Pressure points that impede technology-enabled learning in a New Zealand university: Implications for professional development

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Abstract

This research offers a new way of thinking about university teachers who have been portrayed as reluctant to adopt technology for learning and teaching. Surprisingly, the barriers that hinder teachers' adoption of technology in higher education persist despite the many studies undertaken in this area. What remains unclear is whether these barriers can be overcome when teachers adopt technology in socially situated learning contexts. Therefore, this research investigated factors that impede university teachers from adopting and implementing technology-enabled learning when engaging in socially situated learning approaches to professional development.

This investigation was undertaken in 2014 at the Auckland University of Technology (AUT) with 28 teachers who adopted technology in workgroup settings. Within a social constructionist paradigm, a multiple case study inquiry was designed to surface the voices of teachers through focus groups and individual interviews. Written documents were used to access background information about AUT that informed the context for this research. Through my interpretation of this qualitative data, I developed four case study narratives from which rich descriptions of teachers' perspectives were gained for each of the research questions.

My research identified four areas of difficulty or pressure points that impede teachers from adopting and implementing technology-enabled learning in workgroup settings at AUT. The pressure points are authoritative decision-making, pedagogical development, virtual space and senior leadership. I argue that socially situated learning approaches to professional development are unlikely to have a significant impact on encouraging teachers' implementation of technology-enabled learning if the pressure points that impede adoption projects are not explicitly addressed. I have offered the social constructionist notion of dialogic practice as an avenue for teachers to voice their perspectives when confronted by these pressure points. This research contributes to adoption and diffusion theory in higher education through the development of my Pressure Point Framework. This research is significant because it provides new knowledge about technology-related professional development in situated learning contexts and offers an alternative avenue for addressing pressure points that arise during the technology adoption process.

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List of Abbreviations

ADU	Academic development unit
AUT	Auckland University of Technology
AUTEC	Auckland University of Technology Ethics Committee
CAI	Computer-assisted instruction
CFLAT	Centre for Learning and Teaching
CoP	Community of practice
C-CoP	Course community of practice
IT	Information technology
LATTE	Learning and Teaching Technology Enabler
LMS	Learning management systems
LTDF	Learning and Teaching Development Fund
MOOC	Massive open online course
NSD	No significant difference
NZ	New Zealand
SCOT	Social construction of technology
STEM	Science, technology, engineering and mathematics
TAL	Technology adoption leader
UK	United Kingdom

Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Julia Leah Hallas

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Chapter 1: Introduction

Since the 1990s, adoption and diffusion studies in higher education have demonstrated a recurrence of barriers that impede teachers' uptake of technology for teaching and learning (Reid, 2014; Singh & Hardaker, 2014). Two decades of such research indicate that finding solutions to these barriers is a significant problem, particularly for academic developers who support teachers to adopt technology. In attempting to solve this problem, academic developers have adopted socially situated learning approaches to professional development. However, few studies have been undertaken to demonstrate whether this approach is effective in overcoming barriers that impede teachers' adoption of technology for teaching and learning.

This research has investigated factors that impede teachers from adopting and implementing technology-enabled learning when engaging in socially situated learning approaches to professional development. I decided to investigate this topic because I knew little about how technology adoption processes occurred for teachers across faculties at AUT. Supporting teachers to implement technology in their teaching practice is a key component of my position as a teaching and learning advisor at AUT. Therefore, identifying whether teachers adopting technology at AUT faced similar barriers as those identified in the literature was an important reason for undertaking this research. Initial questions that framed my research were about the processes that teachers undertake to adopt technology, how best to gather their perceptions of these processes and whether AUT provided the support that they required.

Working within a social constructionist paradigm that emphasises democratic research practices, I focused the methodological design on gathering multiple teachers' perspectives, particularly as their voices are under-represented in the literature on technology adoption in higher education. Within a qualitative multiple case study inquiry, I used focus groups and individual interviews to gather data from teachers who undertook technology adoption projects in workgroup settings. I selected four case studies to examine the progression of these multiple workgroups throughout the adoption process.

From the cross-case assertions, I have conceptualised four pressure points that reduced teachers' motivations to adopt technology and impeded their abilities to develop the knowledge and skills necessary for the implementation of technology-enabled learning. In this research, the metaphor of pressure points describes sources or areas of difficulty

where problems are likely to occur for teachers who adopt technology in workgroup settings at AUT. The pressure points relate to teachers' adoption projects undertaken in workgroup settings and are described as pedagogical development, authoritative decision-making, virtual space and senior leadership. Therefore, I argue that socially situated learning approaches to professional development are unlikely to have a significant impact on encouraging teachers' implementation of technology-enabled learning if pressure points that impede adoption projects are not explicitly addressed.

