 2005). Not only can some of the online courses be considered under the *no-significant difference phenomenon*, they are unlikely to satisfy the economic imperatives, "because these approaches bolt on technology to traditional teaching approaches, they will fail to reduce costs and indeed, will frequently increase overall cost." (Twigg, 2001b, p. 4). This is reflected in ACU's experience (AUQA, 2002): "Despite the belief in the need for change, the action most often disappoints. Part of the problem is that you cannot solve the problem by using the same management strategies that created the problem" (Block, 1993). In order

to explain the paradigm shift required to overcome the *no-significant difference phenomenon* appropriately, an analogy is the first introduction of Automatic Teller Machines (ATM) in banks: “The first ATM was located inside banks and was available only during office hours. Bankers viewed this technological innovation as an automated teller” (Twigg, 2001b). This innovation resulted in the customer experiencing *no-significant difference* between the service they received from a teller, or the service they received from the ATM. “Real innovation did not occur until ATMs were placed outside banks and in malls, grocery stores, and airports, and were available twenty-four hours a day” (Twigg, 2001b). The paradigm change which overcame the *no-significant difference phenomenon* was the innovative way in which the technology was used, rather than using new technology in the replication of existing practices (Twigg, 2005).

Where universities have used technology to transfer traditional courses to an online format, this is not viewed as a paradigm shift, it is referred to as “web mounting” (Ellis & Phelps, 2000). Web mounting has been defined as, “where text based material is converted to html, for web based delivery without significant redesign of teaching and learning strategies” (Ellis & Phelps, 2000, p. 41). However, second order change has not reached self-sustaining levels (Pelliccione, 2001). A common belief within the educational community is that educational institutions providing technology enhanced material need to modify both the content as well as the way it is delivered (Dolence & Norris, 1995; Ehrmann, 1995; Ehrmann & Collins, 2001).

A constructivist learning paradigm needs to meet the economic, social and educational objectives, if it is to progress past the *no-significant difference phenomenon* (McDonald, 2002; Twigg, 2001b). To meet this objective, not only must first order impediments be addressed, but the values and beliefs of academic staff need to align with institutional objectives (Ertmer, 1999). A major influence on academics’ beliefs is the beliefs of their peers (Rogers, 1995).

Many educationalists appear to be “grappling with how to make best use of information and communication technologies” (Webber, 2003, p. 121). Leadership in technology is much more than merely resource acquisition and its management.

Given the complexity of schools and universities as learning organisations, technology leadership has multiple dimensions (Flanagan & Jacobsen, 2003).

Much of the literature on leadership is linked to the management of change (Kanter, 1999). Kanter contends that leaders "set the direction, define the context, and produce coherence for their organisations" (Kanter, 1999, p. 15). In a review of literature on school change, change is described as "detailed and snarled" (Fullan, 1991, p. 50). Other descriptions have described educational organisations as chaotic and complex (Fullan, 1999; Hargreaves, 1998) or as living systems (Wheatley, 1994). Extensive literature suggests that hierarchical top-down management models are unsuited to providing leadership in complex and uncertain times (B. R. Clark, 1998; Dolence & Norris, 1995; Senge, 1997; Wheatley, 1999). Moreover, "complex systems can't be adequately addressed through hierarchical structures" (Wheatley, 1999, p. 30).

The literature further suggests that an environment which collectively aligns with staff's values and beliefs is a major factor in innovations being adopted in the current era of complexity and uncertainty (Cavanagh, 1997; Kerns, 2002; Kotter & Schlesinger, 1979). Wheatley's (1999) observation suggests an alternate leadership approach, coupled with the need for collective values and beliefs supporting the use of technology in a constructivist manner. This perspective corresponds to the attributes of learning communities (Alliance., 2002).

Learning communities are characterised by a trusting and collaborate environment, where risk taking and initiative, as well as a shared vision and a commitment to professional development is underpinned by a culture of learning (Leithwood, Leonard, & Sharratt, 1998; Louis, 1998; Silins, 2002). The development of a school or university as a learning organisation would correspond to the educational catalyst for the introduction of technology.

Learning communities which foster greater collaboration between staff also foster motivation and creativity leading to enhanced productivity (Lambert, 1998). Collaboration and peer support have been linked to a greater adoption of technology

(Rogers, 1995), which in turn has been linked to greater economic prosperity (OECD, 2001), thus aligning with the economic catalyst for the introduction of ICT.

Learning organisations address these educational catalysts by delivering enhanced outcomes for student learning (T. Sergiovanni, 1996). The ongoing commitment of learning organisations to professional development (Leithwood et al., 1998) has been linked to mutually reinforcing beliefs in the importance of innovation which diminishes first order impediments such as lack of time and resources. This further enhances ICT's use within a constructivist approach (Ertmer et al., 1999; Mumtaz, 2000).

Learning communities are characterised by the shared values and beliefs of families, students, staff and the wider community (Alliance., 2002). While the utilisation of technology favours the privileged and educated in society (Rogers, 1995), this assumption is based on technology being used to reinforce existing teaching paradigms (Twigg, 2001b). Collective social values of learning communities would ensure that the unintended consequences of technologies are identified and addressed, while positive social aspects are promoted.

This belief in the need for a new management approach is not limited to the higher education sector. Senge commented that the "control and command corporate model will not carry us into the twenty-first century...and that less controlling and more learning is required" (Senge, 1997, p. 30).

The focus on learning, rather than command and control, initially has its roots in the business world where organisations were attempting to build competitive advantage through the use of knowledge workers and the creation of shared organisational knowledge. This use of organisational learning is consistent with educationalists' commitment to the constructivist approach to learning, and has been widely cited in educational technology literature (J. Rogers, 2000).

The characteristics of learning organisations are identified as:

Personal Mastery, which describes an individual's motivation to learn continually.

Common Mental models, which foster creativity and an openness to change and the unexpected.

Shared vision, which allows an organisation to build a commitment to longer term results and achievements.

Team learning, which underpins the transfer of individual learning to the wider team.

Systems thinking, which allows a holistic view of the organisation and its environment. (Senge, 1997).

While the initial literature on the need for learning organisations was focused on business, it has been used widely in the education sector (Tomlinson, 2004). This more holistic approach to managing change is suited to the education environment where academic staff are essentially knowledge workers, whose beliefs and values are essential to the technology adoption process. An evolving model having the attributes of learning communities, aligns well with the successful diffusion of technology innovations as outlined by Rogers (1995). The social and community nature of learning communities has led the education sector to refer to such communities as “Communities of Practice” (Wenger, 2000, p. 225).

2.6.3 Communities of Practice

Communities of practice describe how work, responsibility and knowledge are diffused among practitioners within and across communities (J. Rogers, 2000). The concept of communities of practice is consistent with the Rogers' Diffusion of Innovations, as both are underpinned by change occurring through social engagement. The concept of 'communities of practice' is important as organisations, such as universities, will have multiple communities of practice (Fink, 2005). It is staff members who form the community of practice which revolves around the use of technology in the support of teaching and learning that this research seeks to investigate. Other communities of practice may include the staff club, sporting groups, or groups that come together to organise campus wide activities.

Such communities of practice could be described as being present whenever "people voluntarily come together for mutual engagement and develop over time a shared repertoire of how they do things together" (Fink, 2005, p 118). The 'doing things together' creates coherence within organisations, and it is through their practice that relationships form within the community (J. Rogers, 2000). A key outcome of learning communities is that the knowledge and capabilities of the community are recognised as being greater than the sum of the individuals. The key components of communities of practice are mutual engagement, shared repertoire and joint enterprise (J. Rogers, 2000; Wenger, 1998). Parallel leadership aligns with communities of practice in that it also has the characteristics of mutuality, a sense of shared purpose and allowance for individual expression (Crowther, 2005).

Parallel leadership engages teacher and administrator leaders in collaborative action, while at the same time encouraging the expression of their individual capabilities, aspirations and responsibilities. It leads to strengthened alignments between the school's vision and the school's teaching and learning practices. It facilitates the development of a professional learning community, as well as culture building and school wide approaches to teaching and learning. It makes possible the "enhancement of school identity, teachers' professional esteem, community support, and students' achievements" (Crowther et al., 2001, p. 73).

Mutuality

Mutuality implies that there must be a means for community members to engage in shared activities or shared practice. This is a major challenge in teaching as most teachers and lecturers operate independently. "Without mutual engagement, the community resembles a network of individuals or individual groups rather than a single community of practice" (J. Rogers, 2000, p. 386). The challenge for leaders in academia is to create an environment that facilitates mutual engagement, which requires an environment of respect and trust. It is through such an environment that formal leadership and community members generate new ideas and positive outcomes. "An environment of mutual trust and respect supports the generation of new ideas and the valuing of others' expertise" (Andrews & Lewis, 2004, p. 6). "It is through these mutually supportive activities that different levels of expertise are contributed as more experienced staff provide scaffolding and support for more less experienced members" (Johnson, 2001, p. 49).

Joint enterprise

Joint enterprise allows a community of practice to extend its boundaries beyond that which had been created originally. This is linked to Crowther's parallel leaderships characteristic of individual expression. Individual expression result in outcomes which are different from those originally expected or intended by the organisation. In an Australian study of academic staff developing online material, "enthusiasm, collaboration and a sense of ownership are identified as major factors driving the change process" (Ellis & Phelps, 2000, p. 26). Enthusiasm and collaboration align well with *mutualism* and *joint enterprise*. Rogers contends that "without the sense of joint enterprise, the resulting enterprise could ostensibly be questioned as to its validity and substantiality" (J. Rogers, 2000, p. 387).

Shared repertoire

"Shared repertoire refers to the fact that there is a pool of resources that members not only share but also contribute to and therefore renew" (J. Rogers, 2000, p. 388). A lack of shared points of reference results in "an enterprise that was suspect of having any substance as members would simply be following in line" (J. Rogers, 2000, p. 388). The sharing and developing of resources result in a growth of

knowledge, skills and new ideas within the community of practice expanding the capacity of an organisation. The sharing of ideas amongst community members with less knowledgeable members seeking guidance from more experienced community members is a key indicator of the likely success of any innovation (Rogers, 1995).

2.6.4 Justification for research question four

The predominant focus by technology managers on funds and resources has led to the near ubiquitous deployment of technology within the university sector. This approach to managing technology has resulted in it being used extensively in the support of administrative processes, and by lecturers for email and in their lecture preparation. This top-down management approach has addressed many of the first order impediments to using technology; however, there appears to be a divide between the espoused use of technology in the support of teaching and learning at ACU and the observed reality. Literature used within this chapter suggests that a paradigm change is necessary in the management of technology, if we are to progress past the *no-significant difference phenomenon* at ACU. This in turn requires organisations such as ACU to consider alternate approaches to leadership.

Equally, the literature suggests that leadership approaches encapsulated in learning organisations are more suited to the current chaotic and complex environment. Learning organisations that foster communities of practice and that view the use of technology in teaching and learning in a favourable light, will create an environment that supports positive shared values and beliefs about the importance of such technology.

Consequently, this leads to the articulation of the fourth research question: **How do academic leaders promote the use of ICT in teaching and learning?** This question is important if sustained change is to occur, and the divide between espoused values and observed realities is to be bridged.

Chapter 3: Design of the Research

3.1 Introduction

The purpose of this chapter is to explain and justify the research design adopted in the exploration of the experiences of academic staff in their adoption of technology within the teaching and learning environment.

The research questions that focus on the research design are:

1. Why do academic staff use ICT?

2. How do academic staff use ICT?

3. What are the barriers to the use of ICT that have been identified by academic staff?

4. How do academic leaders promote the use of ICT in teaching and learning?

Given the purpose of this study, the researcher adopted an interpretative design to explore how academic teaching staff, who were the participants of the research, had faced issues relating to their use of technology. In order to elicit the participants' individual perspective of these issues and to gain an understanding of their lived experience, the epistemological framework of constructionism was used. Because the adoption of technology is essentially a social process (Rogers, 1995), symbolic interactionism formed the theoretical perspective through which data analysis was conducted. The link between technology adoption and symbolic interaction is expanded on within this chapter. Case study is used as the methodology. Case study complemented both the study's epistemology and theoretical perspective and enabled an in-depth understanding of the issues academic staff face with adopting technology in their natural context (Coleman & Briggs, 2002).

Table 3-1, offers an overview of the four elements which provide the theoretical framework of the research design. The subsequent text in this chapter addresses each element in detail.

Table 3-1 Theoretical Framework

Epistemology	Constructionism
Theoretical Perspective	Interpretivism Symbolic Interactionism
Research Methodology	Case Study
Data Collection Methods	Interviews: Semi-structured and structured Artefact collection Reflective Journals

3.2 Theoretical Framework

All research is underpinned by a theoretical framework. It is through this theoretical framework, or lens, that we examine the issues and questions raised within the research undertaken. As this research seeks to understand the issues faced by individual academics, as well as the implications for the wider institution, an interpretive design underpinned by a constructivist epistemology is appropriate.

The role of epistemology is to address the nature of knowledge and to provide a philosophical basis for understanding how individuals and groups of people make sense of their world (Crotty, 1998). The epistemological position known as constructionism (Crotty, 1998; Schwantd, 1997) using an interpretative perspective has been adopted. This is appropriate as this research explores the experiences of academic staff, and as the adoption of technology is essentially a social process (Rogers, 1995).

The interpretivist perspective allows the researcher to gain a sense of meaning of how academic staff have constructed events and experiences in their lives relating to the adoption and use of technology (Crotty, 1998). The in-depth study of the research problem from an academic's perspective lends itself to the methodology of a case study (Yin, 1994). This subsequently guided the selection of the participants, analysis and verification of the data, along with the consideration of the ethical issues relating to this study.

3.2.1 Epistemology: Constructionism

Constructionism is a philosophical perspective that seeks to understand how an individual makes sense of something - the process of making meaning of their world. This epistemology espouses "that meanings are constructed by human beings as they engage with the world they are interpreting" (Crotty, 1998, p. 43). Constructionism is an important lens through which to understand this study, as academic staff not only have the ability to adopt or reject the use of technology themselves, but also have the ability to influence the adoption or rejection of that technology by their peers (Rogers, 1995).

Rogers (1995) has demonstrated that the adoption of technology may be viewed as a social phenomenon, with the rate and benefit of its adoption being perceived differently by the proponents of the technology (government and university leaders) and among the participants (academics) (Rogers, 1995). This is consistent with the constructionist view that "reality is constructed by individuals interacting with their social worlds" (Merriam, 1998, p. 6). Similarly, this point is voiced by Ackerman who

asserted that “Knowledge and the world are both constructed and constantly reconstructed through personal experience” (Ackermann, 1991, p. 271).

As individual academics live and interact within different social environments, “multiple realities” (Merriam, 1998, p. 4) may emerge where academics have different perspectives of a singular event. Exploration of issues in such a context lends itself to an interpretivist approach (Merriam, 1998, p. 4).

3.2.2 Theoretical Perspective

This research seeks to explore the issues associated the adoption of technology by academic teaching staff in their teaching and learning environment. The view that technology is universally beneficial dominates western culture (Cuban, 2001; Surry & Land, 2000). It is within this cultural and social setting that the experiences and beliefs of academic staff at ACU are explored. Thus, the research is undertaken within a “value-laden” environment (Candy, 1989, p. 4), where “each of us, when we first see the world in meaningful fashion, we are inevitably viewing it through lenses bestowed upon us by our culture” (Crotty, 1998, p. 54).

Symbolic interactionism

Symbolic interactionism is a theoretical perspective that guides the research design. Symbolic interactionism “seeks to find the common set of symbols and understandings that emerge to give meaning to people’s interactions” (Patton, 1990, p. 75): “The central principle of symbolic interactionism is that we only understand what is going on if we understand what actors themselves believe about their world” (Charon, 2001, p. 206).

Three basic principles central to the concept of symbolic interactionism have been outlined by Blumer (1969) as:

(1) that human beings act toward things on the basis of the meanings that these things have for them;

(2) that the meaning of such things is derived from, and arises out of, the social interaction that one has with one's fellows;

(3) that these meanings are handled in, and modified through, an interpretative process used by the person in dealing with the things he encounters. (Blumer, 1969, p. 2 cited by Crotty, 1998)

Fundamental to an understanding of symbolic interactionism is the concept that understanding of the world, its objects and ideas, and its perceived meanings is through social interactions with others and their ideas. Patton highlights that "people create shared meanings through their interactions, and those meanings become their reality" (Patton, 1990, p. 75).

Since the purpose of this study is to explore the issues faced by academic teaching staff in their professional practice in adopting technology, an understanding of the diffusion of innovations is necessary (Rogers, 1995). The issues underpinning the diffusion of innovation as outlined by Rogers (1995) are aligned closely with the theoretical perspective of symbolic interactionism (Blumer, 1969), as shown in Table 3-2.

Table 3-2 Link between Innovation and Symbolic Interaction

Symbolic interaction (Blumer 1969)	**Innovation diffusion (Rogers 1995)**
Human beings act toward things on the basis of the meanings that these things have for them.	The innovation usually has at least some degree of benefit for its potential adopters.
The meaning of such things is derived from, and arises out of, the social interaction that one has with one's fellows.	Most people depend mainly upon a subjective evaluation of an innovation that is conveyed to them from other like individuals
These meanings are handled in, and modified through, an interpretative process used by the person in dealing with the things he encounters.	Change is not a simultaneous process, with individuals taking time to become aware of the innovation, be persuaded to adopt the innovation, implement the innovation, and finally, permanently changing their behaviour.

By understanding the perceptions of individual staff members and by understanding the issues they face in the use of technology in their teaching and learning, the gap between the espoused importance of adopting technology and the academics' experience will be highlighted. Given the purpose of this research, the use of symbolic interaction is especially appropriate.

3.2.3 Research Methodology – Case Study

This research adopts a case study approach to explore how the issues academic teaching staff face in their professional practice in adopting technology within the teaching and learning environment. The theoretical framework which guides this research is symbolic interactionism. In order to illuminate the research problem from this theoretical perspective, it is imperative to understand the research questions from each individual academic's perceptions. An in-depth understanding of the research problem from this perspective lends itself to the methodology of a case study: A case study is the method of choice when the phenomenon under study is not readily distinguishable from its context (Yin, 2003, p. 4).

Essential features of case studies are the in-depth exploration of a bounded system, based on extensive data collection, where research is conducted in its natural context (Bassey, 1999; Denscombe, 2003; Merriam, 1998). Case studies are particularly useful in examining the "how" and "why" aspects of a real-life phenomenon which can not be manipulated by the researcher (Yin, 2003, p. 20).

The phenomena to be explored in this case study are the issues academic teaching staff negotiate in their professional practice in adopting technology. This is explored through the four research questions using a range of data sources which will provide a "rich thick description" (Merriam, 1998, p. 29), as well as the "how" and "why" (Yin, 2003, p. 20) from an academic's perspective. As the academic staff reality is constructed socially, and the use of technology is essentially a social process (Rogers, 1995), it is not possible to clearly distinguish between the research problem and the context of the problem. A case study is appropriate within this research as it narrates the story of particular staff members and the issues they faced in the use of

technology. Merriam contends that in case studies, “the interest is in the process rather than the outcomes, in context rather than specific variable, in discovery rather than confirmation” (Merriam, 1998, p. 19).

The major benefit of using a case study approach in this research is to “advance the knowledge and understanding” of the issues faced by academics in the adoption of technology in their teaching and learning (Yin, 2003, p. 3). The major strength of a case study approach involves using multiple sources and techniques in the data gathering process (Denscombe, 2003; Gillham, 2000). This assists with ensuring validity or trustworthiness of the data.

3.2.4 Data gathering strategies

The fourth element of the research framework details the data gathering strategies used within this research and are shown in Table 3-2. Within a case study approach, data are gathered by interview, documents, artefact collection, and the use of a reflective journal (Gillham, 2000; Yin, 2003). The range of data sources utilised for this research are consistent with the theoretical framework. Data gathering strategies, however, need to elicit data to gain an understanding of the problem, contribute different perspectives on the issue and to make effective use of the time available for data collection (Glesne, 1999, p. 31). This study primarily utilised interviews, with artefacts being collected, and a reflective journal being kept throughout the research. These aspects of data gathering are explored in the following sections.

Interviews

While previous surveys at ACU provide an insight on what had happened in terms of technology use, these did not provide in-depth information on the particular views, attitudes, behaviours, or feelings of academics towards the use of technology in their teaching and learning (Merriam, 1998). The purpose of interviewing “is to find out what is in and on someone else’s mind” (Patton, 1990, p. 278). Because this research sought to investigate the issues faced by academic staff in their professional practice from an interpretivist approach, it was vital to understand the

issues from the perspective of each individual participant (Merriam, 1998). As individuals view the adoption of technology differently (Rogers, 1995), the interview was the major data collection strategy, as it was “the main road of multiple realities” (Stake, 1995, p. 64).

Semi-structured interviews were guided by the research questions, which allowed standard questions to be asked while allowing the researcher to “respond to the situation at hand, to the emerging world view of the respondent” (Merriam, 1998, p. 74). Prompts were used to structure the interview to ensure that the interviews had “comparable coverage” (Gillham, 2000, p. 67). The use of prompts allow every interview to be “unique and personal” (Gillham, 2000, p. 69), yet essentially covering the same questions. They allow the participants opportunities for unstructured time so that fresh insights and new information could emerge (Merriam, 1998). An interview framework below allows the researcher to “explore, probe and ask questions that elucidated and illuminated that particular subject” (Patton, 1990, p. 283). Interview prompts are provided in Table 3-3.

Table 3-3 Interview prompts

Key Questions	Prompts
Context/Background	Professional details and history as an academic
Why do academic staff use ICT?	Personal theories of teaching and how learning occurs Attitude towards technology Personal goals
How do academic staff use ICT?	ICT use in teaching and learning ICT use at home
What do academic staff identify as barriers to the use of ICT?	Training Time Support ICT facilities/resources ICT concerns
How do academic leaders promote the use of ICT in teaching and learning?	Personal goals Graduate attributes Strategic plans

The interviews were tape-recorded, transcribed, and then analysed for emerging themes. The importance of this technique has been recognised by past researchers (Merriam, 1998). The transcripts and their emerging themes were discussed with each participant at follow-up interviews. This contributed to the validation of the data collected, and facilitated an in-depth meaningful discussion with the participants regarding the emerging issues (Patton, 1990). At each follow-up interview, each participant was asked if the transcript was a true reflection of the previous interview. At that stage they were given the opportunity to make changes as they saw fit or withdraw any comment. Not one participant modified or changed any part of their transcript. The researcher also made post interview notes in a reflective journal. These notes included non-verbal impressions, and recorded aspects of the interviews that were not able to be captured on an audio tape (Denscombe, 2003).

Documents and Artefacts

Documents and artefacts were collected throughout the research period. These included university based policy documents, which provided evidence of the views of government as well as the institutional views on the stated importance of technology in teaching and learning. These documents provided a perspective on current ACU technology expectations which presented a framework against which the academics' utilisation of technology was explored. Documents and artefacts collected from the participants included course outlines, online material, and lesson plans. These documents provided an alternate source of evidence to support how they used technology in their professional practice.

Reflective Journal

Throughout this research, a journal was maintained by the researcher. It provided a personal reflection of the study's progress together with notes on each interview as well as other data collection strategies as they occurred. The notes in this journal form part of the "audit trail" (Merriam & Associates, 2002) as the data was collected.

3.3 Participants

As a case study is a bounded system (Yin, 2003), this case study was limited to academic staff, located at the McAuley campus of ACU. Limiting the participating staff to a single campus increased the depth of the case study. The study also was limited to full-time staff. The limit to full-time staff was based on the need to have a number of in-depth interviews with the participants over a period of time. By limiting the study to full-time academics, it ensured that the attrition rate of participants during the research stage was minimised.

This research took place in two stages. The stages involved "screening" and then "selecting case studies" (Yin, 2003, p. 10). The initial stage involved contacting Heads of School (HoS), regarding full-time academics they believed were using technology at various stages of the adoption process. Identified academics were

invited to participate in the research. It was initially expected that up to 20 staff would be selected from the initial screening process; however, 21 were subsequently interviewed. By having the HoS identify academics who spanned the technology user categories (from innovators to late adopters), the academics were "purposefully selected" (Merriam, 1998, p. 62) to ensure rich in-depth information was collected for this research. The selected participants ranged from all faculties and all levels of seniority. They had various levels of administrative responsibility and represented an age and gender balance, as shown in Table 3-4 and Table 3-5.

Table 3-4 Demographics of participants

Identifier	Gender	age	Academic level	Highest Qualification	Rogers' adopter category
P1	M	50-59	Lecturer	Masters	Innovator
P2	F	50-59	Lecturer	Doctorate	Late Majority
P3	M	40-49	A/Professor	Doctorate	Early Adopter
P4	F	50-59	Senior Lecturer	Doctorate	Early Majority
P5	F	30-39	Lecturer	Masters	Innovator
P6	F	50-59	Lecturer	Doctorate	Early Majority
P7	F	60-69	Lecturer	Masters	Late Majority
P8	F	40-49	Lecturer	Masters	Early majority
P9	M	50-59	Senior Lecturer	Masters	Early Majority
P10	M	60-69	Senior lecturer	Masters	Innovator
P11	F	50-59	A/Professor	Doctorate	Early Adopter

P12	F	40-49	A/Professor	Doctorate	Late Majority
P13	F	60-69	Lecturer	Doctorate	Early Majority
P14	F	40-49	Lecturer	Masters	Early Majority
P15	M	50-59	Senior Lecturer	Masters	Late Majority
P16	F	50-59	Lecturer	Masters	Late Majority
P17	M	40-49	Senior Lecturer	Doctorate	Early Majority
P18	M	40-49	Senior Lecturer	Doctorate	Early Majority
P19	M	30-39	lecturer	Doctorate	Late Majority
P20	F	40-49	Lecturer	Masters	Early Majority
P21	F	50-59	Lecturer	Masters	Early Majority

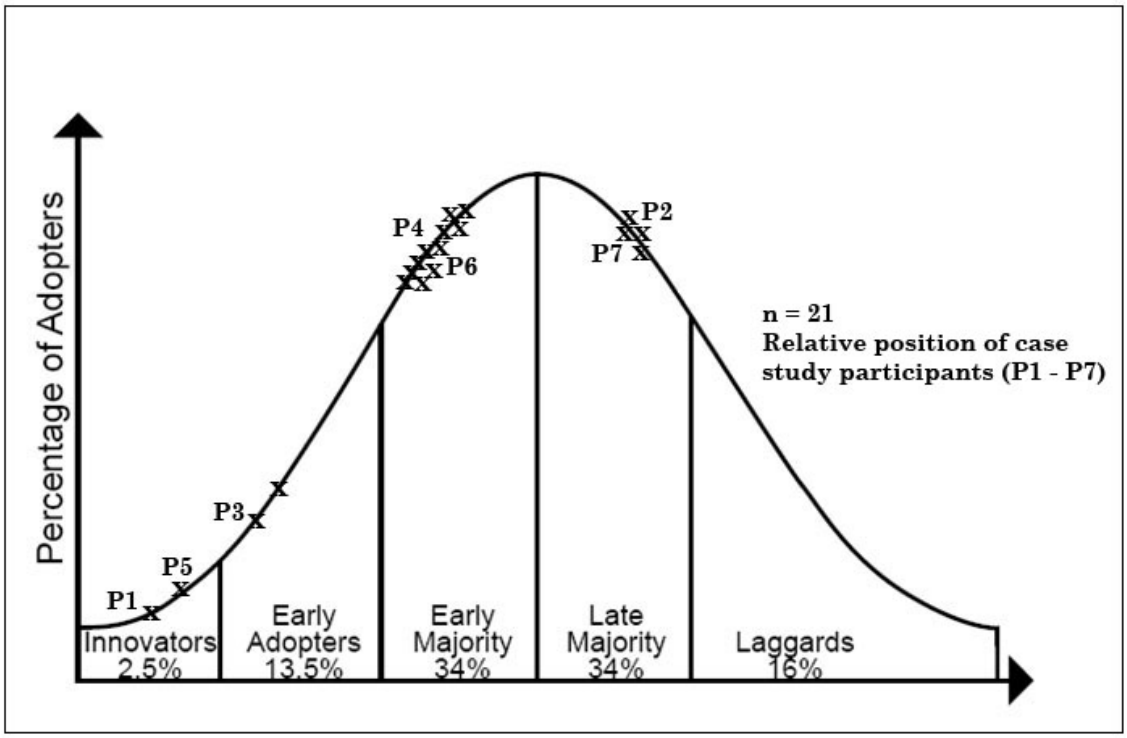
Table 3-5 Gender balance of participants (academic teaching staff)

Gender	No. at McAuley Campus	% at McAuley Campus	Number in case study	% in case study
Female	45	61	13	62
Male	29	39	8	38
Total	74	100	21	100

(ACU, 2005)

The 21 participants were all full-time permanent academic staff, spread across the three faculties at the McAuley campus of ACU. All participants were interviewed at least three times. At the final interview, staff were asked to self-select, explain and categorise where they were in terms of technology adoption using Rogers' adoption categories as shown in Figure 3-1.

Figure 3-1 Participants self evaluation on Roger's Innovations categories



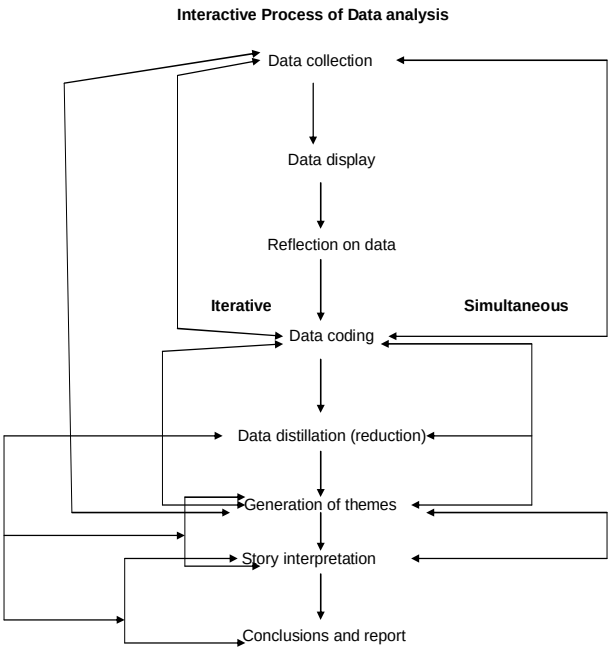
Their responses to the self-assessment, along with their semi-structured interview responses were used to cluster the participants, enabling the researcher to purposefully select the final seven case studies used. These are marked on Figure 3-1 as P1 through to P7. These seven participants represented the spectrum of technology users within ACU. This selection of participants came from a range of adopter categories, which allowed the researcher to narrate their stories in a way that allowed common, as well as different perspectives of the research issues to emerge (Miles & Huberman, 1994). These case studies are presented within the next chapter of this thesis.