This research contributes to adoption and diffusion theory in higher education through the development of my Pressure Point Framework. The pressure points were conceptualised from the cross-case assertions in this research and synthesised with Rogers's (2003) innovation-decision process, and concepts related to the social constructionist notion of dialogic practice. My framework is significant and original, as it places a much-needed focus on identifying and addressing pressure points that occur during the innovation-decision process. The framework will assist stakeholders to address pressure points that impede teachers in workgroup settings from implementing technology-enabled learning.

Social change and the transformation of practice is a focus of social constructionism that was integral to theory development in my research. My research has shown that teachers undertaking technology adoption projects in workgroup settings experienced a process of social change that is reliant on supportive relationships. Accordingly, I have identified concepts relating to social constructionist dialogic practice that have the potential to address the pressure points that impede the implementation of technology-enabled learning.

This investigation was undertaken in 2014 with 28 teachers at the Auckland University of Technology (AUT); therefore, the scope and findings are limited to this setting. Although the findings of this research are particularised to AUT, they will contribute to the practice of teachers/academics, academic developers, technology adoption leaders, senior leadership and others who support technology adoption projects in similar institutions. As stated in the glossary (p. 225), academic developers and senior leaders who facilitate workgroups to adopt technology at AUT are called technology adoption leaders (TALs) in this research.

Next, I introduce the philosophical position that underpins my perspective of technology in this thesis and define the term technology-enabled learning for my research. I briefly discuss the issues in the literature that were the impetus for this investigation and the

development of the research questions. Then I discuss my reasons for undertaking this research. A brief overview of AUT and its academic development unit (ADU) provide a description of the setting in which teachers in this research completed technology adoption projects. I conclude by defining the problem, purpose and research questions, and provide an overview of the chapters in this thesis. A glossary of terms used in this research is included on page 225.

Technology as a social construction

A challenge in writing this thesis was determining how I would define the successful adoption and implementation of technology and the terms I would use to describe the types of technology teachers were adopting for teaching. I begin by explaining the philosophical position I have taken in this research. Then I provide a definition for the successful adoption and implementation of technology for teaching and learning in my research.

Dusek (2006) argues that it is unlikely that a single definition of technology can be agreed upon. Dusek suggests that contemporary philosophers of technology such as Don Ihde and Andrew Feenberg do not believe, as Martin Heidegger or Jacques Ellul did, in a single essence of technology because the "things" (p. 29) that tend to be classified as technology are too diverse to share a single characteristic. Instead, he offers three definitions or characterisations of technology: technology as hardware, technology as rules and technology as system. In defining technology as system, Dusek (2006) proposes that the construction of technology is shaped by the multiple perspectives of people within that system, for example, people who draw on theories to create the designs, marketers who sell technology, trainers who teach people how to operate technology, and people who use technology for specific purposes. Thus, Dusek's definition demonstrates that technology embodies the ideologies of people who contribute to that construction.

Within a technology as system characterisation, the multiple ideologies that contribute to the construction of technology tend to create both desirable and undesirable implications for teaching and learning (Rogers, 2003). I align with the perspective that technology is socially constructed within a technology as system characterisation. Therefore, I suggest that within the context of university teaching, technology cannot be viewed as neutral because of the resultant desirable and undesirable effects on teaching and learning. These implications will be discussed in this research in relation to effective implementation of

technology for learning and teaching. In addition, Dusek's three definitions or characterisations of technology are discussed further in chapter 2, part 2.

This research is concerned with teachers who have adopted technology for learning and teaching. During data gathering, teachers in this study explained their use of mobile phones, iPads, tablets, Mahara ePortfolio, blogs, augmented reality, Blackboard LMS, Twitter and video creation software for example. However, this research was not framed by the type of technology the teachers used for learning and teaching. Nor is this research an examination of the types of technology adopted by teachers in higher education. This research examines teachers' perspectives of the technology adoption process within workgroup settings, therefore, any Internet-based technology and associated software teachers used for learning and teaching was included in this study.