3.4 Analysis of the data

The in-depth interviews were taped, and transcribed. This generated a large amount of "raw data" (Bassey, 1999, p. 70). The transcripts along with notes recorded within the reflective journal were read and re-read by the researcher (S. Taylor & Bogdan, 1998). Prompts were used to highlight the four research questions. The responses to these prompts were grouped in such a way that emerging themes were identified.

These were then used to explore additional emerging issues in subsequent in-depth interviews. The process used to analyse these data was the “constant comparative method” (Merriam, 1998, p. 159). Within this dynamic process, data collection, analysis, and interpretation occur simultaneously and interactively in order to make sense of the information gathered (Creswell, 2002, p. 257).

Figure 3-2 Representation of constant comparative method



The transcripts from the interviews were summarised into significant statements that were presented in the form of “annotations” (Bassey, 1999, p. 70). These statements are identified by Gillham as substantive statements, that is, “statements that really say something” (Gillham, 2000, p. 71). The following table (Table 3-5) illustrates the categorisation process using a portion of the transcript taken from Participant 1.

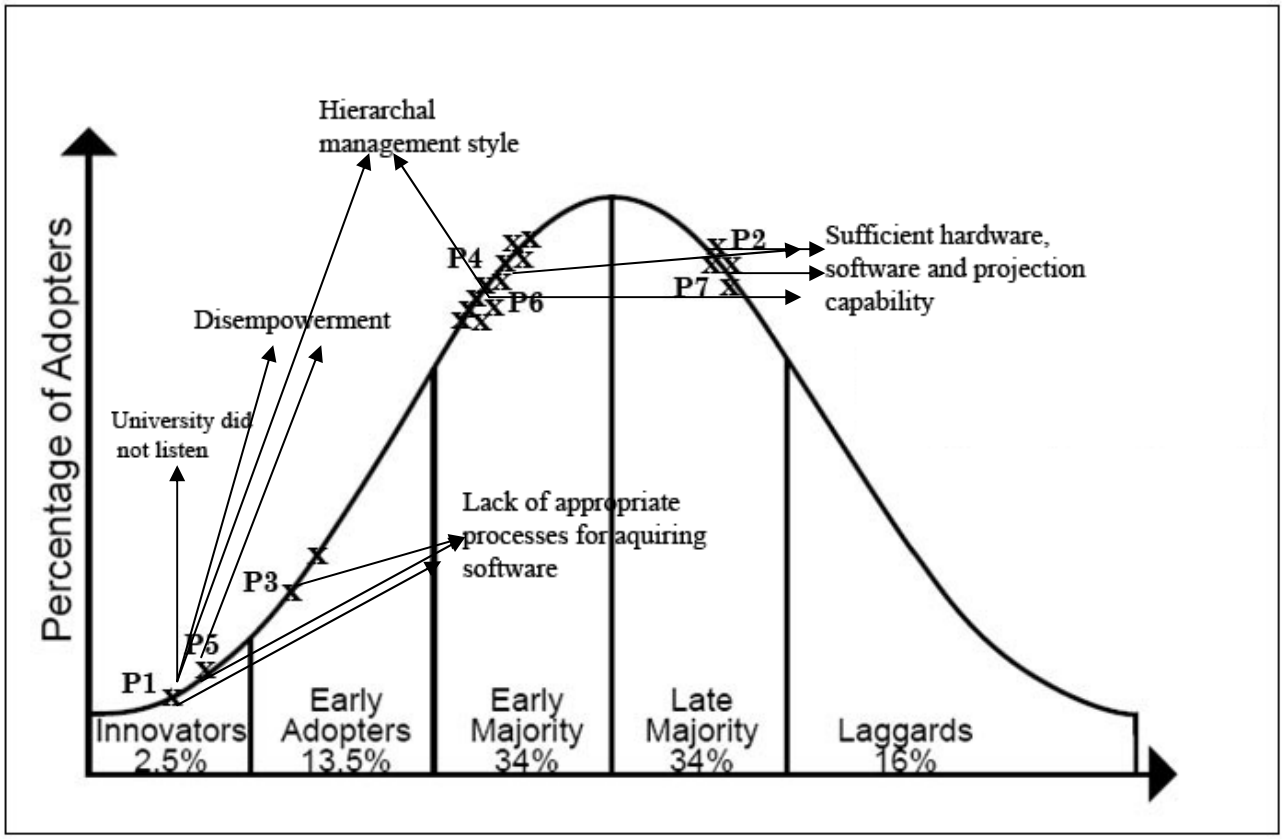
Table 3-6 Categorisation of Data – Using excerpt from interview with P1

P1 talks about his experience of the faculty ICT committee
I recall the time I was at the facility ICT committee and suggested that it might be good we should all have adobe acrobat. You know with the use of WebCT, the ability to create PDF files, and if we are talking web pages we are talking macromedia for the future. There was a very interesting scenario with the committee itself where I asked the chair whether we should have the software (adobe acrobat) for the faculty but she mentioned "but we have all got that". She had come from another university a few years ago and didn't know the difference between adobe acrobat and adobe reader, yet she is supposedly an expert in educational technology. I started to explain and ask questions but who the hell do I ask questions to, and it became extremely difficult, as everywhere I tried to go I got palmed off to someone else. So there seems to be no-one else.

The portion of the text has meaning and contains a number of themes. The researcher's observation from this section of the transcript was that, the P1 was **frustrated** that the university **did not appear to listen** to lower level internal staff and highlighted the participant's perception was that ICT committees were full of staff who lacked relevant knowledge. This raised themes of a **hierarchal management style, disempowerment** of staff, and **lack of appropriate processes** for acquiring software resources.

Over time, as the transcripts of the case studies were read and re-read, the themes were refined and confirmed or discarded when explored in the follow-up interviews. As subsequent interviews progressed, the researcher followed up the emerging themes with both the participants with whom the issue initially arose, and with the other participants to gather further information and to validate or discard the emerging themes. An example of how the themes identified from P1 (Table 3-6) were compared with other participants is shown in Figure 3-4. The graphical depiction of the themes enabled themes which were common between participants and between different technology adopter categories to be identified.

Figure 3-3 The plotting of themes between participants (using P1 as example)



This study involved multiple case studies, including both "within-case analysis and cross-case analysis" (Merriam, 1998, p. 194). The within-case analysis build a "comprehensive case in and of itself" (Merriam, 1998, p. 194), while the cross-case analysis allowed the comprehensive identification of common themes, "abstractions across cases" (Merriam, 1998, p. 195). The graphical depiction of the themes assisted in identifying themes across the seven case studies.

Table 3-7 List of emerging themes and sub themes

Academics use of technology was underpinned by a range of beliefs	
• The belief in the inherent ability of technology to promote learning	P1, P5
• That technology lends itself to a constructivist approach	P2, P3
• The ability to achieve greater efficiency in lecture preparation and presentation	P6, P7
• That the balance between work, study and family commitments could be enhanced through the use of technology.	P7
Academic staff could accurately self-access their stage of technology adoption using Roger's Model	
• Accurate self assessment	P1, P2, P3, P4, P5, P6, P7
• Critical of their peers	P4, P5
Academic's technology innovativeness could be categorised as Early Adopters or Mainstream	
• Hardware and software sufficient for their lesson preparation and lecture delivery	P2, P4, P6, P7
• Predominate technology for lectures- PowerPoint and data projection	P2, P4, P6, P7
• Insufficient hardware and software	P1, P3, P5
• Lack of process to acquire educational software	P1, P3, P5
Ubiquitous technology deployment and ongoing impediments	
• All technology needs meet	P2, P7
• Lack of multimedia resources	P1, P3, P5
• Lack of time	P3, P5
• Investment in time	P1
• Savings in time	P7
• Lack of process to acquire emerging technology	P1, P3, P4
• Lack of professional development opportunities	P3, P5
• Instructional design support	P2, P4
Participants difficulty self-assessing using Instructional Transformation Model	
• **Participants' self-perception as educators**	
Primarily saw themselves as educators	
Identified primarily with their professional	P1, P2, P3, P4, P7
• **Divergent educational practice**	P5

Guide on the side Sage on the stage	 P1, P2, P3 P4, P5
Incongruence between what the university formally communicated and what the academic staff actually experienced • Traditional on-campus courses No institutional direction • Online fee paying courses Just get it online • Incongruence in beliefs experienced through promotions system Participants who had opted out of the promotional pathway Currently undertaking Doctorate for promotional pathway Staff seeking promotion with Doctorates (and the exception)	 P3, P5, P7 P2, P7 P1, P2 P5 P4, P6 (P3)

3.5 Verification

Verification of the analysed data is often associated with the concepts of reliability and validity, as is highlighted by Merriam: “all research is concerned with producing valid and reliable knowledge in an ethical manner” (Merriam, 1998, p. 198). However, the concepts of reliability and validity of the data are most suited to a positivist approach which utilises surveys and experiments. These concepts are less applicable to the interpretative approach within a case study (Bassey, 1999; Merriam, 1998). The concept of trustworthiness is a useful alternative to the concepts of reliability and validity within case study research (Bassey, 1999; Lincoln & Guba, 1985; Merriam, 1998). Ensuring the trustworthiness of this research was an important research design consideration in the way data were collected, analysed, interpreted and finally published within this thesis (Merriam, 1998). Trustworthiness was achieved through a process of triangulation, member checks, prolonged engagement with the data sources, peer examination of findings, and the identification of any biases as a result of the researcher’s role: “This process provided an audit trail, which furnished rich, thick descriptions” (Merriam & Associates, 2002, p. 31).

The design of the research included the use of multiple sources of data, such as in-depth interviews, artefact collection and the collation of a reflective journal. The validity of this research was assured through the researcher's immersion with the data, through which the emerging issues and themes were triangulated. Data collected from the in-depth interviews were tape recorded, transcribed and coded for emerging themes. As themes occurred, from the analysis of the in-depth interviews, peer review was undertaken to ensure that any findings were congruent with the data interpretation. These themes were also referred back to the participants in order to validate them. This ensured that the observed views of the participants were consistent with the perceptions of the participants, and provided an opportunity to correct any biases that may occur as a result of the researcher's role within the university.

An audit trail of all data, how it was collected, coded and the findings were stored for review along with reflections of the researcher kept in a reflective journal. The descriptions of the findings and research context will allow other researchers to determine the transferability of this research to their situation.

3.6 Ethical Issues

As this research explored individuals' perceptions of themselves and their relationship with the organisation, ethical issues were considered in terms of how participants were selected, how data was collected, how it was collated, and how it is ultimately reported within this thesis. Bassey identifies ethical issues in terms of "respect for democracy, respect for truth and respect for persons" (Bassey, 1999, p. 73). Respect for democracy is where researchers in any democratic society can expect a certain freedom to investigate, give and receive information, and express their ideas. Respect for truth is where the researcher is expected to be truthful in data collection as well as in the reporting of the findings. Respect of persons entails recognising the participants' initial ownership of the data, and affording them dignity and privacy. (Bassey, 1999)

This research balances these sometimes conflicting issues by following an approach which gives precedence to the respect for the person, and complies with the guidelines from ACU's Research Project Ethics Committee.

Prior to the case study commencing, each participant was informed in writing that they were free to withdraw from the research at any time. Permission was sought from the participants for the taping of the interviews. Notes from the interviews were checked with the participants at follow-up interviews, thus providing the participants the opportunity to correct the record, and agree for the particular data to be used. All data collected were stored in a locked filing cabinet. As the researcher was also a staff member of the university, data collected as part of this research was only used for the purpose for which it was collected (Merriam, 1998). It is expected, however, that the knowledge gained by the researcher as a result of this research will subsequently inform practice. Throughout the research process, the participants' privacy was respected with the participants' anonymity being protected through the use of a pseudonym (Bassey, 1999).

Ethical clearance for this research was obtained from the ACU's Research Project Ethics Committee.

3.7 Overview of the Research Design

This research is designed to highlight the beliefs and realities experienced by academic staff within their actual teaching and learning. The problem invited an interpretive approach using a range of data collection methods. This allowed the researcher to gain an in-depth understanding of how academic staff constructed events and experiences in their lives in relation to their adoption of technology.

The following table provides a summary of the research design which outlined how the research questions were related to the data, the gathering tools for collecting information, and the timeline used for the research process.

Table 3-8 Overview of the research design

Timeline	Interpretive Process	Data Collection	Data Analysis
January 2003 - December 2005	- Literature Review - Identify relevance, problem and purpose of the study. - Establish a research design. - Develop research questions	- Collection of published university documents	- Identification of university documented expectations of technology
July 2005	- Ethical Approval Application submitted and approved		
January 2005 - July 2005	- Boundaries for the case are established - Interview prompts are developed	- 21 full-time academic staff are identified by their HoS as potential participants.	
July 2005		- 21 invitations to participate in the research are sent to potential participants	
August 2005 - October 2005	- Initial interview undertaken will participants - Validation of themes in light of research questions. - Follow up interview where participants verified the initial themes and self-selected on	- Semi-structured interviews commence. These were audio taped and transcribed. Reflective journal maintained.	- Contemporaneous data analysis begins and continues. Tentative themes emerge and are confirmed or disconfirmed by participants

	Roger's technology adopter categories		
October 2005 – December 2005	- Selection of seven participants for detailed case study based on their technology adopter categories	- Artefacts and documents from participants collected to support interview data.	- Themes and transcripts of the earlier interviews are verified with the case study participants. - Participants clarified comments in their transcript.
January 2006- June 2006	- Detailed case study developed for each of the seven participants.	- Each case is verified by participants and approval sought for inclusion in thesis.	- Themes represented graphically to compare abstractions across the cases.
June 2006- August 2006	- Validation of data. - Return to literature for confirmation of themes.		- Data analysis and synthesis
August 2006- March 2007	- Report key themes in Draft Findings Chapters and use key themes and literature reviewed to develop Discussion Chapter		

Chapter 4: Case Studies

4.1 Introduction

The purpose of this research is to explore the issues encountered by academic staff in their adoption of technology within the teaching and learning environment.

The purpose of this chapter is to present the research data in the form of seven case studies.

The research participants were intertwined in the way they engaged with technology in their professional practice, and within the social context in which they worked. As there is an inability to separate the context from the research problem, and given the social nature of technology adoption, a constructionist epistemological framework was adopted. Within this constructionist framework, a case study approach was adopted.

The literature review identified four major clusters of current scholarship by which the problem was understood and from which the research questions were drawn. These questions were:

1. Why do academic staff use ICT?

2. How do academic staff use ICT?

3. What do academic staff identify as barriers to the use of ICT?

4. How do academic leaders promote the use of ICT in teaching and learning?

Data collection included a series of semi-structured interviews, the maintenance of a reflective journal, the collection of artefacts, and the process of self-assessment by

the participants. The interviews were recorded and transcribed, then analysed using the constant comparative method.

The 21 participants were all full-time permanent academic staff, spread across the three faculties at the McAuley campus of Australian Catholic University. All participants were interviewed at least three times. At the final interview, staff were asked to self-select, explain and categorise where they were in terms of technology adoption using Rogers' (1995) adoption categories (Figure 3-1). They were also asked their perception of where they were on Welliver's instructional transformational model. The materials provided to academic staff were the general attributes for Rogers' (1995) Adopter Categories developed by Jacobsen (1998) as shown in Appendix 1, and Welliver's Instructional Transformational Model in Appendix 2. Their responses to the self-assessment, along with their semi-structured interview responses were used to cluster the participants, enabling the researcher to purposefully select the final seven case studies used.

Rogers (1995) suggests that a person's adopter category is important in understanding their adoption of technology. This belief is underpinned by his assertion that the adoption of technology is essentially a social process, where:

> The innovation usually has at least some degree of benefit for its potential adopters, most people depend mainly upon a social evaluation of an innovation that is conveyed to them from other like individuals, and change is not a simultaneous process, with individuals taking time to become aware of the innovation, implement the innovation, and finally, permanently changing their behaviour (Rogers, 1995).

People from different adopter categories learn about innovations from a range of sources, and choose to adopt it for different motives. By understanding the technology adopter category of the case study, participants assisted in identifying issues that impacted on the adoption of technology for academics from the same adopter category.

One or two academics were then chosen from each of Rogers' (1995) adopter categories with the exception of the Laggard category, which was not included in this study. This category was excluded from the study as it did not contribute to the adoption of technology in any observable way. The seven in-depth case studies are detailed within this chapter.

4.2 Case study P1

P1 is a male lecturer, 50-59 years old, academic level B, and is a course coordinator.

He has 37 years teaching experience, 25 at a primary and secondary level, and 12 at the tertiary level. While P1's highest qualification is a Masters Degree, he has completed six tertiary level qualifications progressively during his career. While P1 is not currently undertaking research or doctoral studies, he exhibits the characteristics of a life-long learner, being actively involved in ongoing professional development. This is exemplified by his comment regarding his most recent qualification: "A lot of professional development has fallen on my own shoulder, that's why I decided to do the Graduate Certificate on Information Systems, just to update."

He was involved with computers before the introduction of personal computers (PCs) and his first computer was an Apple IIe. Originally he was employed in both his secondary and tertiary teaching positions due to his expertise in mathematics. He has, however, moved back and forth between maths education and teaching ICT units throughout his 37 year teaching career. P1 explained that during his career, ICT now is being seen as valuable across the educational spectrum, rather than just being from the domain of the maths teacher.

He actively seeks out new information and is an active member of several professional societies that promote the use of technology in education. He was also a member of a number of faculty and ACU committees, and was nominated by a number of the case study participants as the person they seek advice from in deciding to adopt technology within their teaching, and as a source of technology knowledge and support.

P1's support for the introduction of the latest technology in education resonates with the premise that ICT offers the potential to improve the quality of education. He exhibited an excitement and passion for how he was trying to teach:

> I just want to use it to enhance the teaching I do. I want it to enhance the face to face. I want to teach, and teach as effectively as I can and here's something that will help me do that. Because you've got all the simulation software type things you can do now. There's the word-processing, drafting and redrafting has just been made so much easier for the students, they are motivated by the tools.

P1 expressed the view that if we are expecting trainee teachers to embrace a constructivist approach to their teaching, "you must not only talk the talk, but you must walk the walk". P1 commented:

> I'm currently teaching an ICT subject; however, I take a constructivist view, and students must take responsibility for their learning. And they have to be active participants in it. I'm the facilitator, and put everything up on WebCT extremely thoroughly, particularly in the ICT unit as I want to model it to them.

In using technology, P1 is constantly looking for ways to move from the traditional lecture or instructional mode of teaching to a more constructivist approach.

> Well rather than teaching in the old traditional way, just using a new tool like Powerpoint, I look at new ways of operating. For example, unless you have really dissected an animal you could never really do that in any other way. Now you have the computer model to show the dissection of the animal. The phrase, and it's not my phrase is, I try to be the 'guide on the side', rather than the 'sage on the stage'.

As well as using technology extensively in his teaching program, P1 uses ICT to support his administrative functions. He provided examples of his use of M/S Excel in his calculations of student results and is an enthusiastic user of the university's student system (Banner).

> I use spread sheets for students' results. I just have to put their results in and bingo, their results just come out including z scores. So while we are by academic regulation forced to basically follow the normal distribution pattern it

> is quite appropriate to use it…..I use Banner all the time because I'm a coordinator. I'd be lost without Banner; in fact even if I wasn't a coordinator I'd be lost without Banner.

In communicating with students, P1 uses both the students' university provided email accounts and also communicating through the university's learning shell, WebCT. His preferred mechanism is to use WebCT, as he believes it is more efficient and effective in reaching the correct cohort of students. So while he espouses a constructivist philosophy for the use of ICT for teaching, the economic imperative of effectiveness and efficiency appear to drive his administrative use of ICT: "In communicating with students I mainly do so within WebCT because in the past before WebCT was introduced, what I had to do was to email them from their ordinary email account, getting muddled up with all the other stuff."

P1's extensive and early use of technology includes the delivery of his lecture materials in an electronic format. He continually pushes the boundaries of all resources that are available in the support of his teaching program. He is known on campus as an early and heavy user of ICT resources.

> You also have the electronic reserve facility available, so I probably used it more than it was intended. I use it for all my notes and any information for the students, such as tutorials. I now use WebCT. Because we didn't have the tools, I used e-reserve far more that the library expected it to be. And then I became known in the library as quite a heavy user of it. I stretched the bounds of it, so to speak.

P1 learns about new initiatives in ICT from a range of educational sources, such as from professional societies of which he is a member, and from word of mouth: "I'm in the Queensland Society for Technology and Education, and International Society of Technology in Education, so they are the two main sources of information I guess. But also word of mouth, pestering you guys in IT."

He also actively seeks out new technology from industry sources such as advertising brochures and magazines, and endeavours to gain knowledge regarding various

products which he then seeks to utilise within his teaching: “Many different ways, word of mouth, magazines. Even advertising brochures, with all the new gizmos in them. So it makes you aware that these things exist, so I should have a go at them.”

On becoming aware of new technology, P1 not only endeavours to use the technology within the teaching environment as soon as is practical, but also reflects on its use in enhancing the constructivist approach and attempts to diminish the use of the instructionist model.

> One of the technical staff showed me the visual presenter (clip on electronic whiteboard). So I had a bit of a play, and used it with the whole group during a trial test. It was appropriate that I and the students could come out and write on the whiteboard in the 180 seat lecture room. So what I did was write on the board, but I found that many students still were looking at me rather than what was projected, as they were used to looking at the lecturer.

When P1 was asked to reflect on where his adoption of technology aligned with Rogers’ (1995) Theory of Adoption, he identified himself as an innovator, as shown in Figure 3-1. On reflecting on Jacobsen’s (1998) attributes for technology adopter categories, P1 strongly resonated with being aligned to the “pioneers and venturesome” category: “Well I think innovators being described as pioneers and venturesome describes me straight away. I’m early into things. And I give things a go even if I don’t know much about them.”

While he would appear not to have “control over resources” (Jacobsen, 1998), P1 has considerable funds accumulated in his Professional Pursuits Account, which he uses to purchase “gizmos” to support his interest in innovations that are not provided by the university. Consistent with being an innovator, much of P1’s information regarding innovations comes from outside the organisation.

Consistent with Jacobsen’s (1998) attribute of innovators “coping with a high degree of uncertainty”, and being able to “can cope with setbacks”, P1 exhibits a high level of personal belief in his ability to teach, regardless of the reliability of the technology, or the difficulties involved in learning new things.

> In terms of able to cope with a high degree of uncertainty, well I don't give up, I just try to cope with it. I get annoyed, and cranky and threaten to throw it out the window, but I persist. In terms of the diffusion process, I'm forever helping my colleagues, and providing suggestions to them and being proactive in that sense. So in terms of that model I'm definitely an innovator.

P1 clearly has the attributes of an innovator. His constructivist approach and ongoing self-reflection on how technology supports his teaching is reflected in the way that technology is fully integrated into his teaching. He was not only constantly thinking of ways to use technology, but was rethinking how things could be done with technology that were not possible through the traditional instructional model.

> The technology is absolutely essential, so I'm definitely at the integration stage. But I'm trying to do things differently, so I'm a bit at the reorientation stage…As I want to model it to them, the sort of things I'm doing. So for example assessment, I put up a range of assessment. In trying to model to them, I set up the tutes so that there could be 30 different assessments being done. I think the current group, graduate entry ones have had a lot of difficulty with the constructivist approach; however, by the end of semester, I have anecdotal data from them as they finished tutes, that they have made a lot of progress.

While P1 was very familiar with Welliver's model, and saw himself at the integration stage, moving towards Welliver's stage of reorientation. He also suggested that a better description of how he operated was as the "guide on the side".

> So the 'sage on the stage' is the traditional old teaching model where the lecturer was the font of all knowledge, whereas my approach now is really as the 'guide on the side'. I'm talking constructivist perspective. It's what I do in the IT unit particularly. Some of the students struggle with it at the start, but by the end are really firing, because they have to take active responsibility for their learning, and they have to be active participants. And I'm just pointing them in directions and guiding them from the side. I'm just the facilitator.

As a technology innovator and a heavy user of centrally provided technology resources such as those provided through the library, P1 was asked to reflect on whether the computers provided by the university were of sufficient quality and quantity. In terms of his personal desktop, he indicated that the hardware (PC) provided by the university was sufficient; however, from previous contact with P1, I was aware that he had purchased his own multimedia enabled laptop, and other additional “gizmos”, such as external hard-drives, memory sticks, and MP3 recorders.

When prompted about the computers in computer labs and library labs that were available to support his teaching, his comments suggest that access to the computers when you need them through the timetable is what is important.

> The problem is access to the computer labs when you require them, you mightn’t require them every tute. So it’s the critical times you require the labs and they are timetabled for other teaching. For example with embedding, do you request computer labs with every tute, I don’t think so. In the past, there was two hour lecture, one hour tute, we may now need a different mode, one hour lecture, one hour tute in the content area and then one hour in the lab. So you need the timetable to give you the lab when you need it, not all the time.

P1 expressed frustration with the lack of flexibility in the timetable, which appeared to block book the resources such as the computer labs for an entire semester rather than on a week by week basis which would allow P1 to book the computer labs only when he required them.

> I ran into big strife with my last group. I had to go to a lot of trouble and a lot of man hours last semester to work out something with the library which only has 18 machines, and my mixing and matching and with favours from students doing the right thing by me, we were able to run the online tests. This year I tried a different approach and put in a request and left it in the timetabler’s hands. Because I only wanted one week out of the twelve.

As P1 was an innovator in the use of technology and is an early adopter of many of the features of WebCT (ACU’s online learning shell), such as online exams, he could

foresee that the issues he had faced in gaining access to computers for his teaching activities would grow in quantum as more lecturers embedded WebCT into their courses.

> I did a survey for the school review, and last semester there were nine units using WebCT, this semester there are 29 units using WebCT. As more and more people take on WebCT and we take on embedding, it's going to become a bigger and bigger problem.

I then asked P1 to consider the software that was available. He indicated that while the general software set used for office automation such as Microsoft Office was appropriate and upgraded in a timely manner, however, the absence of specialist subject specific software was a major issue.

> The updating of appropriate software at appropriate time, I don't expect updating every version, but when appropriate. …. And the opportunity to have appropriate software purchased across the whole of our campuses….The difficulties I had trying to get very basic software recognised across the whole university. It appals me that, yes we have Microsoft Office, but still don't have Adobe Acrobat, we still don't have a concept mapping tool across the institution such as Inspiration. So how the heck do I address it, well for two years I tried and no one wanted to know about it. It's those sorts of things, how can you get to revolution if the basic tools aren't there, unless you have the system supporting you, and the hierarchy supporting you, while their preoccupation just seems to be budget, budget, budget…I think they forget those other very important values.

P1 was then asked to reflect on other difficulties he faced in using technology for his teaching. He indicated that time was an issue, and that the lack of time was one of the main reasons for discontinuing his doctoral studies. He felt that when there was conflict between whether to spend his time on research or teaching preparation, he always chose to spend his time on teaching preparation. He felt a sense of accomplishment in mastering new technologies and incorporating them into his teaching.

> People will say there is not enough time, and there has to be time to learn the software package whatever. However, it's an investment in time to allow me to get a long term benefit, so for me to do the online tests it was a huge effort, with WebCT the first semester I only tried to do a number of things as I went through. So I tell other staff don't try to do everything all at once. So the first time I just got all my unit outlines and mail tools, and next semester I then go in to learn the online tests….To get the payback you need to teach the subject a couple of times. So if it's your area of specialty, there is a high likelihood of getting that trade-off. However, with the review and the new courses, the Dean's approach with no individual IT unit on their own, embedded, I am going to lose that. We had a committee that recommended to the Dean that we still have an ICT subject in the classroom type subject early in the course, because I believe that its important to build the basic skills and then embed. And the whole committee felt this way, but the Dean said no to it.

While P1 was generally happy with the first order factors such as resources and time, with the exception of software, he was frustrated that he had provided advice on how to embed technology into courses successfully, but felt there was either no mechanism to raise issues of concern and that they were not listened to by academic leadership.

P1's frustration with institutional obstacles he faces in using technology did not appear to affect his beliefs (2nd order impediments) in using technology. His belief in the importance of technology to his constructivist approach appeared to be mutually reinforced in the professional development he undertakes.

> I think the best way of learning is to teach the stuff, you really learn it when you teach the stuff….I always put my hand up for whatever is going…Well it would be great if it was there, I would utilise it; however, I just do it myself. For example, I haven't been to do a course on Lotus Notes because they were running them while I had my winter institutes….The thing I have found with staff that are not particularly IT interested is that they have to do it (training); however, they can quickly get overwhelmed. The trouble with these courses is

> that they are so intensive, you get brain dead by the end of the day and unless there is a context, it's "P1" as I walk down the corridor and staff want a few pointers and away they go and they are happy. It's not just in my school, also in Arts I get the same thing.

What becomes quite obvious from the tone of his voice is that there is a frustration, and quiet resignation that the institution is unlikely to provide the training or professional development that he is looking for.

> There's only the personal incentive, they (the university) don't support it much. It's up to my own enthusiasm…Well because we have introduced WebCT as the course delivery tool, I've been to the workshops offered by ACU, but otherwise no, a lot of the stuff has fell on my own shoulders. That's why I decided to do the graduate certificate in info systems, just to update.

P1 was then asked what he would like to do if there were no barriers: "I would like to expand the portfolio idea, and have an electronic portfolio, using something like hyperstudio, all the facilities such as access to video cameras, digital cameras, scanners and CD burners, the ability to produce multimedia."

Following the discussion of the impediments to using technology, P1 was asked to consider how academic leaders within ACU encouraged the use of ICT in the support of teaching and learning, and what he believed they wanted him to do. He suggested that all they wanted was for lecturers to use technology such as WebCT. P1 expressed a significant amount of frustration regarding "they". When asked to clarify 'they', the response started with a sigh:

> The frustration where they spruce the language but don't put the support in terms of money where it really needs to be …Like the current Dean is integrating technology across the curriculum and I'm losing my IT units. They're talking about embedding IT in the units, and therefore the implication should be that we are all going to do the same time you know ACU National, the same program in all campuses,… subject to state legislation, …some specific differences, but not global differences, we all have the same

> program…All units offered will be the same, so if she is talking that and embedding the technology into these units then we must have access to the appropriate software/hardware, and everything that goes with it. So I think some of these people don't think of the implications.

P1 then showed me an email, where I, as the Senior IT Manager on the campus at the time, had asked the Deans at the request of several ACU staff, including P1 to consider purchasing a site licence for Macromedia. P1 was frustrated that the request had done the full circle.

> P1 → IT manager → Head of school → Dean → P1
>
> If you look at the email, you see it indicates the very concept that I have been talking about. It keeps bouncing from person to person, almost cyclical in nature, and no one takes responsibility for it. Taking responsibility as in – I'm going to make a decision about this. No, I think ultimately it should be the Deans I guess. But they need to get together and agree, that's my view on it anyway.

There appear to be two major sources of frustration, which emerged from the Macromedia email. The first was that there appeared to be no national mechanism for the decision making process regarding the purchase of appropriate software. He indicated that he had made requests at the school level, but to no avail. On asking the IT manager to pursue the issue at the faculty level, he was further frustrated as when it reached the Dean, he was then asked for his advice as to whether it should be purchased. He referred to this as the Circular Repetitive Administrative Process. He felt that he had already provided his advice, and it required a process, and a faculty decision to purchase rather than seeking further advice from the original proponent.

The second source of frustration was that the university did not appear to listen to the longer term, lower level internal staff and that the committees were full of staff who appear to lack appropriate knowledge.

> I recall the time I was at the faculty ICT committee and suggested that it might be good if we all have Adobe Acrobat. You know with the use of WebCT, the ability to create PDF files, and if we are talking web pages we are talking Macromedia for the future. There was a very interesting scenario with the committee itself, where I asked the chair whether we should have the software (Adobe Acrobat) for the faculty, but she mentioned "but we have all got that". She had come from another university a few years ago and did not know the difference between Adobe Acrobat and Adobe Reader, yet she is supposedly the expert in educational technology. I started to explain and ask questions, but who the hell do I ask questions to, and it became extremely difficult, as wherever I tried to go, I got palmed off to someone else. So there seems to be no-one else.

P1 felt he understood the problem, but felt the university did not provide mechanisms to pursue the important issues of adequate resourcing. When he raised issues with academic leaders they simply passed the issue around in circles with no-one being willing to make a decision. He felt powerless and unable to make a difference.

> The institution will give the teachers technology; however, the support and the maintenance and the upgrade of the appropriate software is minimalised. It's only if you get someone in a leadership role who recognised the role and then support it. I think most of them do not even understand the workload associated with it. They have to understand it is not quick and easy. For example, there is this perception by some that we have this course in distance mode, and because we have the course in paper materials the course can overnight be put online.

P1 felt that the push to have units online within the faculty's approach of standardisation of curricula and assessment nationally was likely to inhibit innovation.

> The institution is not at the integration stage, but is just looking at utilisation…The unit we have to offer has been created at the faculty level, and you have to implement them, or students are disadvantaged. They are now talking of common assessment items across the board. I think the commonality

of assessment is very limited by the hierarchy of the university. In Queensland, we have wrestled with the ideas of comparability for 30 odd years now, and I think some of our staff from other states don't understand the issues. So that is a driver, and assessment will drive any work that students will do in a unit. If it's set as an assessment, you can be damn sure they will do it.

4.2.1 Summary

P1 who primarily saw himself as an educator, expressed a passion for teaching and was engaged in several professional societies. He was not seeking promotion; nor was he planning to upgrade his highest qualifications from masters to doctorate level. Several of the participants looked to P1 as a source of technology information and support.

P1 self-selected as an early adopter of technology. He actively sought out emerging technologies and incorporated them into his courses. He believed in a constructivist approach to education and sought to model the constructivist approach with his students. He refers to this as 'walking the walk' and being the 'guide on the side'.

The major impediment to P1's use of technology in his teaching and learning was the lack of specialist educational software. He felt disempowered and expressed frustration at the lack of process in acquiring technology resources which were outside of the standard issue hardware and software. This process demonstrated the hierarchical management style P1 experienced.

4.3 Case study P2

P2 is a female lecturer, 50-59 years old, academic level B.

She has 30 years of teaching experience, approximately 25 years at the primary level, including a break of seven years to have a family, and five years as a lecturer at ACU.

P2 exhibits the characteristics of a lifelong learner, having started with a Dip Teach, and progressively undertaken five tertiary qualifications culminating in her doctorate. In addition to her tertiary study and keeping up to date in her curriculum area, P2 has recently undertaken a TAFE computer training course to upgrade her skills. P2's attitude to technology has until recently been one of ambivalence, and a self-perception of not being very competent with technology.

> In terms of who I am, I'm a bit of a creative type, and sitting down to do it, I do find it a bit challenging. It's not just at work, I have problems at home. Working microwaves and videos with all this high gadgetry stuff. And I think the problem is that I'm in such a rush to be getting things happening that I haven't had time to stop, and work it through…I've known in the back of my mind, that I've been ambivalent, not against it, but ambivalent. But in terms of other people getting ahead, I felt a little bit insecure then and worried about myself that I booked myself into a TAFE course so that I could actually get up to speed a bit on some of these things.

Despite "battling with technology" and a low self-perception of her ability to use technology, P2 has endeavoured to incorporate technology into all her units in an endeavour to "enhance and improve the learning experience".

When asked if ICT was important to her teaching, she said its importance could be explained from two different dimensions. These related to the world-view that students today have, and the necessity to assist students to become discerning regarding the information that is available from the internet.

> If I come from the promotion of learning with the children, and what I'm teaching the students, is that they have to tap into the kids' world, and where they're at; and they have to use technology because this is part and parcel of their world. So they do need to learn ways and strategies to use all sorts of technology; not just computers or programs or just putting kids on a computer when they've finished their work and telling them to go through a program. They also need to help children to be discerning with what they are doing, but also to help them use technology with recording and monitoring, like PDA's so they can use it as a tool to enhance and improve the learning experience.

P2 does not describe explicitly her usage of ICT in teaching as supporting a constructivist approach. However, by expressing a desire to "tap into the kids' world", it is very much a constructivist approach, of building new knowledge around their current understanding of their world.

> I believe that you need to be current, in touch with the learner's world. My philosophy is that you learn as you are going along, and are building up those skills that you need, I suppose it's my philosophy, but in trying something new you need to be able to play with it, you need to be able to work it through without having the pressure to perform it.

While P2 uses technology to support a constructivist approach to her students' learning, she doesn't see technology as having any inherent constructivist attributes by itself.

> I use Powerpoint in my lectures, but I don't rely on it as I find face to face interaction is important. I do get students to do the searches, but I get them to apply it and get them to learn from it, and I'm trying to learn from them as they are doing it.

P2's comments of encouraging the students to do the searches, and learning from them, support a constructivist approach and illustrates movement away from the traditional transmission paradigm of teaching. By guiding the students' learning and

learning from them, P2 places student learning “at the centre of the process” (King, 1993, p. 30). P2’s approach to this fits with King’s (1993) description of the “guide on the side“, rather than the “sage on the stage” (King, 1993, p. 30).

P2’s technology usage has been driven by both her previous employment, where she was provided with a laptop, and her own doctoral studies. She now leases a computer at home in an attempt to stay current with technology, but acknowledges that she is not really on top of the technology: “But in our house nobody is totally up with it. I don’t use it for the web much, I use ACU resources sometimes, but most times I do it from work.”

In terms of the use of technology for administrative purposes, P2, while having used the Banner student system in the past, has devolved it to administrative support staff within her school. She uses Excel for the calculation of results, but does not upload them herself into the student system. She is an enthusiastic user of emails, and communicates extensively with her students. Much of the communication is one to one, where she responds to students with whatever email address they use to send the request for information. When communicating with a class cohort of students, historically (pre 2005) she used to set up mailing lists; however, she is increasing using the email functionality within WebCT: “We set up mailing lists that was used for the early students, but WebCT makes that easier, and I can send the details to all the students.”

While the benefit to P2 of using WebCT’s email functionality may be one of efficiency, P2’s focus is on the improved communication with her students. She is open with her students regarding the technology learning process and her “battle” with WebCT: “My students congratulated me for using WebCT, I was born last century and I’m learning.”

Her major technology use in lectures is Powerpoint. Her focus on assisting students is exemplified by her developing two versions of Powerpoint on the library’s e-reserve system. One copy of her original Powerpoint slides as delivered in lectures and a summary version suitable for printing out slides to a page. The impression given by P2 is that she is student and pedagogy focused rather than technology focused: “The

course is online because of the need of the university to have it online. I didn't fight putting it online initially because of the technology; it was more that I wasn't convinced that it was the right medium for this particular cohort."

While P2 has expressed ambivalence to technology, she has provided examples where she has adopted technology, and continues to plan to enhance the use of technology in coming semesters: "So I've already set up WebCT with them, I want to use links and I want to use the discussion board for this semester. Next semester I'll broaden it out a little bit."

When P2 was asked to reflect on where she felt her adoption of technology aligned with Rogers' Theory of adoption, she self identified with the Late Majority, as shown in Figure 3-1. On reflecting on Jacobsen's (1998) attributes for technology adopter categories, P2 strongly resonated with being "willing to follow": "I'm willing to follow, I interact frequently with my peers. It is peer pressure but it comes from me anyway. I know I have to adopt it, and that's when I baulk at it - that's when I feel the pressure".

Some of the hesitation appears to be linked to P2's professionalism, and a concern that the standard of teaching would drop if she moved to the new technology based medium.

> As a professional there is a certain level that you need to look at, but you also need a reasonable time frame which to do that in. I don't like to do second rate stuff, and that I think has held me back with the technology, so I'm a little bit afraid of it in terms of, am I going to be able to cope. I need to be convinced and need to feel that it is safe to adopt…I try it out with my third years, who are very supportive, and I learn from them, and I've told them that I need to learn this from them, and that you'll be learning from your kids. I'm using WebCT with more confidence now and I was a Laggard on that.

On reflecting on Welliver's model, P2 indicated that she has progressed from "utilisation" (using Powerpoint and email) to integration, where she is "continually thinking of ways to use technology in her classroom."

> So over the last three months I'm rethinking on how I can use the technology. Knowing my audience, knowing my students, I could progress and there was less risk. I can now take the risk as I know the students' feedback has been great and this group is now moving on. But I really believe that I did the right thing by following my gut and not going straight online, but by building relationships and then moving forward.

While P2 is a late adopter of technology, she is actively integrating the technology in a way that supports her constructivist philosophy. This philosophy is reflected in how she learns as well as the way she encourages her students to learn. In terms of technology it is very much the "Guide on the Side" (King, 1993, p. 30) approach rather than the traditional transmission approach of the "Sage on the Stage" (King, 1993, p. 30).

> Well for the post grad course, I put down that they had to do something practical because they had to feed back to somebody, and teach others with it, and that was part of the model for the assessment piece. I didn't specify anything with ICT, it was up to them, but they have come back with that. So I'm going to use that and include it, because the feedback is that they have done things that they didn't think that they could. So there is a double pronged learning which they feel very proud of….So over the last three months I'm rethinking on how I can use the technology…..Look I've just got one of the teachers in schools to do one of my tutes in one of my units. Now she is a 'whiz bang' on this technology. So she is showing me things that she is doing, so I'll be learning from her as well, so that's good.

In an attempt to identify impediments P2 faced with the adoption of technology, P2 was asked if the hard technology (hardware and software) provided by the university, was sufficient for her needs:

> In terms of the resourcing I find it adequate at the moment, but I probably don't know enough of what's out there to be able to comment, but I've found there is enough for me to be able to use. There is still the old OHP available, if you need it. In terms of the computers, projectors, I don't have any problems with

> anything. If the students need something they can book it and I've never had any problems with that. I just have to sign the forms. I have to get the software onto the new computer at home, but I still use my little old laptop which nobody in the house is allowed to touch. The only problem is probably the audio. But I just bring my own.

From P2's comments, the support in terms of hardware and software required appears to relate to how she goes about getting the standard university software set on her home computer, rather that its availability. While the university does not provide CD/tape players, P2 did not see it as an impediment to her use of technology.

A major impediment identified by P2 was time. The issue of time was not just related to a lack of time to learn and develop technology resources, but a lack of time in general to perform her role: "I feel overloaded in terms of my teaching load, and there's the online stuff added on top to prepare in a very short time-frame, and then I am supposed to publish one paper per year in a refereed journal, and then we are supposed to do research."

In terms of time for the development of technology resources, P2 was very concerned that any technology resource was up to a professional level, and would prefer not to use technology if it was at a lower standard than delivering the course without the technology.

> Coming into this job was an absolutely sharp learning curve, and I had very minimal time to get things prepared. So I had to start fairly rapidly and work on that. I'm self taught in Powerpoint…People do have a number of pressures for change, and as a professional there is a certain level that you need to look at, but you also need a reasonable time frame which to do that in.

P2 indicated that time would be a less of a problem if there was more support. The support required was not technical support, but mentoring with regards to pedagogy.

> I find the IT helpdesk very obliging. I get embarrassed sometimes, I'm sure they have big marks next to my name. They are always obliging, they attend to any requests very promptly, and when I've had a problem in the lecture room, that assistance has come forward…However, the mentoring, help with ongoing support, we do a course and then we help each other, but the reality is that we don't have ongoing support. That's the area I find frustrating.

The frustration that P2 experienced from a lack of time is compounded by a lack of any formal institutional support for developing technology resources, and an unsupportive culture from some of her peers.

> And giving people time to be learners would be nice. I've found that those people who are right up with technology, who understand it, use it, very familiar with it, working it through and forging through the issues like P1 and the fellow who took us for WebCT are very understanding of where you are at, and are not judgmental. I find that some other academics who are using it or learning it may be quite judgmental on those who aren't doing it. It's like the person who stops smoking is very critical of the smoker, I don't know. It's the culture.

P2 was asked how she would like to be using technology, if she wasn't experiencing any of the impediments related to time, support or professional development. She expressed an interest in various technology tools, as well as on how communication could be improved.

> I'd like to know how to use WebCT, I'd like to fully know how to use the discussion board, and knowing the ways to do it, how to use the links, I like to find out ways to help the students and me use the technology so that it cuts back some work, but it actually supports what they are trying to do such as the communications and sharing the work they are trying to do. Images, photographs and things.

The responses from P2 indicate that while she is a Late Majority in terms of Rogers' adopter categories, she has a positive attitude towards using technology, but is

frustrated by workload pressures, the current professional development, and the lack of ongoing support.

Following the discussion of the impediments to using technology, P2 was asked to consider how academic leaders within ACU supported the use of ICT, and what she believed they wanted her to do. She indicated several times during each of the interviews, that "they" wanted the units online.

> I was then told that I needed to get those units online. I only had a few weeks last semester to get it on line. And I felt that it was a very unrealistic time-line. And I felt too much pressure on me. I was really concerned, I was worried, really worried that the technology was going to take over from the essence of what I was trying to do. I got a number of messages enquiring about what I was doing and they needed it online…It may have been economic and the reason they gave me was that the Dean didn't want anything going in paper form.

In terms of support, P2 felt there was initially no institutional support other than "get P1".

> They could give me time and support, the support could be formalised rather than just saying see P1. Now P1 has a very full workload. If I have a problem, I don't mind asking him; however, P1 has his work to do to, and I just didn't think that that was fair that I would have to take his time. Can I trade off some of my time for P1 or can P1 get extra pay rather than me getting a tutor. Maybe if he was interested he could help me. I tried to negotiate with them, but it just wasn't looked at.

While P2 felt that she knew what sort of support she required to run the course, she felt that she was excluded from any decision making regarding "her course".

> Things seemed to be going on all around me that I never seemed to have any say in. The Dean was talking to the postgraduate coordinator; there was no contact between the Dean and me. There were no questions of what I needed, this was just organised all around me. I was just told by the postgraduate

> coordinator that everything would be online, the Dean didn't want any paperwork. Unit outlines readings and links, everything was to be done online. That's when after a while, and I wasn't well, and I got really ticked off because I kept getting called in here for other things, and in the end I was just getting totally stressed. I was really getting stressed. I thought this is ridiculous, I haven't got time for this. I felt I owned it all and I didn't want to let it go. I worked really hard to get it going, and I had the support to get it going. Suddenly all these fingers were coming into the pie. Telling me how I needed to do it and what I needed to do. I felt quite stupid to be honest, I felt inadequate, I can't do this, so what am I going to do? I reached the point where I thought I need to get back to school (leave ACU). I don't know if I can conform to all this pressure.

P2 subsequently ran the course using books of readings, rather than having them fully online, covering some of the costs herself. On asking how it could have been handled differently, she provided insights on having a shared goal, and provided an alternate approach taken from her previous employment.

> They could give me time and support. The support could be formalised rather than just saying, see P1. I think having it as a priority on staff, so that it having as a shared goal, we are all working towards, understand we are all learning, and have a time-frame that we need to be doing this by….I worked on a project where the whole of years five, six, and seven went to technology. The desks were changed, they got computer hubs. And I was the curriculum coordinator for the school. They wanted to take this through the whole school. Teachers were supported. They were given a discount on getting computer and internet access at home. They were given curriculum support and they also had the technology support but they also had a time-frame. And they knew what they had to reach by a certain time. The time-frame wasn't a time-frame of three weeks; it was a time-frame of five years. So in that five years the teachers would be using the hub, the teachers would be using the technology in their teaching, that they would be using it at home for communication with each other and with parents. Teachers knew where they were at. They could plan it. There was pressure for change, but they could set the goal and work it through,

> rather than everybody being a bit wishy washy about it, and then all of a sudden being told you have to have this done in three weeks.

When prompted if she felt this would affect her advancement within the organisation, P2 felt that any incentives to use technology were punitive, rather than supportive.

There is a sense that I'm doing the wrong thing by doing the unit this way. But I stood my dig. It's about having it online, it's about saving the university money. You won't get promoted unless you do it. Look, I've reached where I want to go, so it's not really driving me. And I don't see that I have a long term career in academia. My focus is being up to date and on my teaching.

4.3.1 Summary

P2 primary focus was on concentrating on her discipline area and on her teaching. P2 had completed a doctorate and was actively engaged in her profession; however, she was not seeking promotion, and was not engaged in peer-reviewed research.

P2 self-selected as a Late Majority technology adopter. She acknowledged that she struggled with technology and did not see technology as important in itself, but rather it was important as it was part of the "kids' world". Her student focus aligned with her constructivist educational philosophy; she encouraged students to utilise technology and share their experiences. In this way she learnt with and from her students.

P2 reported that the standard issue hardware and software, along with its support met her requirements; however, she was frustrated with the lack of instructional support, and unrealistic time frames for converting her courses to online courses. Her primary concern was quality of the online courses when compared to the on-campus mode and believed the conversion was economically rather than educationally driven. In her struggling to comply with technology directives, she experienced negative peer support and felt excluded from the decision making process within the university.

4.4 Case study P3

P3 is a male lecturer (Associate Professor), 40-49 years old, academic level D.

He has an Honours Degree, Masters, and PhD which was completed in 1997. Until commencing at ACU as a full-time lecturer (level B) in 1993, P3 was engaged in study or part-time lecturing at three other Queensland universities. He has recently completed a Graduate Certificate in Higher Education and was promoted to Associate Professor in 2005.

He was the recipient of the ACU "Excellence in Teaching Award" and his innovative use of technology has been recognised internationally, receiving the Award for Innovative Excellence in Teaching, Learning and Technology given by the 15th International Conference on College Teaching and Learning, Jacksonville, Florida in 2004. This award recognised the development of an interactive multimedia enabled website which consists of over 250,000 words of text on over 400 topics in Literature and Drama.

The website uses the latest Macromedia Studio MX software, including Flash MX, which enables the motion graphics and sound on each of the page titles as well as the rollover quizzes and sound bites on a number of the pages. Flash MX also drives the 'soundpoems' in the text entries: 'Australia', 'Dover Beach', 'Five Bells', 'Man from Snowy River', 'Song of Myself', 'Ulysses' and 'A Christmas Carol'. The multimedia effects allowed by the adoption of this technology mean that the website is visually engaging and interactive.

P3 described his initial interest in technology as being "game driven".

I always have been a 'techno nut'. My first computer a vic20 in 1981 and then I traded up to the Commodore 64. My first IBM PC was quite late in 89. Part of that was computer game driven; I've always been a computer and videogame 'nut'.

In his professional biography, he expresses a particular interest in the use of the internet for teaching and has been making his lecture notes available on the web since 1998: “Since about 1998 I started putting a lot of the stuff on the web”.

To understand what was driving P3’s production of large volumes of web-based materials on both public web sites and on the university’s WebCT site, he was asked to reflect on why ICT is important to his teaching.

> Because I see the nature of information has obviously changed. It’s not unusual for students sitting in my class to be text messaging each other, they have telephones that do all sorts of things that even I can barely understand. Information is distributed. You don’t see yourself as a lecturer, as a holder of all the information that you are passively transmitting to a class anymore; that model of teaching is out. The information is all out there. You are a guide and people are forced into that realisation by the fact that students can go on the web and offer up information faster than you can deliver it to them…The constructivist theories are really driving my use of technology. There are papers presented that suggest that obvious link between the web and constructivism. You don’t just learn by passively absorbing information, you draw on the information you already have, making connections, and given that the web is all about connections, the web seems to emulate the kind of learning structure that you have in your brain, and maybe the parallel is just illusionary. So if I’m going to be a constructivist, the web and all sorts of information retrieval is going to be at the centre of that.

P3’s initial response suggests that to reach and be credible with today’s technology-savvy students, one must operate in their world where information is instantly available either over the phone or on the internet. He also seeks to guide the students rather than instruct them. His response, and the way his material is structured on his website, suggests that his use of technology is driven by a belief that technology lends itself to improve the quality of education and support his constructivist philosophy. P3 indicated that this philosophy was refined during his Graduate Certificate in Tertiary Education.

> Well I've done a Graduate Certificate in Higher Education at Griffith. And some of the questions there circle around how you teach and some of the theories of education. Because I didn't have an educational background I didn't know at that stage many of the theories, I found that what I was initially doing was using constructivist theory, and we also did stuff on technology and teaching.

As a result of his belief in the benefits of ICT in supporting a constructivist approach, P3 has diminished the importance of his lectures from the traditional transmission model to a much more interactive approach.

> I put my lecture notes in an edited form on the web. With a whole stack of links and that's their lecture and they should do that before coming to class. So contact time now becomes much more interactive, questions and answers. Theoretically they have done the preparation to ask intelligent questions. So I see my role as guiding them through the material there, rather than instructing them.

P3's comments resonated with the constructivist approach of the "Guide on the Side", (King, 1993). He then went on, in a reflective way, to explain how his use of technology was at times by necessity instructive rather than constructive.

> The problem with constructivism is that it is presumed they have some knowledge already. Whereas they are almost a blank slate in some areas anyway. So pure constructivism just doesn't work. So actually some of the work I do with WebCT could be considered instructionism. It's just giving them a bunch of knowledge, like the academy project is basically instructivism, and we are going to emphasise that particularly in first year. Go and read all the stuff, and gain a general knowledge of the stuff.

When P3 reflected on his use of ICT, other than his web-enabled lectures he appears to use only what he has to: "I suppose I could request Banner, but I only used it when I was the coordinator, and that was helpful". This selective approach to technology use is reflected in his use of WebCT. He is aware of many of the features that the learning shell offers; however, he has chosen not to learn them at this stage. This

approach reflects a just in time approach to learning where he “knows what he doesn’t know”, and has a feeling for when he should learn it.

> So within WebCT I know what I don’t know, I know I can email all the students from within WebCT, I actually did it once or twice. There are two aspects, there are so many tools that if you used them all you would go crazy, and second I don’t feel the need to learn some of the aspects…I don’t actually use many of the features of WebCT. I use discussions boards to discuss issues with my students. I just think you can overload the number of things you can do with WebCT. There are several things that I don’t know how to use on WebCT, but I know that I can learn them.

This discussion on what “he knows what he doesn’t know” led to how he has learnt about ICT and new innovations.

> Occasionally looking at educational technology web sites, I’m a step behind the innovators. I would call myself an early adopter rather than an innovator…I found out about Dreamweaver because there is a general legend that Dreamweaver was better than Frontpage; I tried both but I haven’t actually gone back to Frontpage, some people have said it’s quite reasonable now, but I’ve got it in my mind that it’s rubbish. Trial and error, you just get a piece of software and play with it. Well Macromedia Breeze would be an example, just going through the Macromedia suite, because they have extra tools and expansions for Dreamweaver. I keep following the news on Dreamweaver particularly, expansion packages, tools, flash and such…I don’t really think there are any technology oriented subsets of society at ACU that I know of. I’ve never seen a humanities’ department that has had a lot of social interaction. We all have our own disciplines, and on the times we have interacted, it’s been with my own discipline.

This response would indicate that P3 initially learns about technology from his peers. However, his peers are not his colleges from ACU, but virtual colleagues who share an interest in technology and his academic discipline. P3 then seeks out additional information and builds his knowledge and skills in a constructivist manner, which

would appear consistent with his constructivist approach to his own teaching: “So it’s off the web, maybe from some software catalogues, Tuesday’s Australian. So when I hear about something, I use the web to expand my knowledge”.

According to the General Attributes for Rogers’ (1995) adopter categories, P3 sees himself as an Early Adopter as shown in Figure 3-1. While P3 identified with many of the general attributes of the Innovators, he feels that he holds back from the “bleeding edge” of technology by 12 to 18 months thus, minimising his risk. P3 looks to the innovators in his field, examines what they are doing, and then selectively uses an innovation to achieve educational outcomes.

> I’m not quite as early at finding out about the technology as the people in the United States. For example, they were using blogs for a year before I heard what it was…I’m certainly not part of a clique, I don’t really know others doing what I’m doing. I tend to do things on my own. I have employment security as long as ACU has institutional security. I have personal control over my resources, as much of the stuff I have done I have done at home, using my own resources: software, computers or whatever I needed to do it. I am able to understand technical knowledge up to a point, and that stops with anything that resembles programming. I can cope with a high degree of uncertainty, and with setbacks I haven’t had an awful lot. Maybe because I’m a bit back from the bleeding edge by 18 months or two years, something like that. I haven’t got carried away with using technology for teaching, I believe in mixed mode. There was a huge investment around that in 1999, 2000, and I think it’s collapsed pretty badly.

Asked if others see him as a source of information on technology in teaching within ACU, P3 acknowledged that they did. However, he did not consider that he had actively contributed to the diffusion of technology in teaching.

> I diffuse the information to my peers when the institution asks me to do that. I’ve done a few seminars on teaching using the web or WebCT. They haven’t asked me very often, they asked me to show the academy web site. …. there just isn’t much demand because staff just aren’t using it. They will send stuff to

> e-reserve and will literally just email a word document to them. And that's pretty much the level for most people.

P3 was then asked to reflect on Welliver's model for instructional transformation. He felt that despite his beliefs regarding constructivism, much of his technology use was for information provision; however, it has been thoroughly integrated into his teaching.

> I use it for information provision, in some cases it has replaced my lectures. This is what the web has sometimes been criticised for, the passive presentation of information. Not necessarily all that interactive. So 75% of my use would be in the presentation of information.

P3 has, however, continually looked at ways to introduce new technology. His trial of blogs with his students during 2005 demonstrates his implementation of new technology.

> There is one innovation that I have tried this year. We all got a blog, which is a live journal, in Australian literature. And I allowed them to do creative work there. Write their own Australian poems. I wouldn't have done that in a written form.

While P3 self-selected at the integration stage, he is rethinking the educational goals in terms of using technology to support his constructivist philosophy.

> To some degree I'm rethinking the educational goals ….. everybody knows that there is a kind of link between constructivism and technology. Constructivism suggests that people search through things, gain their own knowledge. Technology seems to be built for that. And I provide plentiful links for that to happen. The technology just seems to encourage that mode of learning and I just let it happen. But it hasn't revolutionised many of the ways I teach.

In trying to get P3 to reflect on if his technology use was creating sustained change, P3 was then asked if he could run the course if the technology was turned off.

> Yes, you could switch it off now and it would still happen, it's web assisted rather than web dependent. It's instructional until they expand themselves. You could read them the links for the lecture. There is an argument with distance education that handouts are just as effective as web.

The dilemma faced by P3, in encouraging technology use (web, blogs, discussion boards) in his discipline area of literature, is what he really wants is for his students to read books: "Nearly all of their research is through the web now. They're not using books. In literature you still need to use books, at this library or some larger library, and they are just not doing so. They're driving me crazy".

In an attempt to identify impediments P3 faced in his use of technology, he was asked if the hard technology (hardware and software) provided by the university, was sufficient for his needs. He indicated that until his previous university computer was replaced, it was not capable of running Dreamweaver, and as a result he purchased his own computer and did his web development at home. While this did not impede his technology use, it was an annoyance. He also was annoyed that he had to buy his own copy of Dreamweaver as there did not appear to be any mechanism for obtaining software that was outside the university's standard operating environment.

> I do research at home, but mainly what I do is web construction. Up until my new computer there were things I couldn't do here. I had to buy top grade stuff to do some of the stuff at home. I got my new computer just in that past few weeks and I can now just about do anything. In terms of my old machine, I think that was replaced on a four year cycle. But if you are out of that cycle with software advances you could be stuck, and I was a bit stuck for about two years…Also software, my copy of Dreamweaver is mine. So I have purchased a lot of software myself. For the past five years the mechanism for getting software has been to go down to Harvey Norman and buy it. It's been all self-driven. I wouldn't dream of going to my Head of School and say give me a copy of Dreamweaver. It would certainly result in a nine month long circus. That's not to say that they are particularly difficult, but just budgetary constraints, and the inability to understand the way forward. An example is

> when I tried to obtain Macromedia suite for teaching purposes, having been given a unit called multimedia systems. I've found it's taken nine months to come to some sort of resolution. There isn't any decision-making capacity. There isn't a team of software people, who can say this is what we need. Any links between software and education are non-existent.

The pressures of time were a recurring theme for P3. The issue of time is not restricted to the additional time that it takes to develop online teaching resources, but time for course development in general. P3 stated that ACU's campuses operating in curriculum isolation contributed significantly to the time pressures, in what he termed "content competencies".

> I am the only literature lecturer on my campus. Given that the teaching on each campus is done in isolation from each other, I have had to develop the literature curriculum at the ACU Brisbane campus… I find that I have written 15 units since appointment, or about 1.5 per year…Developing courses is incredibly time-consuming to do. However, having said that, having done that once, they should be theoretically less time consuming to do again. To get payback in an advance unit you would have to teach it five times, and that's not likely to happen. I feel ownership and control; however, technically I don't have any ownership of any technical production here. That would be a problem here if you did distributed or shared teaching here. Someone else using your WebCT course. What the lack of time does is reduce the amount of research that I do. There is no doubt that developing technology and teaching has reduced my research.