Rogers (2003) definition of technology was used to describe a technology that was adopted by a teacher for learning and teaching in this research. That is, Internet-based, and consisting of hardware and software components (Rogers, 2003). A technology such as a smartphone that connects to the Internet is constituted from many technological components, that is, hardware, software, and communications and storage devices. Therefore, many technologies comprise a single device, for example, hardware such as a laptop, smartphone or tablet; software such as the Blackboard learning management system (LMS) or social media; communications channels such as fibre optics or Wi-Fi; and storage such as hard drives and cloud computing. In my research, teachers adopted technology for teaching and learning in lecture theatres and classrooms. Other terms commonly used in the higher education literature to describe technology are educational technology, media, Web 2.0, social media, virtual space and digital technology. These terms will be used when reporting on the literature that uses them.

Technology-enabled learning

A significant aspect of this research was undertaking a review of the literature in order to define the successful adoption and implementation of technology for teaching and learning. To do this, I drew on Kirkwood and Price's (2016) definition of technology-enabled learning, and Rogers's (2003) definition of adoption. Kirkwood and Price (2016) have offered a definition that attempts to specify the role technology has in learning and teaching. They define technology-enabled learning as describing "the use of technology to support students' learning" (p. 2). Additionally, they argue that the word *enable* has a specific role in the definition in that it refers to facilitation, where "learning is made possible by the use of technology" (p. 2). Here they align learning with facilitation, but

separately from technology. Their perspective becomes clearer when they contrast technology-enabled learning with technology-enhanced learning. They conclude that the word *enhanced* implies that technology can enhance learning but that the literature lacks substance on what that enhancement looks like or how students will benefit from such an approach. Rogers (2003) describes innovation as the uptake of technology perceived as new, by individuals, groups or institutions. Rogers defines adoption as the "decision to make full use of an innovation as the best course of action available" (p. 21). Of significance to my research, the phrase 'to make full use of' implies that a technology is implemented effectively or successfully. This effectiveness would be relative to the context in which the technology is adopted. Secondly, the phrase 'the best course of action available' refers to the reason why technology has been adopted. For example, in this research, it could refer to teachers selecting a technology to achieve a pedagogical goal.

Building on the following sources, I have synthesised concepts to highlight four assumptions that underpin my definition of the successful adoption and implementation of technology in university teaching. These concepts and sources are Rogers's (2003) definition of adoption, Kirkwood and Price's (2016) definition of technology-enabled learning, Entwistle's (2009) work on conceptions of and approaches to teaching and Knowles's (1972) adult learning principles. In my research, successful adoption assumes that technology is implemented effectively to support students' deep approaches to learning. Therefore, the term technology-enabled learning is used in this research to indicate the effective adoption of technology for university teaching. The four assumptions that underpin this definition are as follows.

Assumption 1: The teacher makes the decision to make full use of a technology as the best course of action (Rogers, 2003).

Assumption 2: The teacher develops pedagogically determined strategies appropriate for virtual space (Kirkwood & Price, 2013). These strategies are underpinned by learner-focused conceptions of and approaches to teaching that encourage students to take deep approaches to learning (Entwistle, 2009).

Assumption 3: The selected technology must be able to accommodate a model of university teaching underpinned by a social constructivist learning perspective and Knowles's (1972) adult learning principles.

Assumption 4: The effectiveness of the pedagogical strategy may be evidenced by construction of students' meaning making, which will demonstrate change in one or more of the following concepts: conceptual thinking, intellectual reasoning and reflection abilities (Entwistle, 2009). At least some of this evidence should be constructed in a virtual space as defined by Sköld (2012). In this research, these concepts apply to teachers' disciplinary contexts. A term used throughout this research is virtual space, also known as virtual learning environment in a higher education context. Studies relevant to this research have examined how virtual space affects the learning that takes place in that environment (Sköld, 2012). Therefore, for this research and within a learning and teaching context, virtual learning environment or virtual space has been defined by Sköld (2012) as:

> Virtual is, in the present context, functionally defined as "facilitated by networked computers" (Bell, 2008). Space is used as a generic term to denote a platform or environment where people interact" and "learning relates to concepts and educational practices, such as task design, student participation and motivation, student acquisition of information, and learning outcome (Sköld, 2012, p. 2).

Additionally, virtual space is an "umbrella term for similar concepts such as virtual learning environment (VLE), virtual world (VW), collaborative virtual environment (CVE) and multi-user virtual environment MUVE" and also includes game space (Sköld, 2012, p. 2).

I will discuss the evidence for these assumptions in the literature that underpins the basis for this research in chapter 2, the literature review.

Background

In this section I briefly review the practice and theoretical literature that contributed to the development of the research questions and design of my research.