So while P3 experiences competing pressures for his time, it has not impacted on his use of ICT. Rather he has chosen to concentrate on his teaching at the expense of his research. He indicated that while this wasn't currently a problem, he was aware that it has come at the expense of his research, which may have a detrimental effect on his career, if he was to seek employment outside of ACU.

> It's becoming a bit of a drag, the time available for research. Basically the teaching pushed out research to some degree. And that makes you more of an

> ACU centred person and lessens your links with the outside community. And that certainly has happened to me over the past five or six years. It's probably detrimental to my longer term career.

Throughout the interviews, it was apparent that P3 wanted to develop his material further with interactive multimedia, involving video. P3, however, indicated that this was at the limits of his technology expertise. This led to a discussion about how the university has provided technology based training for academic staff.

> I'm a complete autodidact; the only thing that ACU has ever offered is a farcical one day session on HTML, in I think 1997. We went for a day of HTML training, learnt how to make words on a screen change colour, and at the end of the day the guy said, well we'll see you back here tomorrow for the Frontpage training, and we said, we're not coming back tomorrow, we've only got one day training. At which he was aghast. But I did pick up Frontpage; I obtained it, when I was acting HoS for a couple of weeks, when the HoS left. I literally just bought three copies for staff members. And we just started making web pages so it's entirely self-taught. So from there I worked into Dreamweaver which I had heard about and one day could actually afford.

The conversation then moved to training for the university's learning shell (WebCT), which had recently occurred. Two issues arose regarding WebCT. The first was his perception of the "one size fits all" approach to the WebCT training, rather than addressing the specific issues which individual staff may have.

> In terms of lack of training, I wasn't overly impressed or completely convinced by the training that we had. And I think that maybe a second wave or more intimate training could well be necessary.

The second issue regarding WebCT was that P3 has started using it out of compliance. P3 had attended the initial training in WebCT and had invested time in learning the new learning shell, despite a belief that the new learning shell provided few additional advantages over what he had previously web enabled.

> I've moved from just web pages to WebCT mainly for compliance, and partly to make the administration feel better. And before that it was just flat web pages on the McAuley server. I've hardly used the library or e-reserve at all up until recently when the d-library became the only place where you could put stuff with the end of the old McAuley site. I still use that for my own web pages, but I use WebCT for my teaching stuff.

While he felt that the lack of support and training was not holding his use of technology back, he believed that as applications became more complex, there was a need for more targeted training and support.

> Support I don't really need, but training and support are what other people really need. Dreamweaver is a valuable learning tool, but it's a steep learning curve. The more value these tools are, the more complex they are, and the need for more professional training. Training is not holding me back, but I think it's holding a lot of other people back.

P3 identified what he would like to do if there were no barriers to using technology, and what institutionally would have to be addressed.

> I'd film DVD with a high definition video. Distribute DVD's with interactive technologies, or use Macromedia Breeze to teach across campuses…The real thing is a technology team, people who are switched on with the technology and what is happening with the web, and with educational technology, it would only take about two or three people who were instructional designers, but with a technical edge. Who know Flask, who know Dreamweaver, who… It wouldn't just be for me; in many cases it's very hard to do a neat flash program for literature. But for maths it's fantastic, you can do all sorts of simulations. I can think of a dozen different disciplines that could benefit, there's no reason why they couldn't build programs with a bit of advice from the lecturer. The instructional designers would have to do the programming with the lecturer providing the overall guidance on what the program is supposed to be doing. You would be getting web or flash programmers to do it.

Having indicated that he had migrated his marked up course notes from the d-library web site to WebCT out of compliance, P3 was asked to consider how academic leaders within ACU supported the use of ICT, and what he believed they wanted him to do: “The message from them is that you should be using some technology in your teaching. However, there isn’t a strategy on what that actually means.”

P3 reflected that what they actually wanted staff to do with technology lacked strategic direction. The policy was more than just rhetoric, and provided the example of his own good fortune in being promoted, and credited this to his focus on using technology in his teaching.

> The only real reward system in the university is promotion…Well I deliberately crafted a strategy around teaching, because I think that’s going to become increasingly important to the university. What I needed to do was take up the university policy, which knew that technology was important, and actually do something with it, show some concrete evidence that you can advance teaching through the use of technology. Really just doing new things that the university hadn’t thought of.

P3 was wary of using technology to push institutional boundaries. His hesitance appeared to be related to a lack of information on the institution’s technology capability, as well as his being wary of taking the initiative only to have it “dumped” on him.

> One concrete example, the head of a national school has said, why can’t we videoconference lectures that are given in Melbourne into Brisbane. Why can’t we beam them in? I don’t know; do we have the technology? That’s one of the questions I’m going to ask you. Do we? We have the data projectors; we have the broadband links, why can’t it actually happen? Why are there mysterious areas where information is completely missing? Where we do have the technology, we haven’t taken the next step in using it….Whenever I say anything, they say well you do it.

I then asked where P3 felt the problem was, and who should be driving it. He reflected on “they”.

> Well I think they are the problem. Well there is an amorphous they and we all agree that they exist. You don’t get a sense of here’s a strategy, here’s how we are going to drive it, these are the coherent parts of it. So the university invests a lot of money in technology, that’s great, but teaching on every campus there is an obvious link in the middle. Use the technology to teach across campuses, but that hasn’t taken place. Why that hasn’t happened I don’t know. I don’t know if we have a strategy, or if there are organisational constraints, whether there is great staff reluctance, whether devolved finance and counting of EFTSU’s virtually disallows it, I just don’t know.

4.4.1 Summary

P3 was recognised by the university leaders as a technology innovator and self-selected as an early adopter. He was an early user of the web for hosting his lecture notes, and had international and institutional recognition for incorporating multimedia into his online material. Having hosted his lecture notes on the web, his lectures have become more interactive. This initiative supported his constructivist approach to his teaching and learning. While P3 did not believe that technology had inherent educational properties, he agreed his constructivist approach closely aligned with the attributes of current Net Generation students.

Despite institutional recognition and promotion, P3 was frustrated with institutional support. This frustration stemmed from the inadequate standard of hardware and software provided by the university. In order for P3 to undertake multimedia projection he purchased his own hardware and software. His frustration was compounded by the inability of the university to offer appropriate information processes between educators and technology administrators.

4.5 Case study P4

P4 is a female lecturer (Senior Lecturer), 50-59 years old, academic level C.

She has four tertiary qualifications including a Masters degree and PhD. She has been involved in teaching for the past 20 years, mainly at the tertiary level. She has had a range of administrative roles including Head of School.

P4 has an extensive record of technology use for personal and administrative purposes. She was an early user of ACU's internet dial-in service connecting in 1995, and now has broadband at home which she uses extensively.

> For example, I've got a daughter getting married next year, and she rang me and said I want you to get onto the internet and look at these wedding invitations, and it was good, she was on the phone and I was on the phone and she would say what do you think of this and that. I do that sort of thing. I look up bus and ferry times. I've done overseas accommodation bookings.

P4's use of technology to support her administrative tasks is characterised by persistence, in spite of her experience of ongoing technical difficulties.

> Ever since they offered the academics the dial-up from home, I've been connected. But just recently I've found it to be too unreliable…I now use Staff Connect for my leave and stuff, and I'm supposed to look up my research budget, every time I click on it there is a glitch and none of my files come up. Every month I have to ring them and say I can't see my research funds. What has happened to the file? Every month they fix it; but when I get the email the following month the same thing happens.

While she was determined to use the systems there was a deep sense of frustration. The frustration was a result of P4's perception that the university's systems were administratively focused, and not supportive of academics or students.

> I really don't understand inet (ACU intranet site), it's very convoluted, our faculty has documents on it, and the usernames and passwords are quite different from the ones we use every day. I just find it inaccessible and very hard to use. And I don't know if we are allowed to have private space on it, and every time we have asked it is not available…For example, Banner isn't teacher friendly, its administrator friendly. It won't assign students into tutorial group, or check that it's compatible with their individual timetable. To me that is a simple task; students should be able to log on when lists become available. Select the tute that suits them and their timetable, and it happens at other universities, and students find it very convenient. They can book child care, they know ahead when they are free to work and we don't provide it.

P4 has been using technology for personal and administration purposes for many years; however, her use of technology to support her teaching has been a relatively new occurrence, as she has not always considered technology important to her teaching: "It wasn't important when I originally came here and I didn't use it all. The interesting things were in distance education and we sent printed notes. I now think it is really important, but I've learnt that."

Regardless of whether or not P4 is using technology for teaching, she is passionate about teaching. This was a recurring theme where P4 has repeatedly conveyed, "What I enjoy the most is teaching Science."

> If I go down there and it's interesting and exciting, the students and I have a great time. So it's like a little holiday, I enjoy it and that keeps me wanting to be at the undergraduate level. And it's very satisfying to take a whole group of students. But as you move up and get loading for serious administration, well then you start to work with tutors, you do lose touch, so I always like to keep a couple of those undergraduate groups going for my own pleasure, and that's why I sometimes spend all Sunday working with WebCT.

Her passion for teaching is underpinned by her beliefs in a constructivist philosophy to learning. This philosophy has been constant over her conversion to a positive belief in the use of technology in the support of her teaching.

> I have a constructivist philosophy. They have to make sense of the material themselves. That means you are trying to find out a lot about how individuals are thinking. I do a lot of hands on work; I give them time to discuss it with other people. This is where some of the self-paced stuff online helps. Particularly where there is a good website that has things they can do.

P4's constructivist philosophy clearly aligns her technology use for teaching along educational benefits; however, she sees it more as a tool for managing learning, rather than being inherently educational.

> I wouldn't so much put it as a belief, but as good management, easy access to materials, assuming students have access to ICT and students who come onto campus do. And it enables you to do little things like build self-tests for students, things like that that would be very hard otherwise.

The example of the benefits of online *books of readings* shows that the economic imperatives of effectiveness and efficiency, particularly in terms of her time, provided P4 with an incentive to use the university's learning shell.

> I still think WebCT doesn't completely align with my constructivist approach; however, if I'm prepared to put the work in we can get some good resources. The things I like about WebCT, as opposed to *books of readings*, is that once you have put in the initial effort, you can change things fairly easily. You have something that is there and you can keep altering and adjusting it, and that seems to be a fairly small investment.

Her current technology use for teaching revolves around Powerpoint within lectures, the use of the university's learning shell (WebCT) for supplementing coursework and communicating with students, the use of videoconferencing for collaboration with an American university, and the d-library (for copy-righted readings). Of these, it was P4's use of WebCT and videoconferencing that dominated her view of how she incorporated technology into her teaching: "For my teaching I basically use

Powerpoint in lectures and WebCT to manage course material. The use of WebCT is supplemental".

While the initial impetus to use WebCT for P4 was institutionally driven, and the use of videoconferencing was self-initiated, how she learnt about both initiatives was initially through other people.

> People like P1 go out and do WebCT and I come and say that looks great. I like to do those things through people. But once you get onto it, once you start, then you can do it from the system yourself…Videoconferencing came about by an email contact from an academic in America. My initial reaction was ACU wouldn't be doing that. Then I found out it wasn't really costly. Originally the American academic emailed me and said that we could do this. So I rang the helpdesk and they said we could do it. So it was an eye opener to me when he first started to talk about it.

When P4 was asked to reflect on where she felt her adoption of technology aligned with Rogers' Theory of Adoption, P4 self identified with the Early Majority, (Figure 3-1).

> I'm not an Innovator because I think I don't have the basic knowledge…I learn about things from other people. I find new things from talk in the staffroom, contact with other staff, also when you open up you can see what is there, so when I have time I tend to have a bit of a sticky beak….I found out about the videoconferencing because the guy in America used it, and he said could you do it? I asked you guys, and you said of course you can. So that's how I did it. I found out about the camera from you.

Her learning about innovations from her peers is consistent with Jacobsen's (1998) attributes with being an Early Majority; however, her peers are not limited to her work place, but include professional contacts that P4 meets at conferences. P4 resonated with the comments that the "decision to adopt is usually longer" (Jacobsen, 1998). Her explanation for this was related to issues of time.

> It's easier to do these innovative things when you have a bit of time to do it. If you are very rushed or busy, that's when you get angry and frustrated about it not working. My first attempt to use WebCT - it was just a disaster. I was course coordinator, I was just too busy. I then got a secondment to the Institute of Research, and when I had done everything that I had promised to do, I still had about three weeks, so I said why don't I get all my stuff up on WebCT; and I did it. I'm not the person who can go and do this pioneering stuff; however, once I'd done it, I was fine. You have to have the room to deal with the frustration.

P4 indicated that her biggest frustration was her own lack of knowledge, because she did not know what she did not know. And if she could find out what she did not know, then she would be able to seek out how you could get those skills.

On asking P4 to reflect on Welliver's model, she strongly resonated with the integration stage: "I'm integration; that happens when you have it all set up in WebCT".

P4 then provided an example where she was asked to be off campus for her lecture and tutorials. She used the email facility of WebCT to contact her students, and had the students undertake the lecture and tutorial activities from the online instructions. While she was trying to use this example to demonstrate how she had integrated technology into her teaching, her recounting of this experience and reflection on the outcome caused P4 to rethink the structure of the traditional tute. This points to a move from integration to reorientation.

> Well I was asked to go to Sydney for three days' training at very short notice. I did the initial panic, and then I thought hang on. I went and looked at what I had on WebCT for that week, and I said to the students, I won't be available so you won't have any classes, but you are going to do all these activities and exercises, and you are going to bring your work to the tutor at the next tute. It went very smoothly and they did great work. Then you have to think; why do I hold classes? They could actually go and do that tute themselves in their own

> time. I'm starting to rethink. I don't have to walk around a tute room all the time. They could do a lot of things themselves.

In an attempt to identify impediments P4 faced in moving from integration to reorientation, P4 was asked if the hard technology (hardware and software) provided by the university was sufficient for her needs. P4 appeared happy with the standard PC she had, and the general equipment in teaching spaces. She was concerned that schools were implementing new technology such as electronic white boards, and there appeared to no mechanism within ACU for raising issues regarding the implementation of new technology.

> I think that the thing we are going to need the most is electronic whiteboards. They're getting bigger and bigger in schools. And I think that maybe that's what's needed in the main lecture theatre. Because you can actually interact with websites, and write things, save things, I've seen a demonstration, and can't learn to use one because we don't have one in a teaching space…I think this would be really useful in tute rooms, but you need a data projector. They are quite expensive so staff would have to use them properly. At the moment they are fairly new and maybe at a stage of development, so it may waste a lot of money to use them, but I can see that maybe they are the next thing.

P4 had concerns that while the videoconferencing equipment was available (in the videoconference rooms), it was not located in the auditorium where she needed it. P4 also felt that her overseas peers were better resourced, as they were conferencing from their normal lecture rooms and labs, while she was required to arrange for the equipment to be specifically set up for each conference.

> When I have a lecture on Tuesday morning, and that's about five or six o'clock at night in Indiana. The IT staff said that they could do it. But for all the work and effort to set it up, and then you only want it for one hour. It's got to be completely dismantled until you want it again the next week for an hour.

The issue she had was software, which appeared to be related to a perceived lack of process within the university for acquiring software. She reflected that where she

had special software, such as Adobe Acrobat Writer, and Endnote, these had been provided initially by the school, and the University had to be reluctantly dragged along.

> I really appreciated getting the Adobe Acrobat Writer. I think that's a school thing, I don't think that the university provided it. And the same for when Endnotes came along, the school provided it. Then the university sort of followed.

P4 followed up with another example to show that where the university had invested in software and systems to support teaching such as WebCT, institutional constraints had limited P4's ability to use it in an innovative way. She outlined how the current management of WebCT only allows students enrolled in discrete ACU subjects to access the WebCT system. This prohibits collaboration in using this tool between ACU students and others. This comment reaffirmed P4's belief that the university's computing systems are administratively focused rather than to facilitate teaching.

> What I want to know now is how I can set up some online discussions with my students and student teachers overseas. ACU's not really coming to the party there at all. So our students are going to have to log on to the internet and log on to an American university to join this discussion. It's the only way I could do it. That's because WebCT doesn't support non-ACU students. And for us that's an issue with a lot of things. For example, it would be very useful to have a WebCT site for field experience, but because students aren't going to be enrolled in field experience, so it can't be set up; whereas it would be very useful to get our school office to send a list through and say, these are all the students doing field experience, and have all the materials up there, teachers out there should be able to log on to our web page and get the material they need.

Another frustration experienced by P4 was the lack of time.

> The time taken to learn about new packages provided by the university, and stay on top of them…I should be using NVivo, but I'm not using it. SPSS is

> another one I'm not using. I keep losing the plot. The problem with NVivo is I went on the initial workshop, I spent a lot of time putting in research reports and interviews, and things on it then I got too busy. It's been a couple of years and now I've forgotten how to do things. ..So I really need to go back…The time taken, in the case of the university's learning shell, to develop suitable coursework material…Initially when you are a beginner, it takes an enormous amount of time to learn how to use it properly, and you have to make a decision, are you going to pick up this skill, am I going to learn how to use this or will I just do what I'm already doing. But when you do learn to do new things I find them very helpful, it's just that time in the beginning, there is a cost.

The pressure of time for P4 is such that she has made advances in using technology for her teaching only when she has had time release from her normal role. While P4 had attended introductory in-house courses in WebCT, she did not start using it until she had some "spare" time.

> I got some study release time, and at the end of that I had done what I had wanted to do so I sat down again and started to teach myself WebCT. With WebCT I just started by making my notes available to students. But then as each time I've used it I've used something new. I find the online help quite good.

While P4 is routinely placing course work on WebCT, she states that there is no ongoing curriculum support. The large amount of preparation time required initially to get a course online and the lack of support has focused P4 on using WebCT where she has some certainty that she will be teaching the units multiple times.

> It's not the hardware support, it's the curriculum support that is missing. Who's going to load all these documents onto WebCT? Who's going to design the page? That's quite good fun, but it's very time consuming and an expert would do a better job than I do. So if I had that type of support, it would make the transition easier. I've just put a test onto WebCT and it took me three or four days really of work to get it there. I'd have appreciated some help with getting it there, but there isn't any. If you want it up there you have to put it there

> yourself…it's a trade-off with your central subjects that you teach all the time. I think we could do more with the Doctor of Education students in terms of online stuff, but it tends to be less settled in terms of who is teaching what. So it hasn't been set up as much as I'd set up my face to face science.

The other issue raised regarding time was the timetabling of professional development within the university. While P4 attempted to attend all technology based professional development offered by the university, her teaching and other work commitments prevented her from attending many of these courses.

> I go to everything that ACU puts on. I've been trying to get onto one on Nvivo, but the last two times it was scheduled I couldn't come. And we've had the guy from the University of Melbourne talking about assessment; the only problem is that they can be scheduled at a time when you are not here or are somewhere else.

The underlying issue that appeared to create the time pressure for P4 was a conflict between using technology (WebCT) to support and improve her teaching and the need to undertake and publish research to assist her in being promoted.

> Time is the worst one. Because there are so many things you have to do and you're not going to get promoted because you tell someone you have your notes on WebCT. You would be better off writing research papers. So when you are on the brink, you focus on what is going to help your promotion…What the university wants me to do is more research and more administration. And yeah I do that too; I really like teaching and they need me to teach. It's just that when they go to do promotional stuff; they won't acknowledge it. They need it as the bulk of their students are still undergrad. Our status in the university world is in teaching and learning.

Apart from attending in-house courses, P4's major source of professional development is attending conferences in her subject area.

> I regard my conference attendances as professional development. Things about teaching and science and how people are doing things. I went to one on pedagogy in Singapore and I've just come back from the teacher education one by the International Society of Teacher Education, that ACU in Sydney sponsored. You pick up a lot about what is happening and what other people are doing…When I go to conferences I often don't go to the IPT ones, so I tend to work at my own pace. I print out conference papers from a recent conference I didn't attend, and I did take down an IT one. It's not an area I write in so I propose, when you go to conferences that is what you are thinking, you want to see what other people in your area are doing.

Despite her comments about not attending presentations on technology at education conferences, her use of videoconferencing was a result of contacts she made at a conference. P4's conference attendance extended her peer base, and it is from her contacts that she initiated her use of video conferencing for science education.

While we had been discussing impediments to using technology, the communication features of the university's learning shell (WebCT) was seen by P4 as a major incentive in using technology. The first example again reflects the administrative use of technology to improve communication between the lecturer and a cohort of students.

> Simple things, like if I want to send a message to students, I don't have to worry about remembering it in the lecture. I simply use the home page of WebCT and what I do is change the colour, so students know if they open it up and it's green, rather than blue that there's a new announcement there. So I just clean that up and like they are coming in next week. It's the first week of lectures and then they are going out to prac. So I've put up an announcement saying that the first lecture is vital. And before the 22nd of July you have to have A, B, and C done because they are actually going to collect some data while they are out on prac. So in the past you would have to send a letter or just keep your fingers crossed that they would turn up. Now you know that everybody knows.

P4 then provided another example where she had used WebCT to manage complaints regarding student group work. Here the focus on the technology appeared to be the documentation of group participation, rather than educational outcomes from the process.

> I get students' groups to register their discussion of what ideas they are going to discuss for the project online because last year a couple of students came and said, "people in my group didn't contribute". I said "get online, register it as a discussion, then if I see that someone only got into it in the last week. What you are saying is supported". Now some of them choose not to use it. But the effect was that none could complain that the group didn't operate. It gave a record of the discussion and when the item was put up.

When asked what she would like to be doing with technology in teaching if there were no impediments related to resources, time or support, she stated;

> I want to have my own website. And I've never had any in-service at all on how to set up a website. Although I would like a designer to do a good one for me, I still want to be good enough to alter it and keep it up to date myself. Because the problems with websites are that when they are three or four years old, there is nothing new on it. I like to have one with my current papers on it. Maybe some links for my students, but that's not available and I don't know how to do it. I'd be quite happy on my website to put up material for teachers in the Catholic school system. These are the lectures; this is the type of things that we are doing at uni now. If you want access to them come and use them.

After having provided an example where technology could be used to facilitate the education process, P4 continued on to explain how a website could result in improvements in the management of field experience. The example given was mentioned earlier as a frustration at the ACU imposed administrative limits of WebCT. P4 appeared to have given up using the learning shell to address this issue, and was looking at alternate technical possibilities rather than addressing ACU's administrative procedures.

> If we had a website, ACU field experience QLD and we had, the Catholic schools, state schools, and Lutherans could all log in, and our students could log on. To me it would be great. We would keep it up to date; make sure all the documents were the right ones. I think that they are the types of things that make life smoother.

I then asked what the university would have to do to make this happen, P4 believed the only process was to seek approval from the PVC, Academic Affairs.

> As I understand it, the PVC, Academic Affairs has to approve it as a priority, and there are so many other priorities in the university that I'm probably not knowledgeable to know how we get this done. There are probably things that are more important, but these things would be very good.

P4 then returned to the issue of conflicting time pressures between teaching and research, and how the university leaders did not really understand how ACU is principally a teaching university and they needed her and others to teach and not be 'sidelined' into research. This frustration appeared to be the result of her passion for teaching, and her belief that the institution did not share her belief in the importance of teaching.

> They have to be careful they don't go the way of some other universities, where the really good teachers get sidelined into research. I think it's a structural thing; we are all like satellites a long way from the centre. And it's very hard to get the importance of it through….My view, and it may be incorrect, but by the time people get onto academic board, and become PVC or VC they are a long way removed from the teaching coal-face. If I was in one of those positions, I know I would be further away from current practice than I am now. It's also a hierarchical thing. The people coming up to speed with it, and are teaching, are usually your junior staff. When you move up what you leave behind is your teaching. Your research and management become more and more important, you're not skilled up yourself and you don't know what's out there, and it's quite difficult. We've had one recent senior appointment of someone who is ICT smart. But how long that takes to filter through, that wasn't at the professor

level, so they're not on faculty board. So decisions are being made by old people whose teaching experience is way back.

4.5.1 Summary

P4 self-selected as an Early Majority technology adopter. Having both a teaching and administrative role, P4's technology use covers the entire range of technology provided by the university. While she is not a technology determinist, she believes the online and web material improves course management and supports her constructivist philosophy.

P4 reported that the standard issue hardware, software and technical support met her needs. P4 was contented with the current allocation of technology available to staff. While not personally requiring interactive white boards, she appreciated that others may require them in the future. The major impediment P4 experienced was lack of time, and the absence of curriculum support.

The lack of time and curriculum support was related to the conflict P4 experienced between her choice to focus on teaching and the university's promotional requirements of generating peer-reviewed research. In attempting to address both goals, P4 believed that instructional design and curriculum support may offer additional time for her teaching and research. This conflict is compounded by P4's beliefs that the university's systems are administratively rather than educationally focused.

4.6 Case study P5

P5 is a female lecturer, 30-39 years old, academic level B.

She has four years lecturing experience. All of her lecturing experience has been at the undergraduate level, teaching traditional face to face lectures. Prior to lecturing at ACU she worked part time as a laboratory instructor. She is a registered nurse, has completed a Masters degree, and is currently enrolled in a PhD degree.

She sees herself primarily as a nurse, with her role in education as a secondary one. She continues to strive to improve the quality of her lectures, and continues to try new approaches where she feels she can improve.

> First and foremost I'm a nurse, and education has come second. So I'm probably deficient in education principles; so I'm doing a lot by trial and error. Having in the past not being as successful as I wanted to get concepts across I just stumbled onto area by trial and error. It's not a philosophy per se. I just wanted to get the concepts across. The beneficial effect is that technology will get the point across much easier.

There appears to be two driving forces behind her use of technology for teaching. The first is her belief that there is insufficient time in the current course to provide students with enough time to learn and practise clinical skills. P5 believes that technology can be used to provide instruction on clinical processes outside of the timetable so that students' contact time can be maximised for clinical practice.

> Well the structure of the BN in the current curriculum doesn't give us enough face to face teaching time for clinical skills as really I feel is necessary. So last semester, I produced a CD of skills and linked that to the weekly training and the weekly content. It meant that we didn't have to spend an hour of the time that they were meant to be practising in me demonstrating. They could have watched the CD which showed a video of me demonstrating the skills and then

> they could spend the whole two hours prac time as purely practising skills. So that's how we use it clinically.

The second reason for the attractiveness of using technology is that it has inherent properties, particularly in the multimedia area, that facilitate the teaching of difficult concepts in science, particularly to students with low basic knowledge of science concepts.

> In science, I have really significant difficult concepts for them to understand. And I use animations within Powerpoint to portray really sophisticated difficult concepts that they need to understand to support their nursing intervention. I just think it makes teaching a hell of a lot easier. It really is quite difficult in some of the things I teach, difficult concepts for people to understand particularly if they haven't done basic science.

P5 views herself as a major user of technology. At home she is connected to the internet, uses email, library online databases, and develops multimedia resources using macromedia. Her multimedia development occurs at home, with P5 purchasing her own high-end computer, digital video camera, and multimedia software.

> I'm a big user at home, I used to go through a lot of computers and only in the last 12 months I've decided that this is ridiculous, now I lease. I can get top quality. So I've now got a lovely matrix monitor, the type people use as TV's, and a high end multimedia computer that enables me to do a lot of the extra things that I had tried to do on lesser quality computers in the past….I use the e-library, the databases solidly.

P5 uses technology at work both to support her administrative functions and for the preparation of lectures. She communicates with her students with both their ACU provided email account and from within WebCT. While she doesn't actively discourage her students from using their ACU email account for communication, the preferred method of communication with her students is using the email and bulletin board functionality of WebCT.

> Yes, when I email my students I do it from within WebCT because
> (a) the issue of some students not having emails, and
> (b) getting the crap from the hotmail accounts. By using the WebCT email, I can control the volume I suppose.
> I don't tell them not to use the standard ACU account, but I do find they communicate with email and they tend to communicate more with the bulletin board I have set up.

P5 went to explain an unintended educational benefit of using the bulletin board, in that it allows students to ask questions that they may not have asked directly in a lecture or in an email. This reinforced P5's belief in technology's educational benefits.

> And I have discussion boards that I have set up for each of the subjects that I teach, and I get a lot of generic questions there, as students tend to be concerned at putting their name to a question, because they think that I may think that they are stupid. Not that I have, well I hope that I have never led them to believe they are stupid.

In supporting her administrative functions, she uses Staff-Connect for managing her leave arrangements; however, she does not use ACU's student administration system (Banner). When prompted on why she did not use Banner, the reason was related to her level in the organisation rather than any unwillingness on her part to use it: "I have no position of responsibility; I'm probably the lowest of the low here. So I'm not using Banner."

P5 is seen by all participants within her school as being highly innovative. This is evidenced by the production of a multimedia training CD called "Lab Skills". The CD is self-installing, and includes all the tools necessary for students to run the multimedia applications from a standard XP computer. The CD was predominately produced to display standard clinical procedures that students were required to master as part of their course requirements, such as "gowning and gloving, and the operation of infusion pumps". All equipment used for the production of the CD, the

digital video recorder, editing software, and the computer hardware, was personally purchased by P5. At the time of the interview, I was not aware of any other staff member within ACU producing this type of multimedia training material for student use.

When P5 was asked to reflect on where she felt her adoption of technology aligned with Rogers' Theory of Adoption, she self identified as an innovator (Figure 3-1). On reflecting on Jacobsen's (1998) attributes for technology adopter categories, P5 strongly resonated with being "Able to understand and apply complex technical knowledge to their field" and "Able to cope with a high degree of uncertainty". While P5 is currently on probation and has had her probation extended, her current lack of career security did not appear to impact on her enthusiasm for using new technology in her teaching. While control of resources is one of the attributes usually attributed to people who identify as innovators, P5 felt she has no control over university provided resources. In order to develop multimedia applications she has had to buy her own technology resources. It was in buying her own digital video recorder, editing software, and multimedia computer, that gave her any sense of control over resources: "the digital video recorder, I had to purchase that myself".

P5 also did not see herself as "usually part of cliques - others who share their interests", another common innovator attribute. Throughout the interviews I sensed a feeling of isolation, which was reflected from her responses throughout the interview. Despite giving the impression of frustration at being alone with her innovative use of technology, she commented on the good working relationship with technology innovator P1, even though P1 is from a different faculty: "I work with P1, and he's really great".

As P5 is undertaking technology development that is not occurring elsewhere within ACU, P5 was asked to reflect on how she became aware of new technology developments. P5 indicated that it was a trial and error approach, and most of her initial information came from advertising brochures. As her technology requirements were driven by the need to improve her presentations, she took the marketing material to vendors and asked questions about what she was trying to achieve: "Trial

and error, I heard about it from advertising, from Harvey Norman, I would go and say this is what I am trying to do, and see what advice I would get".

Her approach to getting information from marketing material is consistent with being an innovator. She does not get information from her peers, as her ACU peers are not currently using multimedia for teaching. She also does not seek information from her broader peers that may be documenting their technology use in journal articles. This appears to be a result of P5 knowing what she wants to do, but needing technical know-how on how to do it: "I don't go to journals. There are things I know are possible, but I don't know how to do them yet."

P5 was then asked to reflect on Welliver's model; she indicated that technology was fully integrated into her teaching, although not as seamlessly as she would like: "I think that at the moment, technology isn't as advanced as I want it to be, and seamlessly interwoven as possible. So there is still room for progression there."

While P5 has indicated that she seeks to use technology to convey content information to her students in a better way, it is not clear if her technology use is driving her desire to improve her teaching or her teaching is being modified by her use of technology: "So I have changed my teaching because of IT. Technology has become available to a little user". The point made here is when technology becomes available to "a little user". This is linked to her lack of control of university resources, and that to her new technology only becomes available when she can afford to buy it herself.

While P5 is trying to rethink the educational goals, her current use of technology appears to reinforce what has traditionally be done in training nurses to perform practical clinical skills. Much of the multimedia material is linked to the provision of knowledge and skills, and appears to align with the "Sage on the Stage" (King, 1993), approach rather than the use of technology in a constructivist approach. This may be due to the belief of P5, that there is a base level of content in her science subjects which must be learnt by her students, as well clinical techniques which just have to be mastered.

Sensing that she was frustrated with the conflict between how she was using technology to deliver traditional lectures, and her views on technology's inherent educational properties, P5 was asked to elaborate on the conflict.

> I'm kind of caught in the modality that we are in. I used to share teach with x, but now she is taking three of them and I am taking two of them. Out of respect for x, I don't want to change them. I don't want to be changing too much of the structure of them because they work. …In the Clinical, not being the lecturer in charge, and I do want to desperately do some things with the design of that, but don't have the capacity to do it. Well not until I can weasel my way into being the lecturer in charge of that subject.

Having indicated that she has had to purchase her own hardware and software, P5 was asked to elaborate on the issues she has encountered with university provided hardware and software. She indicated that in terms of hardware on her desk and in lecture rooms, "the university is catching up". This not only applied to her university provided computer and the computers in lecture rooms, it also applied to the versions of presentation software that were running in lecture rooms.

> Prior to December last year (Dec 2004), I would write animations on Powerpoint at home, and come to work and the animations wouldn't work in the lecture rooms. The versions were not the same, the version at work was a lesser version, and the earlier version wouldn't run the animations that I had set up at home, so it was very frustrating. But they have caught up now, which is great. It important that when I develop something at home, I need it to be displayed exactly the same in the lecture room, that's important.

Another software related issue identified by P5 was that while she had purchased specialist software to develop multimedia presentations at home, it was not always possible to run these applications in her lectures. This was either due to the lack of a runtime package or the lack of a software licence to cover installing the software in the lecture rooms. She observed that this was often reported as a hardware issue of lack of multimedia capability; however, it was really a lack of appropriate software.

> In terms of lecture rooms, it's not the computers or the projection, it's the lack of multimedia capability of the computers. It's the software to lock the multimedia into a functional package, pull it back into something that is a standalone unit as opposed to requiring software. I don't have access to that here and technically I would have to buy another copy of the software, if I was going to install it on my work computer. I only have one license for the one I have at home, and apart from it being against the law, I don't like to have multiple copies of something I only have one license for. I really need the full macromedia MX suite.

Another impediment identified in using multimedia presentation in the lecture rooms was the blocking of video streaming. Initially this was a surprise to P5 who developed her lectures at home where she has access to broadband. On trying the lecture at ACU she then found out it did not work, and had to develop a workaround.

> There are some problems in the lecture rooms, and I can understand why they have capped downloads. For safety or consumption I suppose. I wasn't sure of the right words, you know where they have to cap volume. There are things that I can't download and play in the lecture theatres. For example, sometimes rather than reinventing the wheel, I find a lovely movie of a couple of minutes from the web and I can't download it in the lecture rooms. What I have to do is download it at home, burn it onto a CD, then bring the CD and install it into the Powerpoint presentation. Because in the past I just assumed it was possible, where I would have a lovely animation in there, tried playing it in the lecture and it just didn't work. When I spoke to the IT people it was because of the cap on movies and things like that.

Another area of frustration was that the university's loan equipment for video production was VHS. The difficulty for P5 in using VHS to collect footage to be imbedded into presentations was that it was easier for her to redo the recording on another day with her own equipment than to persist with university provided equipment.

> One day I forgot my digital recorder and went to IT. They only loaned me an analogue recorder, because I wasn't to have access to the digital recorder and that was very frustrating. So I ended up throwing out that footage for that period and just had to do it again.

One of the biggest issues for P5 was that she had to learn to do everything herself. While this in itself was not a major issue, the time taken to learn and then develop multimedia enabled resources was a major issue. She felt that some technical support would speed up the learning process.

> Everything I have done I have taught myself. The big limitation for me is that because I have to teach myself everything, it takes a considerable amount of time for me to figure out how to do them. Whereas if I could just ask someone how do you do this, it would help.

The issue for P5 regarding time was the conflict between the time taken to use technology in learning and developing her teaching resources, and the institutional pressure to be working on her PhD.

> Well, I'm supposed to be doing a PhD at the moment. But my workload is quite high and I haven't really had the time….My research is on hold. I haven't done anything since the Masters, but I'm obliged to because part of my probation is to have actually started my PhD. And it wasn't looked kindly on at my probation review that I hadn't started; however, I have had workloads in excess of what you are supposed to have. So they extended my probation.

When faced with the choice between spending time preparing teaching resources and spending time on her own research, P5 consistently put her students first. This prompted a question regarding what P5 felt that the university wanted her to be doing. "Obviously do my PhD", was the quick response. I then asked P5 to reflect on what she felt the university's academic leaders wanted staff to be doing in terms of using technology in their teaching.

> In terms of technology I don't feel that they are pushing us to use much. I don't know if anyone in this corridor feels any pressure to embrace IT, I think people are given the opportunity to use it, but they are also given the opportunity to teach the way they are comfortable.

P5 observed with sadness the lack of institutional pressure on academic staff to use current technology appropriately, as she felt students were not being put first.

> I'm sad in a way that they leave some of the old technology here. Some of the less motivated academic staff, hang onto technology that shouldn't be relied upon. The document camera I believe is being misused by some academics who just love to put size 12 text and just display it on the screen. The students are just turned off after the first two minutes.

I asked what the university could do to support her in using technology in her teaching.

> They could have some digital video recorders available for academics. I wasn't allowed that at the time, but maybe that has changed, I don't know….I've bought my own projector and I got a remote with it, and when I go down to the lecture room and I just plug in my remote. So I would like to have these so I can walk around and use the projector…Well there are several modules in WebCT that I believe that we should have. It would be wonderful if there were the funds, and it would be exciting to get the modules online.

4.6.1 Summary

P5 identified herself as an early career academic who self-selected as a technology Innovator. P5 believed her primary role was a nurse and then secondly as an educator. She was passionate about ensuring her students have a high standard of clinical skills when they exit her unit. She believed that technology, and in particular multimedia, has inherent attributes which improves the transmission of knowledge and skills from the lecture to the student.

P5 reported that the hardware and software in both her office and in teaching spaces was insufficient for her needs, and resorted to purchasing her own hardware and software in order to incorporate multimedia into her units. As she was using technology which was beyond the stand university issue, P5 also received no training or technical support, and as a result spent considerable time teaching herself multimedia development skills. The issue of time was compounded by her teaching in excess of the average allocated teaching load. Her tenure was related to her initiating her enrolment in a PhD qualification. P5 believed that university expectations regarding teaching load, doctoral studies and the preparation of resources were unreasonable.

4.7 Case Study P6

P6 is a female lecturer, 50-59 years old, academic level C, and is an Assistant Head of School.

She has thirty years teaching experience. Twenty years at the tertiary level, and ten involved in nurse education in hospitals. P6 has four tertiary qualifications that span her career having recently completing her PhD. She exhibits the characteristics of a life-long learner, being actively involved in ongoing professional development and is an active member of two professional organisations, regularly attending their workshops and conferences.

P6's use of personal computers dates back to her first home computer, an apple 2e in 1995. She was one of the early users to connect to the ACU dial-in system in 1995, and has updated her home PC approximately every three years. Currently she is using dial-in at home, in contrast to broadband due to its unavailability where she lives. Three years ago she moved from the ACU dial-in system to her own provider due to her perception that the ACU system was no longer reliable: "I don't use the ACU dial-in; I use my own Optus account".

She uses technology at home for both private and work purposes. She uses the internet for activities like online banking, web searches for research, accessing the library databases, and communicating with her family and friends as well as her professional colleagues: "I do online banking, I do a lot of searches. I do a lot of web searches for my mother, she's 80, and I am trying to get her on the web. I do my own research at home, I access the library databases".

P6 uses technology extensively to support her administrative functions with ACU. Much of her use of email, videoconferencing and teleconferencing for administration purposes relates to her need to communicate with the HoS and other colleagues who work on interstate campuses.

> I use a lot of spreadsheets for staffing and timetables, those sorts of issues, units on offer, and they go up and down between the Melbourne office and myself by email. We use email, video conferencing, teleconferencing constantly. We use Banner for all the reasons we got it. We use Staff Connect.

While P6 uses technology extensively for administrative tasks with her colleagues, this use doesn't appear to translate to administrative tasks with her students: "I haven't done a lot of emailing to students because of WebCT. However, when we have messages to go out to all students, such as a unit's been cancelled, we give it to our admin officer, who sends it out on their regular email".

When asked if ICT was important to her teaching, she indicated that it was important in two dimensions. These related to the ability of technologies to enhance the delivery of material, and to manage workloads: "It was used to enhance the delivery, to prepare something that was a bit different for delivery, and secondly to facilitate it in terms of time and workload".

When asked to expand on how the enhancement of the delivery of material fitted with her personal teaching philosophy, she described different approaches, depending on whether the teaching was face to face or by distance, and whether or not the students were undergraduates or postgraduates.

> Where I teach face to face, I use it as a backup. In distance education I use it, I use it a fair bit. I used WebCT this year for the first time. I've experimented with things like e-reserve, with the development of online programs, with CD's, with distance education packages that go with them. I think for undergraduate education, the face to face lecture works best, with technology support. I think being able to post things on the web, and do web based exams is good. I think the odd course could be WebCT based. But at the postgraduate level Brisbane is so small compared to many other large universities. What I believe we need to do is attract students from regional areas. I'm a bushy from way back and I think WebCT lends itself to that…The first time I used WebCT, for example, I tried to use it as an accessory to my teaching, but not create an over reliance on it by my students as what they tend to do is look at that, rather than go to

> lectures, so they miss out on the discussions. I want to add value to those on campus; however, having said that, I think there is tremendous benefit as it also opens up these courses to distance education in a way that we've never had distance education before. So the availability to use something like WebCT, you've got chat rooms, notice rooms, students can chat with each other, they can chat with us privately. I think that it opens up a whole wealth of possibilities, for students operating out of university areas.

While P6 has distinguished between face to face and distance, and undergraduate or postgraduate education; all of her undergraduate courses were traditional face to face lectures and all her distance units were for postgraduate students. Having made this distinction, it does not appear that P6 believes technology has any inherent educational properties, rather the use of technology can enhance the delivery of the traditional lecture. For her postgraduate distance courses, P6's comments on "attracting students" tend to suggest that there is an institutional economic benefit to using technology that is imperative if small campuses are to survive.

> I'm trying to salvage a course that I believe is pivotal to ACU. That is the MA leadership. I know we have ED leadership that focuses on a particular group of students, but the MA leadership is broader. It's never had the support other programs have had. So we are at risk of losing it. From the years I've been involved with it, there have been lots of people around Australia who have been interested in it, but haven't had access to it, because it's been strictly Southeast Queensland. So I think that the technology can be used to deliver Christian leadership across Australia, and think it then has the potential to take it offshore.

She also has a personal belief that technology could deliver a social benefit in assisting students gain access to postgraduate education where they are geographically distant from a university. P6 believed that not only would it address social objectives, but the use of technologies such as WebCT with its rich communication features, combined with the reach of the web, allows students to interact with the lecturer, other students, and the course material in ways that were not possible in traditional distance education. Despite her support of online

technologies for meeting social objectives, P6 still felt that postgraduate students needed some face to face interaction.

> I was developing CDs with P9's support, so CDs could go out, but now they can access the internet, they can get in and not feel so isolated. I think it's a wonderful media for people in rural areas. However, having said that, in a course of eight to 12 units, with it all web-based, I think there is a need to bring them onto campus for residential schools. I still think they need the face to face interaction.

When P6 was asked to reflect on where she felt her adoption of technology aligned with Rogers' theory of adoption, she self-identified with the Early Majority as shown in Figure 3-1. On reflecting on Jacobsen's (1998) attributes for technology categories, P6 related to "usually respected by peers", and "interact frequently with their peers". She also believed she had a more positive attitude to change and was able to cope with uncertainty and risk, better than Late Adopters. But the major attribute that influenced her decision to self-select as an Early Majority was that she is willing to follow but not lead in terms of technology utilisation.

P6 appears to have attributes from both the Early Adopter and the Early Majority category. As an important process in Rogers' theory of adoption is the role adopters play in the diffusion process, the questioning sought to explore how she learnt about the innovation. When asked where she had heard about what is going on with technology, she indicated that she heard about them from her peers in the tea room, and from journal articles.

P6 was asked how she had heard and learnt about the university's learning shell, WebCT. She indicated that it was through official communication from the PVC Academic. She then looked for evidence of the university's commitment to the new learning shell. This evidence was in the form of university-provided workshops. She then talked with innovators and early adopters, such as P3, before committing her time to using the new technology. At that point she then started learning and using WebCT. As this adoption occurred before there was economic or peer pressure to adopt, this is consistent with the attributes of an Early Majority adopter.

> Firstly, such as the email that came out from the PVC Academic about WebCT. Then there were workshops put on. When the university puts workshops on, you know they want you to go down that track. I think in my case there were a couple of staff who took it on and used it and talked about it. So I talked to them about it. I go to education conferences as well as psychology … watching what people do there, with their technology and talking to them about it, also increases one's interest, and then there is a case for saying there needs to be a semester when I can get my head around this.

When asked to reflect on Welliver's model of instructional transformation, P6 explained that she perceived herself as being at the integration stage.

> I have been changing what I do because of the technology. I think if you are teaching a subject that you know a lot about, you can take all the risks in the world. If you have been stuck into a unit you don't know much about, then you're not going to be as innovative. But then again I'll probably be relying on the technology to help me with the unit.

From the responses of how P6 is using technology, it appears that she is looking at using technology to replicate what is currently happening in a classroom situation, rather than using technology to do new things. Her primary use of technology is to place course content on the web.

> Some of my masters units are run online, but we meet face to face and students like the face to face wherever possible. I try to use the web, and certainly e-reserve. The more I had students interacting with me the more I could get them interacting with each other.

In many ways this is the electronic "sage on the stage", (King, 1993) approach. Where she does use communication features of WebCT, such as chat and email, her intention is to extend the traditional classroom boundary to include distance students.

> I get interstate students to interact by using WebCT. At the start it was just using emails to get them to talk to each other. I tried to start up a chat type for them. To get them discussing as they would in a classroom situation. Throw some questions on a topic out, get them talking, and then draw out other issues. So I've constantly looked at ways of using technology.

Another area where P6 is looking at using technology is to reinforce to students on different campuses, that while they may have different lecturers, and may be taught differently, they are enrolled in the same unit and will have the same assessment. Here P6 is looking to use videoconferencing to bring the two cohorts together at the start of the semester, to reinforce the national nature of ACU through uniform assessment.

> What I'm looking at doing next semester is to use videoconferencing to have the unit in Melbourne and Brisbane brought together at least for the first class; 150 on this campus and about 100 in Melbourne. I said to the students, remember there are students in Melbourne doing the same subject, different lecturers and it may be taught differently. But when you do the exam, you will be doing the same exam, and when you are graded, you will be graded against your peers in Melbourne. The students looked at me and went "woah". And I thought one of the best ways of getting that notion that it is one class is to get the staff and class together, and wave to each other or something. You know go through the course outline, and stuff.

To identify impediments faced with the adoption of technology, P6 was asked if the university-provided hardware and software met her needs. From her responses it appears that the standard-issue computer and the university's standard software set meet her needs.

> Yes, and I'm about to get a new computer. Because of my naivety, I don't know what else we could have. Certainly what we have got certainly meets my needs at this stage.

She was then asked to consider technology resources in ACU's teaching spaces. The response reflected that her primary use of technology in lecture rooms was Microsoft Powerpoint. Her language when talking about teaching space technology did not distinguish between the hardware (data projector) and the software (Powerpoint) that she primarily used in her lectures. Her response while indicating that the university could always have more, particularly in the smaller lecture rooms, was probably sufficient for her requirements.

> I've just shown a person from UQ around this morning, and she felt we were in the lap of luxury compared to what she had there. There are probably another couple of rooms that could do with Powerpoint. But I think we are pretty well set up in terms of lecture rooms. Really anything that holds more than 20 students really needs it.

An area that causes difficulty, however, was gaining access to teaching rooms rather than the equipment in them: "I think timetabling is a nightmare; I've just been doing the timetable, and it's a nightmare".

Another area of difficulty faced by P6 was when the university made an administrative decision to de-enrol students who had outstanding fees. The impact of this was that large numbers of P6's students were also automatically denied access to online resources such as WebCT. While the decision was subsequently reversed, this resulted in students being unable to access online coursework or sit online assessment items. Another administrative issue related to systemic problems where marked-up content appeared to disappear from the system. While P6 felt that these "operational issues were insurmountable", it did make her feel isolated as the problem students in her units faced became hers to resolve, despite many academic staff being similarly affected.

> A major hiccup when I was trying to learn WebCT was when a large number of my students were de-enrolled, so they missed several weeks of lectures. I had mid-year exams on WebCT, so I had no idea who had access to what. That created lots of consternation. Then when I put things up, for some reason they came off again. I don't know why. So there were so many operational issues

> that came up, but I don't think any of them were insurmountable. I could have caused the problem, I don't think so, but I could have.

After answering the question regarding hard technology resources and administrative issues, P6 went on to explain what resources she needed. The major issues she identified were instructional design self help, timely training with post-training support, and the lack of time.

> The resource I need is something to tell me how to do it. A booklet on this is how you do it and this is how you don't do it….Training provided is fine; however if you are busy and you don't use it within two to three days you have lost it. So for me the initial training is good, it gets you started, and I believe the advance units are quite good. For me it's a case of playing with it. And then saying to someone help me….Time is one, my lack of expertise in technology, quite frankly I don't know how it works, someone shows me how to do it and I just do it. And at my age I'm not going to learn how it works.

The need for "how to documentation" appears to be driven by her perception that the lack of support for placing content on WebCT was unlikely to change, and therefore learning and doing it yourself was a reality.

> I can't help but mention time, apart from time the provision of backup support, probably more than anything the ability to ring up, and say, I'm doing X and having a problem, can you come and help me with it. But we tend to go to each other first. Probably out of necessity. It's easy to go down the corridor and say, you've been using this, how does it work, but, if they are busy, it would be good to have support.

As the issue of time had been raised several times, I asked P6 to elaborate on it. As the issue emerged, it appeared to be a suspicion that while the university was promoting the use of WebCT to supplement the traditional lecture, the real institutional driver for technology use may be "to show that we are up there with the latest, and also to stay afloat", at the expense of academic workloads.

> There appears to be an emphasis on web-based learning, one type or the other. I think on one hand this is good, because it provides a lot of facilities to the students; on the other hand I'm a bit suspicious because if it a web based unit you get two hours of work load, and when it's not web based you get three hours. Which means they can give you more to teach a face to face unit. However it's my argument that if it's web based it takes you just as long to prepare, if not longer than when its face to face....If it's face to face I prepare my Powerpoints and then talk to it. When it's all web based you have to write your lectures so it takes a lot longer to do it. But in reverse the university gives you time to do it. So I'm a little suspicious that it's about increasing workloads.

I then asked P6 to consider that, while a web based unit may take longer to prepare initially, whether there is a time payback when the lecturer has the same unit in the following year: "The reality for me is that in the 15 years I've been here, I've taught 36 different units. Every time we get more junior staff on board, they get the units, and I move onto something new. So I don't always get to redo them again".

While this issue of the time taken to write new courses is not new, the additional time to develop them as online courses is new. The time pressure described by P6 revolved around the time taken to develop online courses, her administrative workload as Assistant Head of School, along with P6's research efforts in an attempt to improve her promotional prospects.

> However, if you want to get promoted, it would appear that you have to show that you can use it, and that you are open to creativity in both your teaching and research activities. There are three major areas, teaching and learning, research, and community service. With teaching and learning you have to show that you are getting good evaluations from your students, that you are being creative, that you are up to date with technology or you are up to date with modern creative technologies. There is conflict. It depends on what you have going that determines what you put your energy into.

P6 then provided an example where her efforts had been focused by what she believed would maximise her promotional prospects.

> Last year, for example, as Head of School, I put my effort into that, and getting my research grants up as opposed to doing anything else. So in terms of my teaching I just let it go. This year I'm trying to get my WebCT subjects up and keep my research going, and I've stepped down as Head of School to allow me to do that.

With her having provided this example, I could sense a frustration that what P6 felt she was required to do in order to achieve her promotion was out of alignment with her beliefs regarding quality teaching.

> Well if I really wanted to get promoted, I'd push out anything I could do with teaching and get on with my research, and publications. Just put your Powerpoint on the web, and get on with your research. But that's certainly not going to help our teaching profile.

I then asked her what the university could do to address this frustration regarding having to make choices between teaching and research.

> If the university gave me a couple of hours per week to get a course up, I would use the time to try and get the course up. In getting that course up on WebCT, organising yourself, and if you were teaching in the area of your research, then it also helps your research, and provides you with some skills that helps your research too.

Despite having had a position of leadership as Head of School, P6 did not appear to have any influence on, or see it as her role to exert any influence over, the use of technology in the support of teaching within her school, or seek to address the self-identified issue of excessive workloads. She felt a sense of frustration that not only was the workload heavy, but it was not evenly carried by all staff.

> If I look at next semester, I have my supervision and my admin load. I have someone taking over for me next semester; however, they haven't done it before. So I'll have that, research supervision and we have more and more

research students, and fourth years with projects. We'll be doing our community service outside, and we'll be carrying 14 hours teaching. When you put that all together, there are those of us who are doing things, and there are those who don't. You won't get by without a 60 or 70 hour week, and then you get burnouts.

4.7.1 Summary

P6 self-selected as an Early Majority technology user. P6 had both administrative and teaching responsibilities. While P6 was not an early adopter, she was an early user of technology for office automation and administrative tasks. P6 did not believe technology has inherent educational properties; nevertheless, P6 commented that it made presentations more visually interesting, and provided teaching efficiencies. This theme of efficiency was expanded regarding the transition from distance education courses to online courses. While P6 was concerned about providing opportunities to students in non-metropolitan areas, she believed technology provided an opportunity to generate sufficient numbers of students to make an online course viable.

P6 indicated that the standard issue hardware and software on her desktop computer, along with projection capability in lecture spaces met her requirements. Time was mentioned as an issue; however, the lack of time was in relation to a conflict between her research commitments required for her promotional goals, her administrative role and the time required to prepare her lectures. P6's solution to this conflict was to retire her administrative role. P6 expressed frustration that even as HoS she was not able to address the workload issue within her school.

4.8 Case study P7

P7 is a female lecturer, 60-69 years old, academic level B.

She has been a lecturer at ACU for the past 18 years. Prior to her time at ACU, P7 was a nurse educator within hospitals for 15 years. P7 is a registered nurse, and has three tertiary qualifications with the highest being a Masters. She currently holds no position of authority within her school and was referred to by two other participants within this research as a technology Laggard.

P7 purchased her first personal computer five years ago when she was told that she would be developing the first online unit within her faculty. She said that at that time, she couldn't type or use a computer at all. She felt that there was no institutional support at all, so she purchased a machine herself so that she could cope with what she was being asked to do.

When asked how she came to be selected to develop the faculty's first online course, she indicated that initially she thought it was a joke. Once she realised that she had to develop the course, she felt an enormous sense of pressure and stress.

> Well the history of this is that before then I had never touched a computer in my life, I couldn't write an email, so I went to an orientation session with members of the faculty to discuss the opportunity, and I was told I was to be the first person to go online. I thought they were joking. I thought it was a joke. I couldn't type, I couldn't work the computer, and I thought that this was the biggest joke of all. And I spent the next three months so stressed that you cannot believe.

The first computer she bought was through the university preferred supplier, who installed it in her home. The machine was the same as university's standard multimedia machine, configured with the university's standard software set and configured to dial into the ACU for internet access: "Well I got no help here. So I

bought a computer from X, he set it up. He gave me some instructions, and the helpdesk people here were just incredibly patient".

From her initial response to her introduction to technology, it was apparent that P7 did not volunteer to develop the first faculty online unit. When asked why it was put online, P7 was firm in her belief that it was a cost saving mechanism.

> I think it was put online as a cost saving mechanism. The fact is once upon a time they taught all these courses on campus and in Queensland I have to say we had full classrooms. When it went online, a number of our customers actually didn't like it. And it's now gradually coming back. There's no question it has come back; I think that the idea was to have one lecturer in charge, rather than meeting a market need.

On replaying the transcript of this part of the of the interview, I identified that P7's language changed, depending on whether P7 was talking about on-campus students or those enrolled in postgraduate online courses. P7 repeatedly referred to on-campus students as "students", and fee paying postgraduates students as "customers". Thus the actual words "cost saving" and the language use suggest that the catalyst for P7's initial use of technology was to deliver an economic outcome for the university.

When asked how she felt about delivering online material today, P7 displayed a positive attitude, and appears to have changed from a conscripted user of technology to a willing participant.

> I really like it. I think it's marvellous. I find it extraordinarily helpful. Once upon a time, a student had to wait to make an appointment, and then wait for the lecturer to get back to them by phone, which historically lecturers don't have a good reputation for that. Now students can email you. You can either email them back directly, send them material, or provide them with references. I think it's a win-win. Students today get everything online, everything.

Today P7 does much of her lesson preparation at home. Her lesson preparation involves developing the content for her lectures in both Word format and Powerpoint. She loads the content into the library's e-reserve system making the notes available to students prior to her lectures. She also uses email extensively to communicate with her students, and encourages their initial contact with her to be via email.

When asked if she had a particular approach to using technology in her teaching, she displayed a genuine concern for the time and work constraints that today's students face. She believes that technology can assist the students by providing both an alternate mechanism for providing content, as well as improving the communication with students.

> My philosophy is that I provide them notes, available on the web and I'd prefer to open up the lecture for debate, ... I teach ethics and I teach law. With law and ethics it's quite OK to put the material on the web, but they do need a follow-up regarding discussion and debate, and exploration and that. If a student can't come, they can access it online. The demographics of the students we had before are very different. Number one, they are coming from all geographic areas, for example, north coast, south coast. The timetable is not always conducive to the students' needs; it's conducive to the university's needs. With the cost of petrol, time being a major component, with regards to people's lifestyles, and on this basis, technology has made a major difference for the student who has to work. They can go in online, get their lecture notes and not be disadvantaged….I say to students, 'I'm available on email, I'd like you to email me and I would set up an appointment or I answer their question directly at the time', which is when they feel they need it the most.

Having indicated that the timetable is institutionally focused rather than student focused, and demonstrating how she uses technology to assist students in getting around timetable generated issues, P7 suggests she sees technology as a way of providing lecture content at a time convenient to her students, thus meeting social objectives of time independent access.

While it appears that P7 did not believe technology in itself has any inherent educational value, she did attempt to use it to maximise the learning experience students would gain from her lectures. In providing the basic lecture content to students electronically before the lecture, she is attempting to increase the amount of time available for discussion, which she believes will enhance their understanding of the subject area.

> I usually send a summary of the lecture notes to e-reserve, firstly to accommodate students who couldn't come to a lecture for whatever reason. Secondly, I try and get the students to think in the lecture room rather than brainlessly write down notes.

While several participants within this doctoral research had identified P7 as a technology Laggard, her technology adoption general attributes (Jacobson 1998) more closely aligns with the Late Majority as shown in Figure 3-1. P7's adoption due to economic and peer pressure placed her within the Late Majority adopter category. The request to develop online courses was a requirement of her position, and her recent learning of Powerpoint was driven by pressure from both her peers and her students.

> I think that the masters' students like that way of learning. They don't have time to come and listen to a lecturer when they could get the same level of learning with a specified list of activities. It's much more student driven than teacher driven.

P7 did not "feel safe" in adopting new technology, and felt she had no institutional support. She attempted to create a safer environment by buying her own machine and learning to use it at home. From P7's response to the feeling safe comments, I sensed that P7 perceived a culture of fear, with staff unwilling to ask for help from their peers in case their lack of knowledge was used against them.

> Once upon a time, if I couldn't find an assignment, that would freak me out. Whereas now, I just say to myself, just calm down. I'll work through the boxes and I'll find things. I wasn't able to do that before. We are not a very cohesive

> school here, very high risk, and I would suggest that none of us would bare our soul too much. I would click boxes until I find what I need.

While P7 now uses WebCT, she finds change difficult, and still aligns with the attribute of "need to be convinced and need to feel that it is safe to adopt" (Jacobsen, 1998).

> I'm not very good with change, so I work my way through it. So when I heard the other day that they are thinking of bringing in another system, I thought 'stuff it!' I said worse than that, because number one; it's going to affect me, and number two; it's going to affect my students. And I think that's not a good thing. If we are going to bring in another change, we should not have bought it in when we did, in the middle of this year. I think that we shouldn't ask either the customer or the lecturer to go through too many changes. People have to consolidate in their minds. They have to work things through. They have to come across as reasonably proficient. The customer is paying quite a bit of money for that. It doesn't do the reputation of the university any good, or doesn't do the lecturer any good not to know where they are going.

P7 also fears that the university may use technology to put courses online as a way of reducing staff numbers.

> From another point of view I'm not going to use technology that is going to put me out of a job. To be honest with you I could quite easily do law online. But if I did law online, I could tell you what would happen, we would end up with one lecturer in charge, there would be no classes, and I think students need a facility with a lecturer available on campus.

In terms of Welliver's Instructional Transformation Model, P7 has moved from Familiarisation to Integration (over the past five years). P7 currently sees technology usage as essential to the learning process. P7's major use of technology is in providing content in an electronic format (Word or Powerpoint) and in communicating with students. When viewing P7 in terms of Welliver's model, her technology use for instruction appears to be a combination of Utilisation and Integration. In terms of

Utilisation, P7 is using technology; however, minor problems are not causing her to discontinue its use. Likewise with Integration, P7 sees technology as essential for the educational process; however, she is not constantly looking for new ways to use technology in the classroom.