The processes involved in adopting technology-enabled learning require teachers to make significant changes in the way they think about and approach teaching with technology. Since the turn of the 21st century, technology has become commonplace in higher education. Few would doubt that students have benefited from increased access to education afforded by technology (Bates & Sangra, 2011). To achieve these benefits, however, teaching practice is changing to accommodate technology and personal mobile devices. Consequently, university education has been disrupted by LMSs and mobile devices during the past two decades. An example of a disruption is the personal

computer, which replaced the typewriter in the 1980s, completely changing the workplace and traditional methods of communication. Though the lecture method does not support technology-enabled learning, it remains the most popular method in university teaching today (Laurillard, 2012; Ramsden, 2003). Few university teachers have teacher qualifications (Bernauer & Tomei, 2015) and those who have been educated in classrooms and lecture theatres may not have a mental image of what teaching might look like in virtual space. Therefore, a major challenge for teachers is knowing why, when and how to best implement technology in their teaching practice (Englund, Olofsson, & Price, 2017; Kirkwood & Price, 2016).

One impetus for this research was to investigate why teachers continue to be viewed in the higher education literature as reluctant to adopt technology. Teachers are often concerned with the ongoing debate that questions whether technology-based teaching methods are as effective as traditional face-to-face teaching methods (Kirkwood & Price, 2016; Oliver, 2013). Despite this unresolved issue, researchers such as Schneckenberg (2010) argue that technology has the potential to enhance education, and institutions continue their initiatives to innovative teaching with technology (Kopcha, Rieber, & Walker, 2015). Millions of dollars have been spent on technology at all levels of education (Cuban, 2001), yet higher education studies continue to conclude that the rate of adoption by teachers is disappointing (Reid, 2014; Schneckenberg, 2010) and that there is a lack of evidence showing that technology has had a transformative effect on teaching and learning (Englund et al., 2017; M. G. Jones & Harmon, 2011; King & Boyatt, 2015; Ng'ambi, 2013; Singh & Hardaker, 2014). A variety of reasons have been suggested by researchers for the slow rate of adoption and the lack of impact on students' learning. For example, Schneckenberg (2010) suggests that universities have not recognised the innovative potential of technology, while others suggest that teachers have not embraced technology for teaching and learning (Hanson, 2009; Reid, 2014; Rienties, Brouwer, & Lygo-Baker, 2013). There are also claims that teachers are reluctant to adopt because they lack the confidence and knowledge to use technology (King & Boyatt, 2015). These studies demonstrate how the problem of a lack of evidence for the effectiveness of technology on students' learning outcomes has been linked to teachers' inability to implement technology effectively.

The second impetus for this research was to investigate the view that technology-related professional development has been ineffective in supporting teachers to change their conceptions of and approaches to teaching with technology. Some researchers have suggested that the reason teachers lack the confidence and knowledge to adopt

technology is that technology-related professional development has not been successful (Bohle Carbonell, Dailey-Hebert, & Gijselaers, 2013; Reid, 2014). Recent research has described how programmes have failed to change teachers' conceptions of and approaches to teaching from a content focus to the learner focus required for technology-enabled learning (Almpanis, 2015; Owens, 2015; Rienties et al., 2013). Another issue is that professional development tends to be predominantly focused on technical skills rather than pedagogical development (Kirkwood & Price, 2016; Teräs & Herrington, 2014; Wilson, 2012). Technical skills development tends to be focused on the functionality of technology (Ramsay & Terrras, 2015), for example, basic tools to support teaching and learning (Kirkwood & Price, 2016). In contrast, pedagogical development focuses on teachers developing a deep understanding of philosophies and learning theories, and how to apply them to their own teaching contexts for effective student learning (de la Harpe & Peterson, 2009). Recent studies have identified that academic developers have been shifting from the traditional institutional workshop programme to socially situated learning contexts in order to improve the effectiveness of professional development (Boyd, Smith, & Ilhan Beyaztas, 2015; Gibbs, 2013).

As discussed in the introduction to this chapter, barriers to the adoption and diffusion of technology are a recurring theme in the higher education literature. Such a recurrence indicates that barriers are not being adequately addressed during the technology adoption process and remain an ongoing issue. These barriers have been well researched over the past two decades (Ertmer, 2005; Kregor, Breslin, & Fountain, 2012; Straub, 2009; Thong, Hong, & Tam, 2006; Tsai & Chai, 2012) and have been categorised as organisational factors, affective factors and contextual factors (Ertmer & Ottenbreit-Leftwich, 2013). Ertmer (2005) argues that an assumption was made that once these factors were addressed, technology adoption would follow; however, this has not happened and similar barriers continue to be confirmed by more recent studies (Kregor et al., 2012; Singh & Hardaker, 2014). Furthermore, Reid (2014) concludes that staff who support faculty to adopt technology should understand the barriers that they are likely to face. Reid argues for research that identifies barriers that can be influenced or changed within institutions in order to identify best practices in supporting faculty. My research will extend what is currently known about the barriers to technology adoption within the context of teachers' workgroup settings in a New Zealand university.

A key significance of my research is its focus on investigating the adoption of technology from the meso or workgroup level of analysis. The established higher education literature on the adoption and diffusion of technology has tended to be focused at the macro and

micro levels of analysis, and scant research has been undertaken at the meso level of analysis. The macro level of analysis refers to the institution-wide adoption of technology, for example, Blackboard LMS or a blended learning approach. The micro level of analysis refers to interventions in individual classes or programmes and tends to dominate the literature on educational technology (Latchem, 2014). The meso level of analysis refers to teachers who form workgroups to collaborate on a specific goal (Trowler, 2008).

Macro studies have tended to focus on barriers to technology adoption at the organisational level (Schneckenberg, 2009; Singh & Hardaker, 2014). Recent studies have been concerned with blended learning approaches from an organisational perspective (Moskal, Dziuban, & Hartman, 2013; Porter & Graham, 2015; Taylor & Newton, 2013). However, Singh and Hardaker (2014) argue that macro level research is often critiqued for not considering the local context in which technology adoption occurs. They suggest, for example, that the absence of data on individual teachers' differing backgrounds, experiences and motivations limits the findings from these studies. On the other hand, micro studies tend to produce research that describes teachers' and/or students' experiences of implementing new technology in courses or programmes without taking into consideration an organisational perspective (Schneckenberg, 2009; Singh & Hardaker, 2014). Additionally, Latchem (2014) argues that even when single micro studies are well designed, the context in which they were conducted limits the generalisability of the conclusions, resulting in minimal influence on policy making. A drawback of micro level studies, Singh and Hardaker (2014) argue, is that they tend to view individuals' decisions to adopt a technology as a catalyst for change, despite their actions being impeded by other decisions that occur within the institution. In reviewing macro and micro technology adoption studies in higher education, Singh and Hardaker (2014) argue that further studies should not model either micro or macro perspectives; instead, they should examine the relationship between institutional influences and teachers' actions.

Latchem (2014) argues that there is a dearth of technology adoption studies that consider issues at the meso level. In an investigation into cultures in higher education, Trowler (2008) concludes that there is limited research on how teachers carry out their academic work at a workgroup or meso level (Trowler, 2008). Additionally, Singh and Hardaker (2014) argue for more research into teachers' perspectives on the issues they face when adopting technology for teaching.

The Pressure Point Framework that I developed as a result of this research has shown the value gained by investigating technology adoption at a meso or workgroup level of analysis. Singh and Hardaker (2014) propose that there are few empirical studies that integrate multiple levels of analysis and explain adoption in relation to organisational influences and teachers' actions. Therefore, my research has demonstrated further significance and originality because in addressing the research questions, I uncovered a macro and meso level relationship that identified institutional influences on teachers who adopt technology in workgroup settings.

Building on Rogers's (2003) diffusion of innovations, my research makes a theoretical contribution to the theories he has identified as under-researched. Though Rogers (2003) began developing the diffusion of innovations in 1962, he argues that more research is required to confirm associated theories, particularly in the field of education. The innovation-decision process posits that individuals or groups progress through five stages, eventually deciding whether to integrate technology into their practice (Rogers, 2003). Rogers proposes that research is needed to identify whether the five stages exist for individuals and groups who adopt technology, particularly in education, where there are few related studies. He cites a lack of research on the types of decision-making that individuals and groups undertake at the adoption stage. Additionally, Rogers claims that because most diffusion studies stop at the adoption stage, few have investigated the consequences of implementing technology and therefore this focus is under-researched. He also cites a lack of research into the reasons why individuals and groups reject or discontinue the use of technology. Regarding methodology, Rogers concludes that research into adoption and diffusion studies have been overly quantitative and lack qualitative perspectives. He argues that a quantitative approach is less appropriate for studying the consequences of adoption, that is, the impact of implementing a technology in practice. Through the development of my research questions and methodological design, this investigation contributes to the theories that Rogers has identified as under-researched in the higher education adoption and diffusion literature.

Why this research?