In an attempt to identify impediments P7 faced in the adoption of technology, she was asked if the hardware technology (hardware and software), provided by the university, was sufficient for her needs.

> I am aware that when I talk to others outside like lawyers, I find that they are astounded by the level of resources that we have. Other people I know are just over-awed by the amount of money we seem to spend on the resources we have. They are just bowled over. They say we are charging $500 per hour to our clients and we don't have what you have.

When asked about the teaching spaces, she felt that all the rooms she was asked to lecture in meet her requirement of being Powerpoint enabled: "Well the classrooms are very reasonable. I get the classrooms I request and all the classrooms now have Powerpoint. I do know there were some problems with the Shanghi set up, but I don't teach them until November".

The Shanghi problem related to a delay in installing data projector/Powerpoint capability into a room specifically allocated to the faculty to house a cohort of full fee paying overseas students. The cause of the delay was that neither the Dean nor Head of School made a decision on room fit-out until after the students arrived. P7 just saw it as an institutional problem, and did not distinguish between centrally allocated teaching space and a one off faculty initiative.

Despite P7's late adoption of technology, she did not see time as an impediment to adoption, and felt that it actually saved her time.

> The way I use the computer is an extremely efficient way of doing it. One aspect is I can work from home. Now with the price of petrol, if I work two days per week from home, fantastic. The other reason is that I don't want to be here

> after half past three so I want to get home before the traffic. So I can sit down at a computer and I can use voice mail, email, and I can do an hour and a half at home. Absolute magic.

On probing a little deeper on how it saved her time, she indicated that she was the only lecturer on campus with the qualifications to teach in her area. This resulted in her reusing her online material over a number of years. P7 then mentioned that putting it online actually improved the structure of her lectures, that helped both her and her students.

> The advantages for me are that it has enabled me to be more structured. More prescribed. Which allows students to know where they are going to start off from and where they are going to. There is a structure, and then if they have questions they can get on the web and ring me up or email me questions.

P7's comments painted an image where there was not any conflict for the use of her time as she was looking at retiring in three years. She was not looking for a promotion, and was just concentrating on her teaching and using technology to assist her and her students.

P7 was then asked to comment on professional development she had undertaken in the past 12 months. She said that she attended everything on offer, and had attended an in-house WebCT course. While she was happy with the course she felt that the course was held when it administratively suited the university rather that when academics needed it.

> I did a WebCT course last year and the complaints we have is that you can't separate the course too long between what you are doing. The course was very helpful. However, when I went into it I couldn't remember, I couldn't apply. As a result of that I couldn't get assignments, and then X said you have to set up a dropbox. And I said I didn't have to set up a dropbox in the old one. And then I had to find the assignments, and then I found WebCT has email, and I'm wondering why I'm not hearing from my master's students, who have always emailed me direct, and they were emailing me via WebCT. So I think there has

> been a breakdown from my perspective, so what I would like is that if we are going onto a new system, I would like the introduction of the new system and the in-service fairly close together.

As she uses WebCT more, she now learns about it from “stumbling over things”, and that while she was learning how to use WebCT, she felt that it was not her job to be an instructional or web designer.

> I don’t believe that instructional design is part of my role. I have accumulated certain knowledge and skills and qualifications. I am here because of those skills. I can deliver them; however, instructional design is another level of specialty. And I believe that is an example, if the university wants me to write a unit I’m am very happy to do it. …the content the objectives etc., however, in terms of how it’s put on the web I don’t want to know about it. They can accept the fact that I am not a web designer and nor do I want to be. I have to keep up with my own knowledge, skills and research and that’s why I’m employed and qualified to do. I don’t want to be doing the other. But I would like the opportunity to proof read it so that I can ensure it is right. So I think those people and ourselves need to come together.

P7 was then asked to reflect on what could the university do to assist her in using technology. She reiterated that the university could do more in the area of instructional design.

P7 was then asked what she felt the university wanted her to do with technology in her teaching and learning. Her response acknowledged that her initial use was driven by a university directive; however, she now embraces it, not because she has to or because she is aware of any directives to use it, but because it is personally meaningful to her and it meets the requirements she and her students expect: “It’s up to me. I’ve never had any specific requirements or requests. It’s purely my philosophy of learning. In fact there is no direction at all. I could sit here with this wonderful computer and not use it”.

4.8.1 Summary

P7 self-selected as a Late Majority technology user. P7 was not undertaking research or higher degree study; she saw herself primarily as an educator. P7's introduction to technology within her teaching and learning occurred when she was nominated by her HoS to engage in the development and delivery of an on-line unit. P7 believes this directive toward online units was driven by economic imperatives. This perception was reinforced in her when she referred to online students as 'customers' and on-campus students as 'students'.

P7 believed that the university provided technology in both her office and in teaching spaces meet her requirements; however, she indicated that it was not her role to be an instructional designer; with additional being necessary in that area. While initially a reluctant technology user, she now believes that technology offers workload efficiencies and flexibility.

While P7's educational philosophy was aligned with the transmission model, she was student focused and placed her lecture notes online to assist students who were unable to attend lectures due to work or family commitments. Apart from the directives to make some of her courses available online, she commented that she experienced no university expectation of technology use for her on-campus units.

4.9 Synthesis of findings from the case studies

A synthesis of the seven case studies provides the following conclusions.

4.9.1 Academics' use of technology was underpinned by a range of beliefs

The drivers of technology in education, as identified in the literature, were clustered as economic, educational and social. The academic staff interviewed predominately expressed views which mirrored educational drivers. Their beliefs, however, ranged from the belief in the inherent ability of technology to promote a constructivist approach to learning, to using technology to achieve greater efficiency in lecture preparation and presentation. While a few mentioned the social benefits of technology, this was inconsistent with the literature. The social benefits from the literature related to addressing issues of the digital divide and the tyranny of distance while the social benefits mentioned by the participants were in relation to the balance of work, family and study.

4.9.2 Academic staff could accurately self-select their stage of technology use and innovativeness

To assist in selecting the case studies, each of the participants in this research were asked to read Jacobsen's (1998) general attributes for each of Rogers' adopter categories, and then asked to self-select and reflect on where they felt they were in terms of their technology adoption. All academic staff interviewed self-selected their adopter category consistent with the findings of the researcher. The research participants were open and voluntarily shared their personal reflections on why they believed they were in a particular category. Academics' technology innovativeness category is used throughout the discussion in the next chapter as it provides a framework from which to assist in the understanding of the issues of academics' technology use.

4.9.3 Academics' technology innovativeness could be categorised as Early Adopters or Mainstream

While Rogers (1995) identified five categories of technology innovativeness, within this research these five categories have collapsed into two categories. The research participants who identified as Innovators and Early Adopters used additional technology tools and had distinct issues from the participants who identified as Early Majority and Late Majority adopters. The Innovators and the Early Adopters have been referred to in this research as the Early Adopters, with the Early and Late Majority being considered the Mainstream academics. Figure 3-1 illustrates that 17 of the 21 case study participants were within the Mainstream. The technology used by these two categories, the issues they face, their alignment with organisational objectives and the chasm between the two categories are discussed in the following chapter.

4.9.4 Ubiquitous technology deployment has effectively been reached, removing first order impediments of hardware and software for the academic Mainstream. However, impediments for the use of technology still exist.

The case studies have shown that first order change of using technology has been reached with the academic Mainstream expressing the view that the equipment and software in lecture rooms and their offices meet their needs. The surprise was that this was not the case for the Early Adopters who expressed frustration at the standard equipment offering. This finding needs to be explained along with other impediments staff face in the educational use of technology to support learning.

4.9.5 Academic staff did not accurately self-select where they were in terms of using technology to support learning.

The research participants used Welliver's Instructional Transformational Model to assist in their self-selection of where they were in terms of using computers to support learning. All of the case study participants self-selected the Integration

Stage. The assessment of the case study participants by the researcher found that not all of the participants were at the Integration Stage, with many participants being in the Utilisation stage. This finding is linked to the themes in the literature which related to sustained change. The verification process used to determine the authenticity of the academics' self-selection and this finding will be discussed in the following chapter.

4.9.6 There appeared to be an incongruence between what the university formally communicated and what the academic staff actually experienced.

Academic staff received information regarding the university's technology drivers and expectations from a number of channels, both formal and informal. The research participants in this study had internalised these messages and synthesised their own understanding of what they believed the university wanted them to do with technology. Their decisions regarding how they reacted to these messages were governed by issues such as their own beliefs and where they perceived they were in their career. This finding is linked to the literature on leadership and management. The issue of management, leadership and the messages academic staff absorb and act upon provides a cloud which permeates every facet of this research. This finding and its implications in light of the case studies are discussed in the following chapter.

4.10 Conclusion

In chapter 2, I synthesised the findings of the literature and have conceptualised it in a theoretical framework as shown in Figure 2-1. This synthesis resulted in four clusters of information which informed the design of the research and from which the research questions emerged. This chapter has documented the detailed case studies and identified the major themes which emerged from this research. In the next chapter the findings will be discussed.

Chapter 5: Discussion of findings

5.1 Introduction

The purpose of this research is to explore the issues encountered by university academic staff in their adoption of technology within the teaching and learning environment. The purpose of this chapter is to discuss the findings which have emerged from the case studies.

The conceptual framework of the literature (Figure 2-1) groups the literature into four clusters. It was from these clusters that the research questions emerged. The research design was focused by the following research questions:

Why do academic staff use ICT?
How do academic staff use ICT?
What are the barriers to the use of ICT that have been identified by academic staff?
How do academic leaders promote the use of ICT in teaching and learning?

The themes which emerged from the case studies are discussed and illuminated by literature.

5.2 Academics' use of technology was underpinned by a range of beliefs

The first research question, 'Why do academic staff use ICT?' was drawn from the cluster of literature labelled as 'Catalysts for Change' (see Figure 2-1 The conceptual framework of the literature review). The major catalysts for the utilisation of technology in education were identified as being economic, educational and social. While these catalysts are espoused by governments, educators and social

commentators, this research sought to understand the drivers for the use of technology from an academic's perspective.

The participants in this research expressed views which ranged from:

the belief in the inherent ability of technology to promote learning;
that technology lends itself to a constructivist approach;
the ability to achieve greater efficiency in lecture preparation and presentation; and
that the balance between work, study and family commitments could be enhanced through the use of technology.

The social benefit of addressing the "digital divide" (Selwyn, 2002a), identified in the literature, was not identified by any participants within this research.

5.2.1 The belief in the inherent ability of technology to promote learning.

Academic staff who believed in the inherent educational attributes of technology expressed comments such as: "I'm the facilitator, and put everything up on WebCT extremely thoroughly, particularly in the ICT unit, as I want to model it to them…I look at new ways of operating" (P1), and "The beneficial effect is that technology will get the point across much easier" (P5).

These comments are consistent with society's general view that technology is inherently beneficial (Cuban, 2001). The first participant (P1) expresses a belief in technology's inherent educational benefits and was modelling the constructivist approach to learning for his education students. The other participant (P5) was using the inherent educational properties of technology to improve the transmission of ideas and concepts to her students. This finding highlights that the participants (P1, P3, and P5), who were classified as Innovators or Early Adopters on Rogers' (1995) innovativeness category (see Figure 3-1), held views consistent with "technological determinism" (Surry & Land, 2000, p. 146). This contends that merely provision of technology will in itself result in positive educational outcomes. This suggests that

being an Early Adopter does not necessarily correlate with a constructivist approach to teaching and learning, with P5 using technology to support an instructivist approach.

5.2.2 Technology lends itself to a constructivist approach

While some of the research participants did not express a belief in any inherent educational attributes of technology, they expressed a need to operate within the students' world view. This was seen as a world providing instant access to information via mobile phones and the internet. These participants expressed views such as: "You must operate in their world where information is instantly available either over the phone or the internet" (P3), and "I believe that you need to be current, in touch with the learner's world" (P2). While the participants did not define the "students' world", they have been referred to as "the Net Generation" (Oblinger & Oblinger, 2005), or as "Digital Natives" (Kennedy et al., 2006).

Observations made by these participants (P2 and P3) concluded that students had access to as much information as the lecturer. The participants were moving to a constructivist paradigm and engaging in a "guide on the side" (King, 1993) or facilitation approach in presenting their courses. In terms of Rogers' (1995) innovativeness categories (see Figure 3-1), P3 was an Early Adopter, while P2 was a Late Majority adopter. This finding demonstrated that a constructivist approach to education using technology was not determined by a particular academic's technology innovativeness, but rather was determined by their student centred approach and their educational philosophy.

5.2.3 The ability to achieve greater efficiency in lecture preparation and presentation through the use of technology.

Some of the research participants indicated that technology made "no-significant difference" to learning, but used it in making presentations more visually interesting and making lesson preparation easier: "One, it was used to enhance delivery, to prepare something that was a bit different for delivery, and secondly to facilitate it in

terms of time and workload" (P6), and "Most of the time I will use it to put unit outlines up. So while it may not be making a difference to students, it may make your teaching easier, you may be helping yourself, and that needs to be thought of" (P8).

This group of participants (P6, P7) used technology tools such as Powerpoint to provide visually pleasing presentations and saw the technology as having time saving and efficiency attributes. The efficiency attributes seen by the individual academic staff focused not on improving the national economy, as identified as a major governmental objective (Beattie, 2000), but rather in terms of reducing their workload. This finding is consistent with an EDUCAUSE study showing that the predominant use of technology, such as learning managements systems by academics, was for the dissemination of "schedules, syllabi assignments and so forth and less as a tool to implement effective pedagogy" (Henshaw, 2006, p. 11). P6 and P7 were clustered within the main-stream (see Figure 3-1) with their technology use being consistent with the findings of Henshaw. Research from a student perspective has also indicated that the "course management features used least by faculty were the features that students indicated contributed the most to their learning" (Kavik, 2005, p. 95). These included opportunities for sharing material with other students, faculty feedback on assignments, and online readings. This finding, coupled with Kavik's (2005) research, highlights that for the Mainstream participants technology and a constructivist approach to education appeared to be unrelated.

5.2.4 The balance between work, study and family commitments could be enhanced through the use of technology

The other predominately governmental driven objective for using technology was to address social issues such as the 'tyranny of distance', the 'digital divide' and for increasing access for the "earner learners" (DEST, 2002, p. 12). Earner Learners are those students who traditionally would not attend university due to their work commitments and this is linked to the concept of lifelong learning (OECD, 2000). Where courses had been converted from distance mode to a fully online mode, the participants discussed the online course hosting in the context of saving courses, rather than meeting social objectives: "I'm trying to salvage a course that I believe is

pivotal to ACU….. It's never had the support other programs have had. So we are at risk of losing it" (P6). The emphasis in this case was the economic imperative to attract a sufficient cohort of students to make a course economically viable, rather than to address social disadvantage as a result of the 'tyranny of distance'.

The emerging social objective of work, study and family balance (Fisher, 2005, p. 22) was mentioned by several participants. This issue was expressed in terms of how work and family commitments impacted on students' study: "I put all my notes online because there are students with jobs and family commitments and they can't always attend lectures. So they aren't disadvantaged if they can't attend" (P7). P7's approach of work-family-study commitments was to provide flexibility delivery options to her students rather than to address the issue of distance education, or to meet the needs of the Net Generation. This approach was student-centred, and focused on the participants' concern for predominately mature age students engaging in study, while having other ongoing commitments such as work and family. This student-centred approach to flexible content delivery has similarities with the participants who expressed a desire to operate within the students' world. For P2 and P3 these were issues specifically relating to the Net Generation. In P7's example, the objective was to facilitate learning for the mature life-long learner who has the competing commitments of study, work and family. In both cases the participants are student-focused and they used technology to engage their students.

Just as P7 has utilised technology to provide flexibility for her students, the other participants had sought to operate within the "students' world" (P2, P3). While some participants were student focused, others had restricted access to their lecture notes and presentations to ensure students attended their lectures: "I think for undergraduate education, the face to face lecture works best, with technology support…but not create an over-reliance on it by students as what they tend to do is look at that rather than go to lectures" (P6), and "It's about having the technology assist, rather than letting it take over. For example, with WebCT some students think they don't have to front up. They start using it as a replacement" (P8). These comments reflected an approach which was focused on the transmission of information from the lecturer to the student. Within this study the participants who believed technology was merely a tool which delivered efficiencies and enhanced

presentations were also the participants who saw no inherent educational benefit in technology and tended to be lecturer centred rather than student centred.

5.3 Academic staff could accurately self-access their stage of technology use and innovativeness, but were critical of their peers

The second research question, 'How do academics use ICT?', was drawn from the second cluster of literature, the 'Diffusion of Technology' as shown in Figure 2-1 (The conceptual framework of the literature review). The context of this research (Section 1.2) and the statistics benchmarking teaching technology at ACU (Table 2-1) demonstrated that the teaching technology environment within ACU is comparable with other tertiary institutions. The technology-rich teaching environment identified in Table 2-1 has been referred to as "ubiquitous computing" (D. Brown & Petitto, 2003, p. 25) and shortcomings identified within this environment are discussed in the subsequent section. It is within this technology-rich environment that the participants operated. Rogers' (1995) theory of diffusion of innovations was utilised to categorise the technology innovativeness of the research participants, provided prompts for the semi-structured interviews, and assisted in the selection of case study participants.

5.3.1 Self-assessment by participants

While some of the research participants were familiar with the terminology involved with Rogers' theory, each of the participants were provided with a copy of Jacobsen's (1998) general attributes for each of Rogers' adopter categories to ensure they were reflecting on the same criteria. Having reflected on Jacobsen's attributes, they were requested to nominate where they believed they belonged on Rogers' innovativeness category (Figure 2-1). These reflections, along with interviews and observations, allowed the researcher to verify the self-selection by the participants.

The research concluded that particular academic staff strongly related to Jacobsen's attributes with comments such as:

> Well I think Innovators being described as pioneers and venturesome describes me straight away. I'm early into things. And I give things a go even if I don't know much about them. (P1)

> I'm not an Innovator because I think I don't have the basic knowledge. (P4)
> I'm willing to follow… I interact frequently with my peers. It is peer pressure but it comes from me anyway. I know I have to adopt it, and that's when I baulk at it-that's when I feel the pressure. (P2)

After reading through the attributes and discussing how they related to each of the adopter categories, the research participants then self-selected their technology adopter category which was consistent with their categorisation by the researcher. This demonstrated that academic staff could reflect on their technology use in their professional practice and could accurately self-assess their stage of technology adoption. Regardless of the adopter category of the research participant, participants were willing to discuss their technology use in a frank and open manner.

5.3.2 Critical assessment of peers

While the research participants were not asked to critique their peers, several of the Early Adopters/Innovators identified other research participants in the Late Majority category as Laggards. On identifying them as Laggards they expressed disappointment for the students whom they believed were receiving an inferior product: "I'm sad in a way that they leave some of the old technology here. Some of the less motivated academic staff hang onto technology that shouldn't be relied upon. The document camera I believe is being misused by some academics who just love to put size 12 text and just display it on the screen. The students are just turned off after the first two minutes" (P5).

The participants identified by their peers as Laggards, however, did not believe their teaching was impaired by their later adoption of technology as compared to their peers: "My students congratulated me for using WebCT, I was born last century and I'm learning" (P2).

A Late Majority participant, who was identified as a Laggard, also identified the technology innovators within her school, and explained that she wasn't opposed to technology, but did not believe it was the right medium for her particular students. This case study participant indicated that, other than a few individuals who were helpful, the overall culture within the school was unsupportive of those who were struggling with technology: "…pushing technology on academics, the drivers of education, will not get technology into the classroom unless academics first understand the technology and its relevance in the classroom". (Kopye, 2006)

The critical self-assessment of the Late Majority within this case study demonstrates that academic staff across the technology adopter categories, including those considered by their peers to be Laggards, can evaluate critically and discuss their stage of technology adoption. The critical comments of the Early Adopters towards the Late Majority participants tend to be based on "technology determinism"; however, the Late Majority participants reported this criticism as an unsupportive environment.

5.4 Academics' technology innovativeness could be categorised as Early Adopters or Mainstream

Rogers' (1995) theory of innovation identified five categories of technology innovativeness. These categories are:

Innovators - the risk takers willing to take the initiative and time to try something new.
Early Adopters - tend to be respected group leaders, who influence adoption by the whole group.
Early Majority - the careful, safe, deliberate individuals, who are unwilling to risk time and other resources.
Late Majority - those who are resistant to change, and are hard to move from their present state without significant influence.

Laggards - are those who are consistently and adamantly resisting change, who need external pressure to change.
Rogers (1995)

As discussed in section 5.2.1 (self-assessment by participants), each of the participants critically could evaluate and discuss their stage of technology adoption in terms of one of the five categories. While this assisted in the selection of the seven participants who are documented in chapter four, the issues identified by the case study participants collapsed the five categories into two. The issues identified by the participants could be reduced to two clusters. The first cluster aligned with the Innovators and Early Adopters, while the issues identified by the Early Majority and Late Majority formed the other cluster. The researcher has termed the cluster comprising the Innovators and Early Adopters the 'Early Adopters', and has referred to the second cluster as the 'Mainstream'. The Early Adopters constituted four of the 21 participants while the Mainstream had 17 of 21 participants.

5.4.1 Mainstream

Academics who self-assessed their technology innovativeness category as Early Majority and Late Majority constituted 80% of the participants within this study, and represented the Mainstream. Each of the participants in this cluster indicated that the university provided hardware and software were sufficient for their lesson preparation: "I don't know what else we could have. Certainly, what we have got certainly meets my needs at this stage. If it's face to face I prepare my Powerpoint's and then talk to it. When it's all web based you have to write your lectures so it takes a lot longer to do it" (P6).

The major technology tool mostly used by this cluster in lectures was Microsoft Powerpoint. As all computers within ACU at the time of this research were multimedia enabled, internet connected, and loaded with Microsoft Office (which included Microsoft Powerpoint), the capability of the machines exceeded the technology expectation of this cluster of participants. As the major technology for teaching was Powerpoint, the participant's major technology requirement in teaching

spaces was a Powerpoint capable computer connected to a data projector. The participants in this cluster did not distinguish between hardware component consisting of a computer and data projector and the software (Powerpoint): “There are probably another couple of rooms that could do with Powerpoint. But I think we are pretty well set up in terms of lecture rooms” (P4).

While some participants within this cluster mentioned the need for electronic whiteboards, the lack of electronic whiteboards did not appear to be an impediment to their technology use, as the need was not driven by their own requirements, but rather they had experienced them in schools and felt that the university should also have them: “I think that the thing we are going to need the most is electronic whiteboards. They’re getting bigger and bigger in schools. And I think that maybe that’s what needed in the main lecture theatre” (P4).

While the participants who identified as Late Majority experienced similar issues relating to technology, this portion of the Mainstream experienced an unsupportive peer environment resulting in feelings of inadequacy: “I felt quite stupid to be honest, I felt inadequate, I can’t do this, so what am I going to do” (P2).

5.4.2 Early Adopters

While the Mainstream participants were generally happy with the hardware and software which supported their teaching, the Innovators and Early Adopters felt impeded by this standard issue. This impediment directly impacted on their teaching programs:

> I still don’t have Adobe Acrobat, we still don’t have a concept mapping tool across the institution such as Inspiration. (P1)

> Up until my new computer there were things I couldn’t do here. I had to buy top grade stuff to do some of the stuff at home…..Also software, my copy of Dreamweaver is mine. (P3)

> The digital video recorder, I had to purchase that myself….In terms of lecture rooms, it's not the computers, or the projection, it's the lack of multimedia capability of the computers. It's the software to lock the multimedia into a functional package, pull it back into something that is a stand-alone unit as opposed to requiring software. (P5)

The clear discrepancy between the two groups of participants (Early and Mainstream adopter) relates to the alignment between the provision of university technology to the two clusters. In the case of the Mainstream, the technology provisioning by the university aligns with their expectations. However, in the case of Early Adopters, there is a marked mismatch between the university's provisioning of technology and this cluster's expectations. The university's focus for teaching technology appears to relate to the universal provisioning on office automation software including Microsoft Powerpoint and the high levels of projection capability within teaching spaces. While this meets the teaching requirements of the Mainstream, the Innovators and Early Adopters were searching for additional learning tools. The major learning technology emerging from the Early Adopters were multimedia resources which were not provided or supported by the university. The members of this cluster resorted to purchasing their own hardware and software where this was required.

5.5 Ubiquitous technology deployment has effectively been reached, removing first order impediments of hardware and software for the academic Mainstream. However impediments for technology use still exist.

The third research question, 'What are the barriers to the use of ICT that have been identified by academic staff?', was drawn from the third cluster of literature, 'Impediments to Use' as shown in Figure 2-1 (The conceptual framework of the literature review). The literature identified that even if all first order impediments such as hardware, software and support (Figure 2-4) were diminished, sustained change was not assured unless academics' values and beliefs in the importance of technology were also addressed (Ertmer, 2005).

The case studies have shown that first order impediments relating to hardware and software have been reached for the academic Mainstream who expressed the view that the hardware and software provided in both their offices and in the lecture rooms meet their requirements: “Well the classrooms are very reasonable. I get the classrooms I request and all the classrooms now have Powerpoint” (P7), and “In terms of computers, projectors, I don’t have any problems with anything” (P2).

This finding is consistent with the *EDUCAUSE* core data service which has shown an increase in the percentage of rooms fitted with internet and projection capability across the sector increasing from 39% in 2002 to 57.5% in 2005 (Hawkins & Rudy, 2006; Hawkins et al., 2003b). The *EDUCAUSE* findings of “ubiquitous deployment” (D. Brown & Petitto, 2003, p. 25) reflects the lived experience of the Mainstream participants in this research.

The third cluster of literature, ‘Impediments to Use’ as shown in Figure 2-1 also identified that positive beliefs in the importance of technology diminished first order impediments to technology’s use. As the Early Adopters in this research have beliefs which assert that innovative technology is linked to positive educational outcomes, the expected finding based on the literature would be that this cluster of participants would experience fewer first order impediments than the Mainstream participants who were adopting more out of compliance to university directives. This research found the Early Adopters, while holding technology deterministic views, reported all of the first order impediments identified in Figure 2-4, while the Mainstream participants did not identify ‘appropriate resources’ as an impediment. This finding is explained in the next section 5.4.1 (issues in accessing emerging technology), which is contrary to the expected findings, based on the literature.

5.5.1 Issues in accessing emerging technology

The provisioning of technology resources for academic staff revolved around university defined standards and its Standard Operating Environment (SOE). Lecture rooms are listed on the university’s web site identifying the standard technology fit-

out which includes projection capability. The standard and recommended suppliers for new computers were published on the university's web site along with the standard software which was funded and supported centrally through the national helpdesk. This approach to the provision of standard hardware and software demonstrates a top-down approach, consistent with a hierarchical management style. Fink (2005) has identified that this top-down approach has historically been more concerned with compliance and control rather than building organisational capacity to promote educational change.

While this base level of technology deployment was utilised by both the Early Adopters and Mainstream participants in their teaching programs, the early adopters had moved past the point where the lecture was defined by time and place and as a consequence they utilised additional resources: "I put my lecture notes in an edited form on the web. With a whole stack of links and that's their lecture and they should do that before coming to class. So contact time now becomes much more interactive, questions and answers" (P3).

The multimodal approach for the Early Adopters of using traditional lectures combined with online resources was heavily reliant on the use of multimedia tools. The software tools most commonly discussed by this group was Dreamweaver and the newer Macromedia suite. Macromedia was not part of the university's standard software suite and all of the Early Adopters has resorted to purchasing it from their own funds. The process the early adopters experienced in their endeavour to upgrade the standard offering with new technology tools highlights the university's management approach to the provisioning of hardware and software.

Despite each of the Early Adopter participants being from different faculties and having to negotiate individually with their respective faculties, the common issue amongst the Early Adopter participants was that their technology use was beyond what was issued as the university standard. The fact that each Early Adopter participant had to negotiate individually with their faculty highlighted the lack of any formal community of practice or forum for raising educational technology issues.

The most junior of the Early Adopter participants felt she had no avenue to approach her faculty at all for additional hardware and software, saying “I have no position of responsibility; I’m probably the lowest of the low here” (P5). She felt isolated and frustrated at being alone and referred to herself as “a little user” who could only get access to technology when she could afford to buy it. This sense of isolation and lack of mechanism to engage the faculty leadership highlights the rigid nature of the management structure within the faculty (Drago-Severson & Pinto, 2006).

While P5 mentioned that she felt isolated, she did discuss the good working relationship with P1, who provided a sounding board and support. P1 was from a different faculty and while there were no formal links between their faculties they had a mutual interest and shared a common belief in the ability of technology to improve their students’ experience. The characteristics of mutualism, a sense of shared purpose and allowance for individual expression align with Crowther’s attributes of parallel leadership. P1’s presence and support filled an informal role of “teacher leader” for the more junior P5 (Crowther, Hann, & McMaster, 2001). The informal support provided to the relatively new academic by the more experienced academic provided P5 with the confidence to continue with her use of technology in her teaching. This informal relationship parallels the benefits which emerge from communities of practice where novices develop into experts through a supporting environment (Fink, 2005).

While P1 was viewed by others (P2, and P5) as a technology leader and engaged in providing support and assistance to other academic staff, he held no positions of authority within his faculty. On reflecting on his need and the need of others within the campus for software tools such as Macromedia, he raised the issue with his HoS. By taking ownership of this issue and taking it to his management structure despite having no formal role demonstrates a kind of leadership referred to “parallel leadership” (Andrews & Crowther, 2002).

P1 provided several options to his HoS for the purchase of Macromedia suite ranging from multiple single licences through to a campus site licence. The request finally reached the Dean, who in turn asked P1 what he thought of the request: “If you look at the email, you see it indicates the very concept that I have been talking about. It

keeps bouncing from person to person, almost cyclical in nature and no one takes responsibility for it. Taking responsibility as in – I'm going to make a decision about this" (P1).

The response of the Dean showed that the Dean did not appear to realise that the request had originated from P1, and some of P1's frustration related to being asked to comment on what he had already proposed. This frustration could be viewed as a clash of values, where P1 has attempted to operate in a more organic manner, which is consistent with a parallel leadership model (Andrews & Crowther, 2002), while the organisational response is based on a hierarchical approach.