My primary goal for undertaking this research was to offer a new way of thinking about university teachers who have been portrayed in the literature as reluctant to adopt technology (Reid, 2014; Rienties et al., 2013). My role at AUT is as a teaching and learning advisor in the Centre for Learning and Teaching (CFLAT). In terms of my academic identity, I view myself first as a university teacher and second as a teaching and

learning advisor. My experiences as a teacher inform my work as an advisor in CFLAT, while my experiences of working with colleagues as an advisor inform my teaching practice. Therefore, I view myself as one of the teachers described in the literature as being reluctant to adopt technology. This perspective troubles me, as while I agree that some teachers are reluctant to adopt technology, I have worked with many colleagues who have adopted technology to improve the learning experience for their students.

Teachers' viewpoints are not well represented in the literature and may contribute to their portrayal as reluctant to adopt technology. Having completed an extensive literature review on blended learning in higher education, Gerbic (2012) concluded that studies have tended to emphasise students' accounts, resulting in a dearth of studies that focus on the perspectives of teachers. Ottenbreit-Leftwich, Glazewski, Newby and Ertmer (2010) argue that not only are teachers' voices lacking in studies on technology adoption, when they are acknowledged, they tend to be portrayed as being incapable of implementing technology effectively. They conclude that this leads to teachers' views being under-represented in policy and programmes that result from the use of such evidence. To privilege teachers' voices in my research, I focused the methodological design on gathering multiple teachers' perspectives.

In my work as a teaching and learning advisor, I have spoken with colleagues who are interested in, yet uncertain about, adopting technology and I am curious about that. For example, one colleague suggested he would stop using his iPad because he felt like a fraud when he used it in class. On another occasion a colleague explained that she had been given an iPad but did not know what to do with it so kept it in an office drawer. From my teacher's perspective, it appeared as if these teachers lacked confidence and viewed their agency as a classroom teacher as being undermined by technology. From my teaching and learning advisor perspective, these teachers did not seem to have developed a pedagogical understanding of how to use the iPad for learning and teaching. This lack of pedagogical understanding may explain why teachers are viewed in the literature as being incapable of implementing technology effectively (Ottenbreit-Leftwich et al., 2010). Another catalyst for this research was my ongoing teaching and learning advisor work, which continues to surface teachers' concerns regarding technology-enabled learning. The way I perceive teachers' concerns are an indication of my disciplinary experiences and subjective views on technology-enabled learning and therefore a source of researcher bias. As recommended by Stake (2010), I have attempted to minimise researcher bias through rigorous research design and implementation. Researcher bias will be discussed in more detail in chapters 3 and 9.

The setting

The setting for this multiple case study is AUT. Over a 105-year period this institution has morphed from a technical institute to an institute of technology and in the year 2000 became New Zealand's newest and eighth university. AUT's continued growth as a higher education provider is important to the success of New Zealand's society and economy. The most recently published statistics show that AUT employed 1,166 academic staff and enrolled 29,014 equivalent full-time students in 2016 (AUT, 2016). The country benefits from AUT's $580 million contribution to the gross domestic product and through the provision of 4,292 jobs to the Auckland economy (AUT, 2015). AUT views its involvement with education, research, businesses and community as a mechanism for social and economic transformation, including the promotion of the well-being of people (AUT, 2015). Therefore, teachers employed by the university are contributors to its growth and to the social and economic transformation of the nation.

AUT describes itself in its strategic plan (2012–2016) as "a university for the changing world; an increasingly, powerful force for learning and discovery that promotes the wellbeing of people and their environments, and provides them with the opportunities to expand and achieve their aspirations" (AUT, 2012, p. 4). Findsen (2011) explains that, historically, "AUT has its roots in technical and vocational education" (p. 229). However, the lack of reference to technology in the teaching and learning section of the strategic plan indicates a possibility that AUT has shifted from its vocational roots to a professional-contextualist perspective of education. A professional-contextualist education depicts the purpose of teaching as developing students' human capabilities rather than their vocational skills (Findsen, 2011).

Each year AUT allocates a portion of its funding to maintaining the institutional use of the Blackboard LMS as well as other technology such as computers, iPads and smartphones. Consequently, the university's ADU supports teachers to contribute to AUT's goals and strategies through the improvement and development of learning and teaching activities. A significant reason for undertaking this research was the restructuring of the university's centralised ADU that occurred in 2010. Renamed the Centre for Learning and Teaching (CFLAT), the restructure changed the provision of professional development for teachers. The institutional workshop programme became defunct and was replaced with socially situated learning approaches to professional development. In an email communication, the director described the outcome of the restructure as a "needs-driven, bespoke and customised" approach to professional development (Frielick, 2015). Therefore, CFLAT

continues to contribute to AUT's goals and strategies, albeit through a different approach to professional development. The Learning and Teaching Development Fund (LTDF) was established to encourage groups of teachers to initiate innovative projects that encourage the scholarship of learning and teaching. Consisting of teachers and CFLAT academic advisors, teachers' workgroups were formed to undertake the projects, many of which were technology based. Between 2012 and 2014, 103 LTDF projects were completed, resulting in the publication of journal articles and the dissemination of conference posters and e-books that showcased teachers' enthusiasm to improve their teaching practice and, consequently, the student experience at AUT. This research includes the perspectives of some of these teachers who engaged in these CFLAT projects. The timing of my research provided an opportunity to examine the impact of replacing the workshop programme with socially situated learning approaches to professional development in CFLAT. Therefore, the methodology of this research was designed to investigate whether socially situated learning approaches to professional development can overcome barriers to support teachers to successfully adopt technology-enabled learning at AUT.

Problem, purpose and research question

The impetus for this research was to investigate recurring issues in the extant literature: first, that teachers' voices are lacking in the literature on adoption studies, leaving them unable to respond to claims that they are reluctant to adopt technology, and second, that technology-related professional development has been ineffective in changing teachers' approaches to teaching.

The purpose of this research was to investigate factors that impede teachers from adopting and implementing technology-enabled learning when engaging in socially situated learning approaches to professional development.

The main research question was: What factors impede teachers in workgroup settings from adopting and implementing technology-enabled learning?

The supporting research questions were:

1. How does the decision-making process motivate teachers to adopt technology?
2. What pedagogical knowledge do teachers develop about teaching with technology and how do they develop it?
3. What are teachers' approaches to teaching with technology?
4. Why do teachers reject or discontinue using technology?

5. What are the implications for approaches to professional development?

This section concludes chapter 1, an introduction to the research. An overview of the organisation for the rest of the thesis is provided next.

Overview of the thesis

This thesis is structured as follows. Chapter 2 discusses a review of the literature, focusing on the impact of technological advancement in universities, technology adoption in higher education, learning and teaching with technology, and preparing to teach with technology. Chapter 3 describes the social constructionist paradigm that underpins this investigation, the research design and implementation, and the quality procedures undertaken to ensure the trustworthiness of this research. An introduction to the findings chapters is provided next. Each of the findings chapters, chapters 4, 5, 6 and 7, is a narrative of one of four case studies investigated in this research. Chapter 8 provides an in-depth discussion of the cross-case assertions that resulted in the conceptualisation of the Pressure Point Framework. The notion of social constructionist dialogic practice is offered as one avenue for addressing the pressure points during the stages of the innovation-decision process. I discuss the implications of the pressure points derived from this investigation for socially situated learning approaches to professional development. Chapter 8 concludes by summing up the findings of this investigation through the lens of Dusek's (2006) technology as system definition. Finally, chapter 9 revisits the strengths and limitations of the methodological design, the Pressure Point Framework and my contribution to theory. I offer directions for future studies and conclude with a final reflection on my research.

Chapter 2: Literature review

This chapter discusses a wide range of literature that underpins my research on the factors that impede teachers from adopting technology in situated learning contexts. The literature contributed to the development of the research questions and the identification of theories used to support discussion in the later chapters. This literature review could have been organised differently because many themes are interrelated. However, to cope with the volume of literature that spans a number of disciplines, the review has been divided into four sections and organised around the research questions. The headings below indicate the scope of the literature reviewed.

Section 1: The impact of technological advancement on universities

Section 2: Technology adoption in higher education (questions 1 and 4)

Section 3: Learning and teaching with technology (question 3)

Section 4: Preparing to teach with technology (questions 2 and 5)

In each section of the literature review, I locate the themes within the broader context of the field in focus, establish the problems, and identify research that has analysed or attempted to solve these problems. Finally, I conclude the section by highlighting issues of significance for my research. I end this chapter by discussing the implications of this review of literature on my research and conclude with a justification of the choice of methodology.

Section 1: The impact of technological advancement on universities

A discussion on the impact of technological advancement on higher education in 21st century society, with a particular focus on challenges facing the university sector today, begins this section. As this research occurs in a New Zealand (NZ) setting, the values and activities associated with NZ universities are emphasised.