When the third Early Adopter (P3) was asked to run a multimedia course, he also approached his HoS to purchase Macromedia licences. While both P1 and P3 experienced the same lack of decision making process, P3 did not create informal links with like-minded staff within the campus, instead he waited for advice from his HoS. The contrast between participants here is that while P1 worked as a "teacher leader" (Andrews & Crowther, 2002, p. 154) by engaging others who wished to use technology in their teaching to achieve improved learning outcomes, P3 limited his commitment to what was possible within the formal top-down structure:

For the past five years the mechanism for getting software has been to go down to Harvey Norman and buy it… I wouldn't dream of going to my Head of School and say give me a copy of Dreamweaver. It would certainly result in a nine month long circus. That's not to say that they are particularly difficult, but just budgetary constraints, and the inability to understand the way forward. An example is when I tried to obtain Macromedia suite for teaching purposes, having been given a unit called multimedia systems. I've found it had taken nine months to come to some sort of resolution. There isn't any decision making capacity. There isn't a team of software people, who can say this is what we need. Any links between software and education are non existent. (P3)

As part of the researcher's administrative role at the time, I discussed the issue of macromedia licences with the Heads of School and Deans. Each expressed frustration about the decision making process. Each said that someone more senior

should make this decision and fund it. Such a process highlights that in terms of new technology acquisitions each level of management in the organisational structure was unwilling to make acquisition decisions and sought ever higher levels of approval. The same response from each of the Heads of School showed that the hierarchical decision making process was not the domain of a single academic manager, but endemic within the organisation. This was highlighted when not only the academic teaching staff felt frustrated and disempowered by the top-down process, but the leaders of these faculties also felt constrained.

The examples above show that while the deployment of technology for teaching may be viewed by leaders within the sector as having reached a ubiquitous state (D. Brown & Petitto, 2003), hardware and software resources are still a major impediment to the Early Adopters. The major source of frustration within this group was directly linked to the university's top-down management approach.

5.5.2 Lack of Time

While the Mainstream did not view hardware or software resources as impediments to their use of technology, they continued to express concerns about other first order impediments such as having sufficient time, the appropriateness of professional development, and ongoing support. These concerns of appropriate professional development and support were common to all participants regardless of their adopter status.

The issue of time was predominantly discussed by the participants as a conflict between the time available for research and the time for teaching and teaching preparation. This conflict was discussed in terms of the participants' beliefs in quality teaching and their lived experience of the university promotions system. This conflict is consistent with a longitudinal study over 20 years which has shown that academic staff are promoted "almost exclusively on research productivity", (Milem, Berger, & Dey, 2000, p. 460). Milem et al. also concluded that academic staff were "spending more time engaged in research and more time teaching and preparing for teaching" (Milem et al., 2000, p. 467). As the time available to academic staff is finite, the issue of workload must be also be more pressing now, than 20 years earlier. On this time-

poor environment, technology was seen by some participants as providing opportunities to become more efficient, and by others as contributing to their workload:

> People will say there is not enough time, and there has to be time to learn the software package whatever; however, it's an investment in time to allow me to get a long term benefit. (P1)

> The way I use the computer is an extremely efficient way of doing it. One aspect is I can work from home. Now with the price of petrol, if I work two days per week from home, fantastic. The other reason is that I don't want to be here after half past three so I want to get home before the traffic. So I can sit down at a computer and I can use voice mail, email, and I can do an hour and a half at home. Absolute magic. (P7)

Regardless of whether participants viewed technology as an efficiency tool or not, all of them were engaged in using technology for research and teaching preparation from home. With time commitments for teaching, teaching preparation and research increasing (Milem et al., 2000), this suggests that technology has created more time for both research and teaching by providing access to the same electronic resources at home as they traditionally had at work.

5.5.3 Professional Development and ongoing support

The issue of professional development was linked by several participants to the issue of time and support. Early Adopters were frustrated that there was no professional development or support in using new software tools. The lack of training or support on emerging technology resulted in the early adopters learning themselves by trial and error, visiting retailers, engaging in IT related higher degrees, and joining professional bodies such as the Australasian Society of Computers in Learning and Tertiary Education (ASCILITE).

> Everything I have done I have taught myself. The big limitation for me is that because I have to teach myself everything, it takes a considerable amount of time for me to figure out how to do them. Whereas if I could just ask someone how do you do this. (P5)

> Trial and error, you just get a piece of software and play with it. (P3)

The lack of professional development opportunities for Early Adopters, coupled with limited support, and the necessity for them to purchase their own software and hardware, resulted in the Early Adopter participants feeling isolated: “I don’t really think there are any technology oriented subsets of society at ACU that I know of”, (P3).

While all Early Adopters lamented the lack of support as impacting on their time, this impediment did not prevent their use of emerging technology. The lack, however, of any formal structures to facilitate the sharing of their expertise and enthusiasm, resulted in the Early Adopters remaining lone rangers, and consequently their expertise and enthusiasm did not diffuse throughout the organisation and become embraced by the Mainstream. “This Lone Ranger” approach results in issues of workload and quality and usually does not translate into wider adoption within the university community (A. W. Bates & Pool, 2003).

Within the Mainstream Adopters of technology, several participants also linked professional development and support directly with time.

> It’s not the hardware support, it’s the curriculum support that is missing. Who’s going to load all these documents onto WebCT, who’s going to design the page. That’s quite good fun, but it’s very time consuming, and an expert would do a better job than I do. So if I had that type of support it would make the transition easier. I’ve just put a test onto WebCT and it took me three or four days really of work to get it there. I’d have appreciated some help with getting it there, but there isn’t any. If you want it up there you have to put it there yourself. (P4)

> I find the IT helpdesk very obliging. I get embarrassed sometimes, I'm sure they have big marks next to my name. They are always obliging, they attend to any requests very promptly, and when I've had a problem in the lecture room, that assistance has come forward. However, the mentoring, help with ongoing support, we do a course and then we help each other, but the reality is that we don't have ongoing support. That is the area I find frustrating. (P2)

While the Mainstream academics were universally happy with the hardware and software support, they felt there was no institutional support for their educational use of technology. Time to learn and implement technology in a pedagogically sound manner was a pressing concern for the Mainstream. While the academic Mainstream were not opposed to top down direction to "get their unit online", they felt frustrated that they were not provided with any formal mentoring, or ongoing curriculum support. One participant (P2) offered to take on additional workload in exchange for time release of another staff member to provide support; however, she was told that this wasn't how things were done and felt abandoned.

> They could give me time and support, the support could be formalised rather than just saying see P1. Now P1 has a very full workload. If I have a problem, I don't mind asking him; however, P1 has his work to do to, and I just didn't think that that was fair that I would have to take his time. Can I trade off some of my time for P1 or can P1 get extra pay rather than me getting a tutor. Maybe if he was interested he could help me. I tried to negotiate it with them but it just wasn't looked at. (P2)

While there was a management perception that some of the Mainstream academic adopters were resistant to using technology, as highlighted in Cuban's "blame cycle" (Cuban, 1986), the participants within this survey who were identified by other participants as resisting technology experienced a conflict between introducing technology on one hand and delivering instruction in a pedagogically sound manner on the other (Kopye, 2006). This perceived resistance to top-down directions is consistent with research from a survey of 40 schools in Ohio, which found that teaching staff had increased positive attitudes to using technology when they

perceived their school leaders operated in a democratic manner, as opposed to an authoritarian leadership style (Hughes & Zachariah, 2001).

The issues of professional development and the participants' reflections that appropriate professional development would release time, were expressed by both Early Adopters and Mainstream participants. The support and professional development sought, however, by each cluster was different. Early Adopters sought assistance with emerging technology, while the Mainstream needed ongoing support on implementing the university's online learning shell. The current 'one size fits all' approach to professional development reported by the participants failed to meet the expectations of either the Early Adopters or the Mainstream.

The standard university technology deployed in academic offices and lecture rooms had reached a near ubiquitous state and was well supported for the Mainstream academics. Senge (2000) suggests that infrastructure needs to include the guiding ideas of the organisation, the design for learning outcomes and the support for those outcomes. The participants (both Early Adopters and Mainstream adopters), believed that institutional design and support for teaching and learning were lacking. While the participants reported a lack of institutional support, several also reported a lack of peer support and expressed feelings of isolation and frustration. In the absence of a supportive community of practice, the major impediment to technology's use by the participants was simplistically reported as the lack of time: "Individuals learn by a process of experience and reflection; groups learn by a process of sharing of individual experiences; organisations learn from a process of sharing individual and group experiences" (Tomlinson, 2004, p. 185).

5.6 Academic staff did not accurately self-assess where they were in terms of using technology to support learning.

The third cluster of literature, 'Impediments to Use' as shown in Figure 2-1 (The conceptual framework of the literature review), identified first and second order impediments to change. Equally, change has been referred to as first and second order as identified in Chapter 2, section 2.4.3 (Evidence of change). In section 5.2.1 (Self-assessment by participants) this research established that the participants were able to access their technology innovativeness and hence comment on their propensity to embrace technological facilitated change. In many organisations, technology innovativeness and adoption is viewed as evidence of change. Cuban (1988) contends, however, that most educational changes brought about through the utilisation of technology does not alter organisational structures, or the roles of students or teachers.

Just as participants were asked to reflect on Rogers' innovativeness categories (Rogers, 1995) to provide evidence of first order change, Welliver's Instructional Transformational Model (1995) (Figure 2-4) was used to gauge the extent of second order change. When the participants went through the self-assessment process using Welliver's Instructional Transformational Model, the results contrasted with Rogers' technology innovation. The participants did not select the same stage in Welliver's model as was selected by the researcher. The Integration Stage was self-selected by all of the participants, while the researcher concluded that only three of the seven participants were at this stage, with the remaining four participants being categorised as belonging in the Utilisation stage.

This generated questions as to why all the participants had correctly self-assessed their technology innovativeness, yet were unable correctly to reflect and access their instructional use of technology. This phenomenon appears linked to their beliefs in themselves as educators, their personal educational philosophy as either pedagogue or student-centred. (Newhouse et al., 2002, p. 44)

5.6.1 Participants' self-perception as educators

The dominant view of all of the participants was that they primarily saw themselves as educators:

> I want to teach, and teach as effectively as I can. (P1)
>
> My focus is being up to date and on my teaching. (P2)
>
> I deliberately crafted a strategy around teaching. (P3)
>
> What I enjoy the most is teaching science. (P4)
>
> I teach ethics and I teach law. (P7)

The exception to this was P5 who saw herself primarily as a professional nurse, and then as an educator: "First and foremost I'm a nurse, and education has come second", (P5). Despite seeing herself firstly as a nurse, her stated goal was to offer high quality nurse education in the area of clinical skills. So while she identified as a nurse rather than as an academic, her focus on quality education was consistent with the other participants.

Having a common belief in the importance of education formed the basis for internal change and the creation of learning communities (Alliance., 2002; Wheatley, 1999). This shared belief did not translate into a shared vision or "mutual engagement" (Fink, 2005, p. 188), as the participants used technology to reinforce their predominant pedagogical practices which ranged from the traditional lecture through to a constructivist approach to learning.

5.6.2 Divergent educational practice

The participants, while universally describing their primary role as educators, expressed a common belief in the importance in teaching. They did not share the same pedagogical beliefs, with some participants being principally concerned with the transmission of knowledge and skills, while others were in the constructivist paradigm believing that technology was important in producing positive educational outcomes. This was evident when some of the participants referred to themselves as

“a guide on the side” (P1, P3), while others utilised technology to enhance the quality of their delivery, reinforcing the “sage on the stage”, (King, 1993, p. 30).

The explanation for the participants selecting the Integration stage may lie within the educational philosophy espoused by Welliver’s model. Welliver’s instructional transformation model is underpinned by a belief in a constructivist approach where technology is used to support student-centred learning (Newhouse, 2001). Newhouse identified the transition from utilisation to integration as the point where educators “emergent self-awareness of a role change in teaching from teaching-centred to learning-centred” (Newhouse, 2001). Without a change in the underlying teaching philosophy to a student-centered approach, the promise of technology enhanced learning to go beyond the utilisation stage is unlikely to be achieved.

While four of the participants were identified by the researcher as being at the utilisation stage based on the findings of Newhouse (2001), these participants believed that they had used technology to enhance the transmission of their content either online or via a traditional lecture. They viewed this as evidence that they had integrated technology into their courses. This finding is consistent with Cuban’s (1988) observation that technology introduction does not necessarily result in second order change. The lack of second order change has been linked to the ‘no-significant difference’ phenomenon where the introduction of technology has not resulted in measurable improvements to learning outcomes: “The majority of instructors use learning management systems primarily to disseminate schedules, syllabi, assignment, and so forth, and less as a tool to implement effective pedagogy” (Henshaw, 2006, p. 11).

Those participants who practised a constructivist approach to their teaching referred to themselves during the interviews as “guides on the side”, (P1, P2, P3). Two of the three participants who identified themselves as “guides on the side” were judged by the researcher as being at the integration stage. Both were Early Adopters of technology and saw technology as having attributes to support a constructivist approach to education.

> It is their knowledge and beliefs about teaching, learning and technology which will lead to real changes in the classroom. It is up to the leaders in our educational communities to align those changes in meaningful, productive directions for the future. (Hughes & Zachariah, 2001)

The anomalous finding among the participants was a Late Majority adopter who also saw herself as a 'guide on the side'. This participant had been viewed by some within her school as a Laggard, as she had resisted placing some of her units fully online. While she "battled with technology", she endeavoured to incorporate technology into her units to "enhance the learning experience" (P2). Unlike the other adopters who clearly identified with using a constructivist approach, P2 did not see her constructivist approach as being triggered by technology. Rather her teaching approach involved learning with, and from the students. Technology was utilised not because she saw it as having any inherent educational properties, but because she saw it a part of the students' world. "They have to tap into the kids' world, and where they're at; and they have to use technology because this is part of their world" (P2).

Where technology aligned with the collaborative learning approach, or the students' development of technology resources, P2 created settings where these resources were shared among the students. This example indicates that, while technology is often seen as an enabler of the constructivist approach to learning (Tong & Trinidad, 2005), the constructivist approach is not confined only to participants who were identified as Integrators on Welliver's instructional transformation model.

This inconsistency highlights that adopting technology early, as measured by Rogers' adopter categories, does not necessarily align with a constructivist approach to using technology for the support of learning as measured by Welliver's model. The use of technology for P2 and P3 was not important in itself, but rather because technology was a part of the students' world and therefore a part of how students construct their knowledge: "Constructivism suggests that people search through things, gain their own knowledge. Technology seems to be built for that" (P3).

5.7 There appeared to be incongruence between what the university formally communicated and what the academic staff actually experienced.

The fourth research question, 'How do academic leaders promote the use of ICT in teaching and learning?', was drawn from the cluster of literature labelled as 'Management/Leadership' in Figure 2-1 (The conceptual framework of the literature review). The literature identified that academics' beliefs on the importance of technology in education were influenced by institutional beliefs in a mutually reinforcing way (Ertmer, 1999). Positive beliefs in the use of technology to support a student-centred approach to learning have also been shown to diminish impediments to the adoption of technology (Mumtaz, 2000; Newhouse et al., 2002). While the literature highlights the importance of shared values and beliefs between an organisation and its staff, the participants highlighted a gap between the espoused organisational values and their lived experience.

5.7.1 Espoused beliefs – Lived experience

The university's documented expectations of technology were both economic and educational, as stated in the university's *Strategic Plan* (1998) and subsequently updated in the *Teaching and Learning Plan* (2003).

> Processes and structure should aim to achieve cost effectiveness and efficiency. (ACU, 1998, p. 5)

> Technology will be harnessed to produce the best ways of promoting student learning. (ACU, 1998, p. 7)

When the participants were asked about the university's espoused rationale for the adoption of technology, not one participant was aware of the statements from the university's Strategic Plan or comments from the Teaching and Learning Plan. This finding was despite these plans having been emailed to all staff at the time of their release. When participants were asked what they believed the university wanted

them to be doing with technology in their teaching, they unanimously responded that the university wanted them to 'use it': "The message from them is that you should be using some technology in your teaching" (P3).

While the research shows that academic staff are aware of the university's policy for technology to be used in their teaching, the messages the participants received appeared to relate to economic imperatives, rather than to enhance the learning for students: "It may have been economic and the reason they gave me was that the Dean didn't want anything going in paper form" (P2) and "…their preoccupation just seems to be budget, budget, budget… I think they forgot those other very important values" (P1), "I think it was put online as a cost saving mechanism" (P7).

Traditional on-campus courses

Where the academic staff did not require any resources above the standard issue multimedia computer loaded with Microsoft Office, and were teaching traditional on-campus students, most of the participants felt no institutional pressure to utilise technology in their teaching:

> In terms of technology I don't feel that they are pushing us to use much. I don't know if anyone in this corridor feels any pressure to embrace IT, I think people are given the opportunity to use it, but they are also given the opportunity to teach the way they are comfortable. (P5)

> ….It's up to me. I've never had any specific requirements or requests. It's purely my philosophy of learning. In fact there is no direction at all. I could sit here with this wonderful computer and not use it. (P7)

These responses highlight that staff appear to work autonomously when it comes to course preparation and delivery. There were circumstances where the participants received direction from the university. This occurred when the participants sought additional resources or the course was offered as a fee paying course and therefore had to be available online. Where staff required resources above the standard offering, (a multimedia internet connected PC running Microsoft XP Professional and the current version of Office), such as Macromedia suite for the development of

multimedia enabled web pages, the participants felt they were ignored: “The digital video recorder, I had to purchase that myself” (P5), and “I started to explain and ask questions but who the hell do I ask questions to, and it became extremely difficult, as wherever I tried to go, I got palmed off to someone else. So there seems to be no-one else” (P1), “An example is when I tried to obtain Macromedia Suite for teaching purposes, having been given a unit called multimedia systems. I’ve found it’s taken nine months to come to some sort of resolution. There isn’t any decision making capacity. There isn’t a team of software people, who can say this is what we need. Any links between software and education are non-existent” (P3).

This frustration with the provided resources and lack of perceived process when resources were requested indicated to these participants that there was no institutional support for the educational use of technology. Each of these participants were either Innovators or Early Adopters and each had resorted to purchasing their own additional equipment and software.

Online fee paying courses

Where the participants were engaged in a course which was to be available online, there was considerable pressure from the academic’s HoS or Dean to ensure that the units were online within a certain timeframe. In some cases the participants were not involved in the decision to make the units available online and felt that the timeframe was insufficient to create quality online courses:

> I was then told that I needed to get those units online. Well there was last semester to get it online. And I felt that it was a very unrealistic timeline. And I felt too much pressure on me. I was really concerned, I was worried, really worried that the technology was going to take over from the essence of what I was trying to do. I got a number of messages enquiring about what I was doing and they needed it online. (P2)

Another participant (P7), while initially fearful at being directed to put her courses online, ultimately sees benefits in having her material online. This consisted of her lecture content in either M/S Word or Powerpoint format, which she believed meets the university’s directive of having it online. This approach of using technology to

host lecture notes reflected a university economic imperative rather than meeting an educational imperative. The economic imperative to use technology was reinforced through the participant's language, where she referred to on-campus students as "students" and the online students as "customers": "I think it was put online as a cost saving mechanism. The fact is once upon a time they taught all these courses on campus and in Queensland I have to say we had full classrooms. When it went online, a number of our customers actually didn't like it" (P7).

5.7.2 Values experienced through the promotions system

Another channel by which staff received information on the university's expectations, was through their peers regarding perceptions of what was successful in gaining promotions. When discussing what they believed the university wanted them to do in order to be promoted, the research participants split into three main groups.

These were:

1. Those staff members who were not seeking promotion.
2. Those who were currently undertaking a doctorate.
3. Those staff members with a doctorate who were seeking further promotion.

Those staff members who were not seeking promotion

Several of the participants said that they were not interested in pursuing a promotional pathway and wanted to enhance their teaching so that their students could learn more authentically. This response demonstrated a conflict between the value participants placed on teaching, and their belief in the university's focus on research. This group of participants believed the path to promotion was through publications. This is consistent with findings from the US which showed that academic promotional rewards are based on research, as measured by publications and "that teaching can be a negative predictor of rewards" (Milem et al., 2000, p. 454). These participants, when faced with the conflict between research and teaching, chose to put their teaching first, and opted out of pursuing a promotion: "I've reached where I want to go, so it's not really driving me. And I don't see that I

have a long term career in academia, my focus is being up to date and on my teaching" (P2).

Those who were currently undertaking a Doctorate

The participants without a PhD indicated that the university primarily wanted them to complete a PhD. When asked to reflect on the research-teaching nexus, they indicated that they would not be promoted until they have completed their PhD. This group of participants experienced a constant conflict between the time they needed to complete their Doctorate and the time they required for their teaching. All the research participants in this category expressed conflicting values with the university, in that they regularly put their teaching preparation ahead of their own research. This group indicated that putting their students and teaching ahead of their own research was to their detriment in relation to career progression. This conflict between teaching and research is consistent between the prior group and this group; however, this group has chosen not to opt out of the promotion path option: "There is nothing I could do on my teaching side that would get me to the next level.… there is no recognition of what I do on the teaching side, it's all now down to my research" (P9), and "Well, I'm supposed to be doing a PhD at the moment. But my workload is quite high and I haven't really had the time. My research is on hold. I haven't done anything since the Masters, but I'm obliged to because part of my probation is to have actually started my PhD. And it wasn't looked kindly on at my probation review that I hadn't started; however, I have had workloads in excess of what you are supposed to have. So they extended my probation" (P5).

Participants with a Doctorate who were seeking further promotion

The final grouping of staff was those with a doctorate who were seeking further promotion. These participants, with one exception, viewed publishing research as the key to being promoted. The belief by this group that promotion prospects correlated with publication output is consistent with findings from US universities over the past 20 years (Milem et al., 2000). This group, while pursuing promotions predominately via research publications, expressed frustration in what this research focus was doing to the quality of teaching. This frustration was a result of a clash between their belief in quality teaching and their perception of the institutional focus on research publications: "Well if I really wanted to get promoted, I'd push out

anything I could do with teaching and get on with my research, and publications. Just put your Powerpoint on the web, and get on with your research. But that's certainly not going to help our teaching profile" (P6), "What the university wants me to do is more research and more administration. And yeah I do that too. I really like teaching and they need me to teach, it's just that when they go to do promotional stuff, they won't acknowledge it" (P4).

The exception within this group of academics with doctorates seeking further promotion was P3, who believed he had been promoted due to his deliberate emphasis on teaching and the incorporation of technology into his teaching. He indicated that the institutional leaders did not know what they wanted other than to be utilising technology for teaching. As he knew he was an Early Adopter and was producing multimedia enabled web pages which had been recognised at an international conference, he believed this gave him status of being highly innovative. While he attributes his promotions to his use of technology in teaching, he believes his emphasis on teaching has been at the expense of his research which may be detrimental to his continuing career if he were to leave ACU. This finding demonstrated that all of the participants viewed promotions within the sector as being related to research publication, despite one using his use of technology to gain a promotion: "Basically the teaching pushed out research to some degree. And that makes you more of an ACU centred person and lessens your links with the outside community. And that certainly has happened to me over the past five or six years. It's probably detrimental to my longer term career" (P3).

These three groupings of staff consistently believe that the predominant pathway to promotion within the higher education sector is through research publications. While the university espouses the importance of teaching and the use of technology to promote learning, most participants believed teaching in itself was not rewarded. All three groups expressed frustration with the conflict between their beliefs and the reward mechanisms of the university.

The differences between the three groups emerged from the way staff actualised this incongruence between their beliefs and their lived experience. Those staff members who were not seeking promotion opted out of the promotion process, rather than

compromise their beliefs. Those who were currently undertaking a Doctorate complied with the research requirement, but expressed frustration about satisfying the requirement to complete their Doctorate and the conflicting high teaching workloads. Those staff members with a Doctorate who were seeking further promotion engaged in research to comply with university expectations despite personal conflict that the quality of their teaching may suffer. The participants who were operating out of a constructivist philosophy (P1, P2, and P3), had opted out of the research pathways to promotions.

This finding demonstrates that the lived experience of the research participants were often at odds with the university's espoused values. Academic staff believed that the introduction of technologies, in particular the teaching of online courses, was driven by the need to meet the university's economic imperatives rather than to enhance learning. The experience of academics was that they placed their teaching commitments ahead of their own research, despite their belief that the university valued research over teaching in terms of promotional prospects. While there was evidence that the university valued teaching in promotion criteria, the perception was that teaching and the use of technology to assist teaching were not valued when compared to the value placed on publications. This finding is consistent with US research which concludes that universities lower down the research ranking were trying to emulate leading research universities which predominantly rewarded academic staff for their research output (Milem et al., 2000).

5.8 Conclusion

While the findings from the case studies were presented in the light of the four clusters of literature (Figure 2-1), the issues academic staff face within their professional practice in adopting technology for their teaching and learning environment are multifaceted and interrelated. The case study approach allowed these interrelated themes to be explored and discussed from the particular participant's perspective. This use of Rogers' (1995) innovation adopter categories in discussing the findings will assist the reader in making decisions regarding the transferability of the findings in this research.

This research found that the technology deployed by the university in the teaching and learning environment met the requirements for Mainstream participants, with all participants utilising technology in their research, lesson preparation and for their administrative tasks. Early Adopter participants experienced institutional obstacles when utilising emerging technologies within their courses. The hierarchical structure of the university coupled with a 'top-down management' style was highlighted by the experience of the Early Adopters' endeavours in striving obtaining additional resources. This organisational structure and mode of operation caused frustration for both the participants and their line management.

This study identified a major dissonance between the documented beliefs of the university and the lived experience of staff. The research also found that the constructivist approach to using technology was not necessarily linked to early technology adoption, as most participants utilised technology primarily in the support of the traditional transmission mode of education.

Chapter 6: Conclusion and Recommendations

The purpose of this chapter is to present the conclusions and recommendations of the study.

6.1 Introduction

This chapter reflects on the purpose of this study and its research design. This is followed by a summary of the findings framed by the research questions, which leads to sections highlighting the conclusions from this research. Recommendations for further research conclude this study.

6.2 Purpose of the Study

The purpose of this research is to explore the issues encountered by university academic staff in their adoption of technology within the teaching and learning environment. The literature highlighted that significant resources have been expended by universities on the provision of technology. This provisioning is underpinned by a deterministic belief that the mere adoption of technologies will produce positive economic, educational and social outcomes. Within ACU, this belief is espoused in its Strategic Plan. Consistent with deterministic beliefs in technology, deployment and use of technology continue to be seen as indicators of positive social and educational change.

The higher education sector has widely adopted technology. However, this has predominantly been used by individual academic staff to support existing pedagogies and practices, rather than facilitating more constructivist approaches to education (Cuban, 2001; Henshaw, 2006).

This research is important as it assisted in identifying the gap between the espoused university policy, the observed technology provisioning by the university, and the

experience of the academic staff. In order to illuminate this gap within the teaching and learning environment, this study explored issues faced by academic staff within their professional practice.

6.3 Research Design

The conceptual framework (Figure 2-1) grouped the literature into four clusters. It was from these clusters that the research questions emerged. The research design was focused by the following research questions:

1. Why do academic staff use ICT?
2. How do academic staff use ICT?
3. What are the barriers to the use of ICT that have been identified by academic staff?
4. How do academic leaders promote the use of ICT in teaching and learning?

Given that the purpose of this study was to explore the issues from the perspective of individual academics, an interpretive approach to the research was adopted. Constructivism was adopted as the epistemological framework for this research, as it sought to elicit an understanding how the participants made sense of their world through their lived experience.

The adoption of technology is essentially a social process where individuals make choices to adopt or reject innovations based on social interaction with their peers, and on the basis of personal meanings (Rogers, 1995). For this reason the theoretical perspective of symbolic interaction was employed as the research method within this thesis. The links between technology innovation and symbolic interaction are highlighted in Table 3-2.

Given that the adoption of technology is essentially a social process, and that this research sought to understand the research questions from an individual academic's perception, a case study approach was considered appropriate by the researcher.

This approach is consistent with Yin (2003), where a case study approach is considered appropriate when the phenomenon under study, ie., the use of technology by academics, could not clearly be separated from the context of the research.

The participants in this study were full-time academic staff, employed by ACU and located at the McAuley Campus. The participants ranged from internationally recognised instructional technology innovators through to participants considered as Laggards in this field by their HoS. The narrative of each case study explores their experiences and perceptions.

The data gathering strategies adopted included the collection of documents and artefacts, the maintenance of a reflective journal, and semi-structured interviews. The selection of participants occurred in two stages: In the first stage participants were nominated by their HoS, and consequently invited by the researcher to participate in this study. Prompts were used (Table 3-3), to ensure the semi-structured interviews had comparable coverage. Following two interviews with each of the initial 21 participants, a self-evaluation of their technology innovativeness (Table 2-2 General Attributes) was undertaken by each of the participants. From this self-evaluation (Figure 3-1), seven participants were selected by the researcher for further interviews. These were taped and transcribed, and then compiled into a narrative. Each of the seven participants read and agreed that their documented case study accurately reflected what they said and therefore contributed to the trustworthiness of the data collection. These in-depth case studies are documented in Chapter 4.

The participant selection and the data collection process conformed with Ethical Clearance granted by the ACU Research Ethics Committee (Appendix 1).

6.4 Limitations of the Research

This research was concerned with exploring the issues academic teaching staff face in their professional practice in adopting technology in the teaching and learning environment, and to explore how leadership influences the adoption of ICT in a university context. To increase the probability that the participants would be available throughout the entire data collection phase of this research, participants were limited to full-time academic staff at the McAuley Campus of ACU. It is acknowledged that the interpretative nature of the seven detailed cases means that the findings only apply to this group under study at a specific point in time. This small group allowed for rich, thick descriptions of the phenomena of the particular academics' use of technology in the support of their teaching and learning in sufficient detail that "readers will be able to determine how closely their situations match the research situations, and hence, whether findings can be transferred" (Merriam, 1998, p. 211).

Therefore each reader may apply their own limitations through a process of engaging with the cases and discussions presented, applying their own understanding and perhaps through a "vicarious experience" (Stake, 1995, p. 87) make generalisations through case to case transfer.

6.5 Research Questions Addressed

This section presents a summary of the findings of the four research questions.

6.5.1 Research Question One

The literature identified that governments, educators and social groups expressed a range of expected outcomes from the educational use of technology. This suggests that the participants would hold a wide range of personal beliefs with regard to technologies that were considered important in their teaching and learning. The first research question sought to understand the motivation behind the use of technology by academics. This question was asked:

Why do academic staff use ICT?

The participants showed a variety of motivations for the adoption of ICT. Several participants expressed a technological deterministic belief in the inherent ability of technology to promote learning. Within this group, some utilised technology to facilitate a social constructivist approach, while others utilised technology to enhance their traditional lecture with multimedia presentations. The participants who saw themselves as operating out of a constructivist paradigm referred to themselves as the 'guide on the side' and were operating from a student-centric paradigm.

Some participants believed that technology delivered personal efficiencies in the preparation of lectures, and in particular, their use of Microsoft Powerpoint. This efficiency was seen not in terms of the economy, but in terms of reducing their workload. Participants who used technology for personal benefits typically operated out of the transmissional mode of instruction. This model has been described as operating from the 'sage on the stage' or in a lecturer-centric paradigm. All of the participants believed that the institutional introduction of technology was driven by economic imperatives. For example, one participant saw opportunities to save her courses through the use of technology by broadening the enrolment base of students within her unit.

The social benefits of technology as discussed by the participants were not mirrored within the literature. The participants did not discuss issues of 'tyranny of distance' and 'the digital divide'. The mixed mode use of technology was discussed as a way of balancing students' work, study, and family commitments. Some participants made their course work available online to assist students to meet this balance. Other participants did not make their course material available due to concerns that students would not attend their lectures. This dichotomy of beliefs exemplified the student centred, and the lecturer centred beliefs of individual participants.

6.5.2 Research Question Two

The second research question sought to explore issues relating to the organisation's deployment of technology and the participants' experience in using that technology to support their teaching and learning. It sought to highlight any incongruence between the participants' espoused beliefs as identified in question one and their lived experience. To further explore the views expressed by the participants and to understand their technology innovativeness, this question was asked:

How do academic staff use ICT?

The case studies identified that all participants (regardless of their technology adopter category) extensively used technology in the support of their administrative functions and in the preparation and presentation of their lectures. This finding of universal use contradicted earlier surveys within ACU (Maguire et al., 2003).

Rogers (1995) identified five categories of innovativeness (refer to Figure 2-2). The research concluded that, while the participants could self-identify consistently with a particular innovativeness category, the issues identified by the participants collapsed Rogers' categories from five to two. These two categories were identified by the researcher as the 'Early Adopters' (Innovators and Early Adopters), and the 'Mainstream' (Early and Late Majority).

The Mainstream technology users constituted 80% of the participants (17 out of the 21) interviewed in stage one of this study. The major use of technology by this group was for: email for communication, the WWW for information and resources, and the use of Microsoft Powerpoint for the presentation of their lectures. Where this group used the university's online learning shell, it primarily consisted of web hosting their lecture notes and Powerpoint presentations. All of the Mainstream participants expressed beliefs in the importance of their role as educators. The group was split with some participants using technology to reinforce the lecturer-centric approach, while others chose to use technology to facilitate a more student-centric approach in their teaching and learning. The predominant source of technology information for this group was from their peers within the university. This group of participants felt no

organisational or peer pressure to use technology, except where the material was for a fee-paying online course.

The Early Adopters used the same technology as the Mainstream. They also used additional technology which included multimedia, animations embedded within their presentations, and they experimented with emerging technology such as blogs. The defining split between Early Adopters and the Mainstream was that the Early Adopters were using technology which was beyond that currently provided by the university. As with the Mainstream participants, the Early Adopters utilised technology to support their predominant educational philosophy. Two of the three case study participants within this group used technology to facilitate a more constructivist approach, while the remaining participant utilised multimedia to enhance the transmission of the course content.

6.5.3 Research Question Three

The third research question sought to explore both the positive conditions and the impediments that impact on academics in their implementation of ICT. The first and second order issues faced by the participants were explored in the light of their technology innovation category. This question asked:

What do academic staff identify as the barriers to the use of ICT?

The participants who identified as Mainstream technology adopters reported that the university hardware and software provided met their requirements. This finding conflicts with earlier surveys undertaken within ACU, which listed hardware and software as a major impediment to the use of technology (Maguire et al., 2003). This finding supports the literature which contends that the state of ubiquitous computing had been reached. The Mainstream participants all reported that the technology support that they received from their university was of a high standard; however, several commented that instructional support was lacking. Participants commented that the lack of instructional design support had resulted in diminished quality, delayed utilisation, and had taken more of their time than would otherwise have been the case.

Three participants identified as Early Adopters agreed with the Mainstream technology adopters that the quantum of projection capable teaching spaces was sufficient for their needs. The three Early Adopters found that the university provided hardware along with the lack of any multimedia editing software had impeded their use of technology in teaching. Therefore, each of the Early Adopters had purchased their own hardware and software to overcome this impediment. These participants reported that their teaching workload and the absence of multimedia support had impacted on their time to an extent that they had ceased any research. When the Early Adopter participants sought to have Macromedia purchased by their department, each felt that there was no formal mechanism to acquire additional educational software. These participants expressed the view that the hardware refresh cycle (every three years) would solve deficiencies in the provided hardware. The lack of a mechanism for the purchase of software in addition to the university standard software suite was a source of frustration.

6.5.4 Research Question Four

The literature suggests that even if all the first order impediments (identified from question three) are addressed technology may still not be fully utilised. The fourth research question explored the incongruence between the organisation's espoused beliefs in the importance of ICT and the observed lack of success in the use of technology in the support of teaching and learning. The question asked was:

How do academic leaders promote the use of ICT in teaching and learning?

The participants were unaware of the formally communicated statements on the importance of technology either within the 'university's Strategic Plan' or within the 'university's Teaching and Learning Plan'. While the participants could not recall the university's formally espoused views on the importance of ICT in their teaching and learning, they did receive messages through other channels.

The major channel of information on what the university wanted the participants to do with ICT was from their peers' perception of the promotional process. All of the

participants with the exception of P3, believed that the path to promotion was through the production of research publications. Most of the participants reported making trade-offs with how they spent their time. The participants' perceptions of the promotions-system were that technology integration into their teaching and learning had a low institutional priority.

Where participants were teaching traditional on-campus courses, they experienced limited direction with regard to technology, other than 'just use it'. This was in distinct contrast to fee-paying postgraduate courses where the Late Majority participants (P2, P7) experienced both institutional and peer coercion to get their courses online. The message received by these participants was that quality and pedagogical approach was of lesser importance than getting their lecture notes (Word and Powerpoint) online. The pressure experienced by the Late Majority participants was compounded by the lack of instructional support.

Just as there was limited instructional support, the Early Adopters believed they were powerless to influence the educational direction of technology. The experience of the Early Adopter participants in their endeavour to acquire Macromedia suite highlighted the hierarchal management structure of the university, where decisions and the information flow occur in a top-down manner. The Early Adopters' experience was they had no formal mechanism to influence technology decisions within the university. This top-down approach to the provisioning of educational software was a source of frustration for both the Early Adopter participants and their line management.

In summary, the management approach to technology within ACU reflected the 'build it and they will come' approach. Where academics utilised the provided technology, they received adequate hardware and software support. They also experienced limited instructional support, where the overriding message was just to use it. The 'just use it' resulted in the participants utilising technology to reinforce their existing pedagogical style, rather than utilising technology to facilitate a more student-centred or constructivist approach in their teaching and learning. Where staff attempted to extend technology by adopting new innovations, which were outside the standard build, they experienced frustration and a lack of institutional support. While the Early

Adopter participants were viewed by their peers as instructional leaders, they were disenfranchised from the decision-making regarding technology decisions at an institutional level.

6.6 Conclusions of the study

The following conclusions represent an attempt to understand the issues academic staff face in their use of ICT within their teaching and learning. The conclusions for this study have been drawn from the case studies.

6.6.1 Ubiquitous deployment

This research concluded that 'hard technology', defined as internet connected multimedia computers and data projection capability, has reached the stage of ubiquitous deployment at ACU. This deployment of measurable hard technology is predominately due to two factors. These are the formalised replacement cycles for computers as well as the impact of benchmarking statistics (EDUCAUSE core data service) (K. Green, 2003).

The benchmarking of hard technology as measured by the percentage of rooms with projection capability results in yearly cycles of additional technology deployment as institutions continually increase such deployment so as not to be deemed as lagging in the technology stakes. ACU's practice of replacing staff and teaching space computers every three years ensures that emerging uses and applications are not impeded by hardware.

The touchstone for this conclusion is not the use of statistics which compare ACU's technology deployment with other institutions in the sector, (where ACU's deployment is comparable), but the experience of participants across all technology innovativeness categories who reported that they had the technology they required, when they required it. This conclusion contradicts earlier research within ACU (Maguire et al., 2003) and elsewhere (Maguire et al., 2003; Surry & Ensminger, 2003)

which identified a lack of resources as the most reported impediment in the take-up of technology by academics. The only exception to this conclusion was the lack of digital video recording devices by the early technology adopters.

6.6.2 Universal Use

This research has concluded that all participants use email, MS word, MS Powerpoint, and the web routinely in performing their roles. This conclusion is incongruent with early research completed in ACU during 2002 (Maguire et al., 2003) which reported limited use of technology by academic staff. The earlier study reported less than universal use amongst academic staff with 96% using MS Word, 88% using email, and 55% using Powerpoint (Maguire et al., 2003). This earlier study identified a lack of resources, technical problems with equipment, lack of professional development and support as the major impediments to academics' use of technology. The incongruence can partly be explained by the timing of the two studies which occurred three years apart. During this time-frame, this research concluded that resources such as computers and data projectors had reached a state of ubiquitous deployment and were not reported as being an impediment to technology's use. The other explanation for the universal use of Word, Powerpoint and the web is that technology's use has become interwoven into academics' social and professional lives to the extent that its use is both the mandated and expected norm. This conclusion demonstrates that use of technology is pervasive throughout the sector with all academic staff using email, presentation tools and the internet, regardless of whether the participants were early technology adopters or late adopters.

6.6.3 Remaining 1st Order Impediments

As the participants were all using technology to support their administrative functions and in the preparation of their lectures, first order issues relating to appropriate resources largely have been addressed. This study concluded that the issue of time was related to a conflict between research and teaching, rather than being time constraints between teaching with or without technology. The participants did report

that developing online resources took considerably more time than the preparation needed for a traditional lecture. This is consistent with a factor identified within the scholarship (Messing, 2002; Newton, 2003); however, most participants believed this time was recovered when they subsequently repeated the course.

Time, however, was considered as an impediment, not in the use of the technology, but in the initial learning of new technology skills. The participants suggested that the time to learn new technology skills could be reduced by more institutionally provided training and ongoing instructional support. While the literature linked professional development to a positive attitude by academic staff towards instructional technology use and to the development of learning communities (Wilson et al., 2001), the participants viewed training on the university's online learning shell (WebCT), as a 'one size fits all' approach, and reported a lack of ongoing institutional support. This study concluded that ongoing professional development and support would increase the instructional use of technology. This conclusion is consistent with the findings from the 2002 survey on academics' use of technology at ACU, (Maguire et al., 2003) and from the literature which links professional development and instructional support with technology adoption (Ertmer, 2005).

6.6.4 Technology innovativeness was not linked to a constructivist approach

The research concludes that, while the use of technology was universal amongst academic staff, its predominant use was in support of the transmission mode of education, with the predominant technology for instruction being the use of MS Powerpoint. This predominant use of technology was evident in each of Rogers' (1995) innovativeness categories. This conclusion is consistent with the literature which states that new technology is primarily used in the support of the transmission mode of instruction (Cuban et al., 2001; Laurillard, 2002). A contributing factor that supports this conclusion was the paucity of instructional technology support, rather than the unavailability of hardware or software support. The lack of instructional integration support was an ongoing issue. This has been raised as an issue within the sector since 2002 (K. Green, 2006).

This study generated a particularly interesting conclusion that the literature often neglects, which was the constructivist approach to using technology by Late Majority technology adopters. P2 demonstrated that the constructivist approach to teaching was not reliant on her being an early technology adopter, but dependent on her philosophy on how learning occurs. This conclusion is consistent with literature which suggests that "teachers use technology which is consistent with their personal beliefs about curriculum and institutional practice" (Ertmer, 2005, p. 31).

6.6.5 Values Conflict

While the university promoted ICT as beneficial for student learning, the participants' experience was that the agenda of management for ICT use was underpinned by financial imperatives.

While the espoused view of the university was to use technology to generate cost effectiveness and efficiency, as well as to promote student learning, (ACU, 1998) the lived experience of the participants was that the economic imperative emasculated their interactions with their organisational superiors. This message was reinforced with several participants who taught fee-paying postgraduate courses, and traditional on campus courses. For traditional on-campus courses, staff reported minimal direction or expectation from their HoS regarding technology usage. When the researcher raised the issue of technology integration by the participants with their HoS, they indicated they did not see it as part of their role. Where the course was fee-paying, pressure was applied from the HoS and the Deans of faculty to ensure the course was available online. This supported the conclusion of the primacy of the economic imperative, rather than seeing technology as providing instructional benefit. This conclusion reinforces research elsewhere (Lohmann, 2005) that the use of technology for instruction is seen essentially as ensuring a university's economic sustainability.

When it came to promotions, all participants, with the exception of one, believed that the path to promotion was via the attainment of a Doctorate followed by research

publications. One participant believed that his technology had underpinned his promotion; however, he also expressed the view that his focus on teaching at the expense of research publications had reduced his employment prospects within the wider tertiary sector. This study concluded that dissonance existed between the university's espoused belief in the importance of technology in student learning, and the way in which staff perceived this was rewarded in terms of promotional prospects. This conclusion is consistent with research which found academic promotions were linked to research publications rather than teaching (Milem et al., 2000).

The conflict between the participants' beliefs in authentic education for their students and their lived experience created dilemmas for the participants. The participants managed the conflict between research and teaching in two distinct ways. One group emphasised their teaching, which they acknowledged meant a diminution of promotional prospects. The others continued to seek promotion through the attainment of a Doctorate and the research publications path. However, these participants expressed frustration with the clash between their belief in quality teaching and their perception of the institutional focus primarily being on research publications.

6.6.6 Lack of Instructional Leadership

This study concludes that the lack of instructional leadership resulted in the considerable financial expenditure on technology which reinforced the transmission mode of instruction. More creative and innovative approaches appeared to be diminished and remained the private initiative of a few individual academics.

This conclusion was reached after reflecting on the participants' attempts to acquire the Macromedia suite. When the participants raised the request with their line management, the request was referred to ever higher levels within the organisation. The Heads of School did not believe technology integration to be part of their leadership role, unless it impacted on a fee-paying course. Higher level leadership such as Deans of Faculty saw it as a cost issue and referred it to administrative bureaucrats, who lacked the pedagogical understanding underpinning the request.

Those involved in this issue - the participants, as well as each level of management, expressed frustration with the process, thus indicating an institutional systemic problem. It highlighted the fact that the technology leadership within the university had minimal mechanisms for addressing emerging instructional needs and also indicated that academic leadership was incapable of making appropriate instructional technology decisions. The organisation's inability to deal with technology innovations was exacerbated by a lack of policy and appropriate professional development. This finding is consistent with the literature which shows that adoption is less likely, if it deviates from the organisational values, beliefs and practices (Zhao, Pugh, Sheldon, & Byers, 2002). With a lack of instructional leadership this alignment of values and beliefs is unlikely to occur.

6.7 Summation

This study has shown that technology deployment of internet connected multimedia computers and projection capability in lecture rooms has reached a ubiquitous state with first order impediments of hardware and software being largely overcome. Having delivered this technology-rich environment, governments, educators and social commentators could argue that we have reached a technology utopia where economic, educational and social benefits automatically should accrue.

> Most policy makers, corporate executives, practitioners, and parents assume that wiring schools, buying hardware and software, distributing the equipment throughout will lead to abundant classroom use by teachers and students and improved teaching and learning… We found that access to equipment and software seldom led to widespread teacher and student use. Most teachers were occasional users or nonusers. When they used computers for classroom use, more often than not their use sustained rather than altered existing patterns of teaching practice. (Cuban et al., 2001, p. 813)

This study moves the research past the findings of Cuban by concluding that technology is widely used by all academic staff. The study has shown that the

predominate use of technology by academic staff, and supported by the organisation, is the transmission model of instruction. In other words, the “Chalk and Talk” still predominates in an electronic format. The technological enhancement of the transmission model has been shown to deliver no significant educational outcomes (Dynarski et al., 2007). As the major educational catalyst for the introduction of technology was its potential to improve the quality of teaching and learning, the literature suggests we can only overcome the *no-significant difference phenomenon* by utilising technology to facilitate a more constructivist approach to teaching and learning.

6.8 Recommendations from this Research

Considering the conclusions of this research, that the predominant use of technology by academic staff has been in the support of the traditional instructional models, the recommendation for moving forward from this research is to address issues which would facilitate the use of technology to support a more constructivist pedagogical approach. These recommendations have emerged principally from the participants, as well as the reflections of the researcher.

The recommendations are:

1. Academic staff should be provided with opportunities to undertake studies which will inform and challenge their educational practice. This recommendation emerged from the finding that academics primarily utilised technology to reinforce their existing pedagogical practice. Providing academic staff with opportunities to learn about other pedagogical options could encourage different technology practices.

2. Academic staff continue to believe that the path to promotion is through research publications. The equal importance of teaching as a promotional track needs to be experienced as well as espoused. The university should clearly articulate the importance of technology in the support of teaching and

learning, and ensure that the academics' experience more closely aligns with the espoused values of the institution.

3. This research recommends that the existing high levels of hardware and software support be expanded to include instructional design support. Many participants failed to utilise technology to its full potential due to their lack of confidence and expertise. Enhancing the provision of instructional support would assist in addressing this impediment. ICT organisational leadership would have to recognise the educational importance of technology, and not just its administrative importance.

4. A further recommendation is for the creation of an appropriate mechanism so that educational technology practitioners be considered as stakeholders in the decision making process regarding the provisioning of appropriate hardware and software. Currently decisions regarding such provisioning are made by an administratively focused directorate which does not have any specific educational expertise. Providing a more structured academic input form a range of technology adopters could ease the current source of enormous frustration.

5. A final recommendation is that top-down management, typified by 'just use it', should be transitioned to a more supportive peer environment, which would foster the development of communities of practice focused on enhancing learning outcomes. The current approach resulted in the Late Adopters of technology experiencing a hostile and unsupportive peer environment.

While this research has identified that the current use of technology has moved past the point identified by previous studies eg. (Cuban et al., 2001), further research could confirm the conclusions of this study in the sector in general and investigate the transition to a more constructivist approach to using technology in the higher education sector.

Chapter 7: Appendices

Appendix A: Ethics Approval Letter

Australian Catholic University
Brisbane Sydney Canberra Ballarat Melbourne

ACU National

Human Research Ethics Committee

Committee Approval Form

Principal Investigator/Supervisor: A/Prof Denis McLaughlin Brisbane Campus
Co-Investigators: Brisbane Campus
Student Researcher: Mr Gordon Howell Brisbane Campus

Ethics approval has been granted for the following project:
Leadership and the delivery of Information Technology Services in a University Context

for the period: 10.06.2005 to 31.12.2005

Human Research Ethics Committee (HREC) Register Number: Q2004 05 26

The following standard conditions as stipulated in the *National Statement on Ethical Conduct in Research Involving Humans* (1999) apply:

(i) that Principal Investigators / Supervisors provide, on the form supplied by the Human Research Ethics Committee, annual reports on matters such as:
- security of records
- compliance with approved consent procedures and documentation
- compliance with special conditions, and

(ii) that researchers report to the HREC immediately any matter that might affect the ethical acceptability of the protocol, such as:
- proposed changes to the protocol
- unforeseen circumstances or events
- adverse effects on participants

The HREC will conduct an audit each year of all projects deemed to be of more than minimum risk. There will also be random audits of a sample of projects considered to be of minimum risk on all campuses each year.

Within one month of the conclusion of the project, researchers are required to complete a *Final Report Form* and submit it to the local Research Services Officer.

If the project continues for more than one year, researchers are required to complete an *Annual Progress Report Form* and submit it to the local Research Services Officer within one month of the anniversary date of the ethics approval.

Signed: ..... Date: 10/6/05
(Research Services Officer, McAuley Campus)

(Committee Approval.dot @ 15/10/04) Page 1 of 1

Appendix B: Information Letter to Pro Vice Chancellor (Quality and Outreach)

ACU National

Australian Catholic University
Brisbane Sydney Canberra Ballarat Melbourne

Information Letter to PVC (Q&O)

Title of Project: Leadership and the delivery of information technology services in a university context.

Names of Staff Supervisor: Dr Denis McLaughlin

Name of Researcher: Mr Gordon Howell

Name of Program: Doctor of Education

Dear Prof O'Gorman,

This letter is to seek your approval to undertake research on McAuley at Banyo Campus and access academic staff for research purposes, as required by the Human Research Ethics Committee.
This study forms an important and vital part of the Doctorate in Education that I am currently undertaking.

The purpose of this research is to explore the issues academic teaching staff face in their professional practice in adopting technology in the teaching and learning environment, and to explore how leadership influences the adoption of ICT in a University context.

Participants (academic staff) who accept the invitation to be involved in this study will be interviewed on up to 3 occasions. The interview times will be mutually agreed upon and may be for up to 30 minutes on each occasion. Interviews will be audio taped.

The benefits of this research, will be to
: identify impediments that academic staff face in the adoption of technology
: provide a voice to academic staff regarding the issues they face in the adoption of technology in the support of teaching and learning, and
: shape future practice in the administrative delivery of technology.

Data collected during interviews will be treated confidentially during the conduct of the research and in any publication arising from this process. To ensure confidentiality pparticipants will be allocated pseudonyms that will be used in all transcripts of interviews, to protect their identity. Where participants feel that they may be identified even with the use of a pseudonym, the researcher will seek permission to use their particular case study in the final research publication. The

participants' right of access to the transcripts of their interviews, conversations and field notes, is acknowledged. All recordings and written material will be stored securely in a locked cabinet in the researcher supervisors office, throughout the study. These materials will be kept locked for a period of five years following completion of the project, in accordance with the ethical requirements of the Australian Catholic University Human Research Ethics Committee. These materials will then be disposed of by shredding all written data and erasing all audio recordings and relevant computer disks.

Any questions regarding this project should be directed to:
Student Researcher: Gordon Howell, ACU McAuley Campus by phone on 07 3623 7269
Or
Principal Supervisor: Associate Professor Denis McLaughlin ACU McAuley Campus by phone on 07 3623 7154
On completion of this project, feedback will be available to participants to facilitate reflection on the results of the research.

This study has been approved by the Human Research Ethics Committee at Australian Catholic University.

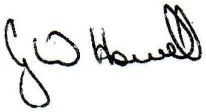
In the event that you have a complaint or concern about any aspect of the study including your personal treatment you may write to the following address,

Chair, HREC
C/O Research Services
Australian Catholic University
Brisbane Campus
PO Box 456
Virginia QLD 4014
Tel 0736237294
Fax 0736237328

If you consent to this project, please sign the consent form below, retain one copy for your records and return the other copy to me.

Many thanks for your support,

Dr Denis McLaughlin – Principal Supervisor 

Gordon Howell – Student Researcher 

Appendix C: Pro Vice Chancellor (Quality and Outreach) Consent Form

ACU National

Australian Catholic University
Brisbane Sydney Canberra Ballarat Melbourne

PVC (Q&O) CONSENT FORM

TITLE OF PROJECT: LEADERSHIP AND THE DELIVERY OF INFORMATION TECHNOLOGY SERVICES IN A UNIVERSITY CONTEXT.

NAMES OF STAFF SUPERVISORS: DR DENIS MCLAUGHLIN
DR EUGENE KAMINSKI

NAME OF STUDENT RESEARCHER: MR GORDON HOWELL

I have read and understood the information provided in the information letter. Any questions I have asked have been answered to my satisfaction. I have given my consent for this research to be undertaken at the McAuley at Banyo campus of ACU.

Prof John O'Gorman
SIGNATURE ..... DATE: 17 June 05

SIGNATURE OF PRINCIPAL SUPERVISOR: .....

DATE: 17/6/05

SIGNATURE OF STUDENT RESEARCHER: .....

Date: 17/6/05

Appendix D: Information Letter to Head of School

ACU National

Australian Catholic University
Brisbane Sydney Canberra Ballarat Melbourne

Information Letter to Head of Schools.

Title of Project: Leadership and the delivery of information technology services in a university context.

Names of Staff Supervisor: Dr Denis McLaughlin

Name of Researcher: Mr Gordon Howell

Name of Program: Doctor of Education

Dear HOS,

This letter is to invite you to participate in this research project. This study forms an important and vital part of the Doctorate in Education that I am currently undertaking.

The purpose of this research is to explore the issues academic teaching staff face in their professional practice in adopting technology in the teaching and learning environment, and to explore how leadership influences the adoption of ICT in a university context.

Your assistance is sought to identify potential participants from your school who are at various stages of using technology in their teaching and learning.

These staff would then be invited to be involved in this study. You may also choose to select yourself as a suitable participant.

Participants who accept the invitation to be involved in this study will be interviewed on up to 3 occasions. The interview times will be mutually agreed upon and may be for up to 30 minutes on each occasion. Interviews will be audio taped.

The benefits of this research, will be to
: identify impediments that academic staff face in the adoption of technology
: provide a voice to academic staff regarding the issues they face in the adoption of technology in the support of teaching and learning, and
: shape future practice in the administrative delivery of technology.

Participation in this research is voluntary and you are free to refuse consent, withdraw consent at any time during the data collecting process.

Data collected during interviews will be treated confidentially during the conduct of the research and in any publication arising from this process. To ensure confidentiality participants will be allocated pseudonyms that will be used in all transcripts of interviews, to protect their identity. Where participants feel that they may be identified even with the use of a pseudonym, the researcher will seek permission to use their particular case study in the final research publication. The participants' right of access to the transcripts of their interviews, conversations and field notes, is acknowledged. All recordings and written material will be stored securely in a locked cabinet in the researcher supervisors office, throughout the study. These materials will be kept locked for a period of five years following completion of the project, in accordance with the ethical requirements of the Australian Catholic University Human Research Ethics Committee. These materials will then be disposed of by shredding all written data and erasing all audio recordings and relevant computer disks.

Any questions regarding this project should be directed to:
Student Researcher: Gordon Howell, ACU McAuley Campus by phone on 07 3623 7269
Or
Principal Supervisor: Associate Professor Denis McLaughlin ACU McAuley Campus by phone on 07 3623 7154

On completion of this project, feedback will be available to participants to facilitate reflection on the results of the research.

This study has been approved by the Human Research Ethics Committee at Australian Catholic University.

In the event that you have a complaint or concern about any aspect of the study including your personal treatment you may write to the following address,

Chair, HREC
C/O Research Services
Australian Catholic University
Brisbane Campus
PO Box 456
Virginia QLD 4014
Tel 0736237294
Fax 0736237328

If you agree to participate in this project, please sign both copies of the consent form, retain one copy for your records and return the other copy to me.

Many thanks for your support,

Dr Denis McLaughlin – Principal Supervisor

Gordon Howell – Student Researcher

Appendix E: Letter of Invitation to Participants

ACU National

Australian Catholic University
Brisbane Sydney Canberra Ballarat Melbourne

Information Letter to Participants

Title of Project: Leadership and the delivery of information technology services in a university context.

Names of Staff Supervisor: Dr Denis McLaughlin

Name of Researcher: Mr Gordon Howell

Name of Program: Doctor of Education

Dear academic staff,

This letter is to invite you to participate in this research project. This study forms an important and vital part of the Doctorate in Education that I am currently undertaking.

The purpose of this research is to explore the issues academic teaching staff face in their professional practice in adopting technology in the teaching and learning environment, and to explore how leadership influences the adoption of ICT in a university context.

Participants who accept the invitation to be involved in this study will be interviewed on up to 3 occasions. The interview times will be mutually agreed upon and may be for up to 30 minutes in duration on each occasion. Interviews will be audio taped.

The benefits of this research, will be to
: identify impediments that academic staff face in the adoption of technology
: provide a voice to academic staff regarding the issues they face in the adoption of technology in the support of teaching and learning, and

: shape future practise in the administrative delivery of technology.

Participation in this research is voluntary and you are free to refuse consent, withdraw consent at any time during the data collecting process.

Data collected during interviews will be treated confidentially during the conduct of the research and in any publication arising from this process. To ensure confidentiality participants will be allocated pseudonyms that will be used in all transcripts of interviews, to protect their identity. Where participants feel that they may be identified even with the use of a pseudonym, the researcher will seek permission to use their particular case study in the final research publication. The participants' right of access to the transcripts of their interviews, conversations and field notes, is acknowledged. All recordings and written material will be stored securely in a locked cabinet in the researcher supervisors office, throughout the study. These materials will be kept locked for a period of five years following completion of the project, in accordance with the ethical requirements of the Australian Catholic University Human Research Ethics Committee. These materials will then be disposed of by shredding all written data and erasing all audio recordings and relevant computer disks.

Any questions regarding this project should be directed to:
Student Researcher: Gordon Howell, ACU McAuley Campus by phone on 07 3623 7269
Or
Principal Supervisor: Associate Professor Denis McLaughlin ACU McAuley Campus by phone on 07 3623 7154
On completion of this project, feedback will be available to participants to facilitate reflection on the results of the research.

This study has been approved by the Human Research Ethics Committee at Australian Catholic University.

In the event that you have a complaint or concern about any aspect of the study including your personal treatment you may write to the following address,

Chair, HREC
C/O Research Services
Australian Catholic University
Brisbane Campus
PO Box 456
Virginia QLD 4014
Tel 0736237294
Fax 0736237328

If you agree to participate in this project, please sign both copies of the consent form, retain one copy for your records and return the other copy to me.

Many thanks for your support,

Dr Denis McLaughlin – Principal Supervisor

Gordon Howell – Student Researcher

Appendix F: Consent Form for Participation in Study

ACU National

Australian Catholic University
Brisbane Sydney Canberra Ballarat Melbourne

Consent form (participant's copy)

TITLE OF PROJECT: LEADERSHIP AND THE DELIVERY OF INFORMATION TECHNOLOGY SERVICES IN A UNIVERSITY CONTEXT.

NAMES OF STAFF SUPERVISORS: DR DENIS MCLAUGHLIN
DR EUGENE KAMINSKI

NAME OF STUDENT RESEARCHER: MR GORDON HOWELL

I…….(the participant) have read and understood the information provided in the Letter to Participants. Any questions I have asked have been answered to my satisfaction. Due to the research being conducted on a single campus of ACU, confidentially may be difficult even with the use of pseudonym. I will have access to transcripts of the interviews, provided at subsequent interviews and may withdraw consent for part or all of the proceeding interview.

I agree to participate in this activity, by undertaking a number of interviews with the researcher, realising that I can withdraw at any time. I agree that the research data collected for the study may be published or may be provided to other researchers in a form that does not identify me in any way.

NAME OF PARTICIPANT: (block letters)

SIGNATURE

:……DATE:……

SIGNATURE OF PRINCIPAL SUPERVISOR:……

DATE:……

SIGNATURE OF STUDENT RESEARCHER:……

Date:……

Chapter 8: References

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