Universities are key contributors to the progress of society, yet as is the case with other institutions, technological advancements are challenging their foundational values and activities. Viewed as experts in knowledge production, universities are well placed to provide the technologically capable workforce required to drive a knowledge economy (Selwyn, 2011). Yet, despite technology being promoted as having the potential to transform university education, the higher education literature suggests that there is little evidence that this is occurring. I suggest that one reason for the slow rate of adoption is

that teachers are conflicted about the role of technology in relation to the purpose of a university education. For graduates to develop as knowledge creators, university teaching needs to be reimagined to address the conundrum of technological advancement and ineffective teaching methods. This section will discuss these issues and examine the implications for academic developers who support university teachers to adopt technology.

Characteristics of New Zealand universities

Universities are characterised by their traditions, norms and values. For 800 years, universities have been key contributors to the development and well-being of society, and remain one of the most enduring institutions in the world (Barnett & Standish, 2003; Bates & Sangra, 2011). Being located in a relatively young country, universities in NZ have tended to look to "international practice for its norms and values" (Prebble & New Zealand Ministry of Education, 2005, p. 48). Like international universities, a characteristic of NZ universities is that they act as critic and conscience of society (Education Act, 1989): "a responsibility that brings with it expectations of truth and integrity" (Barnett, 2011a; Bowen & Guthrie, 2015, p. 10). This notion stems from mediaeval times when universities were viewed as a community of scholars who enjoyed the "freedom to explore universal themes of truth, knowledge, criticality and learning" (Beckton, 2009, p. 80). It also implies a duty to remain ethical when engaging with research, teaching and wider communities. Additionally, the NZ Education Act (1989) describes a university as "characterised by a wide diversity of teaching and research, especially at a higher level, that maintains, advances, disseminates, and assists the application of, knowledge, develops intellectual independence, and promotes community learning" (Education Act, 1989, p. 298).

Of particular interest to my research is that universities should be primarily concerned with more advanced learning, and that their principal aim is to develop intellectual independence in graduates (Education Act, 1989). Consequently, teachers have looked to university traditions of learning and teaching to develop graduates' advanced knowledge and intellectual independence. However, since the mid-20th century, the traditions, norms and values on which universities were founded have been both disrupted and shaped by technological advancement, economic forces and political influences. The implications for universities are discussed next.

Universities in transition

The concept of a university is in an increasingly contested space (Barnacle, 2016), therefore in attempting to understand higher education and the university in a contemporary world, Barnett (2011b) offers as a resource - ideas, characteristics and practical principles to create or reimagine the university in various forms. His view is that universities are always changing, that they cannot and should not be the same, and importantly, that each university should choose what it wants to become, so that they are not continually "subject to the buffering of large global forces" (Barnett, 2014, p. 9). The medieval university denoted by the church, gave way to the scientific or research university, and concerned with knowledge for its own sake and academic freedom, research was seen as more important than teaching (Barnett, 2011b). However with the emergence of the knowledge society and economy, new competitors entered the world of knowledge production, at the same time as society viewed universities as a method for improving the economy. A focus on employability meant that teachers had to concern themselves with developing curriculum that went some way to meeting employer requirements (Barnett, 2011b). Therefore the research university has given way to, but is embedded within the notion of an entrepreneurial university. Both Barnett (2014) and Clark (2004) suggest that the entrepreneurial university has superseded the research university.

The dominant vocabulary in higher education indicates the kind of university one is becoming (Barnett, 2014). Accordingly, the entrepreneurial university can be characterised by terms such as "knowledge society, knowledge economy, entrepreneurial, skills, marketability, employability, personal financial gain, personal benefit and knowledge transfer" (Barnett, 2014, p. 10). However, while Clark (2004) argues for an entrepreneurial university, Barnett (2011b, 2013) suggests that universities could choose to go in other directions such as an ecological and/or multi-vocal university. Barnett (2014) argues that the values that underpin an ecological university and a multi-vocal university could support the improvement of current global and national instability, therefore more social and public conceptions of higher education may be called for. Current world problems require a different approach and a new language is appearing recognised by terms such as "social engagement, public benefit, gender, rights, and citizenship" (Barnett, 2014, p. 10). In line with these conceptions, Barnett (2011b) describes the ecological university as "an engaged university, a critical and an enquiring university *and* a university-for-development, acting to put its resources to good effect in promoting world well-being" (p. 452). On the other hand, the multi-

vocal university may be seen as growing within the entrepreneurial university. The multi-vocal university is facilitated by the digital revolution which opens possibilities for communication and interaction (Barnett, 2013). The Internet, mobile technologies and apps give a university, which includes those within it a voice across the globe. The multi-vocal university opens up spaces for voice and supports the expansion of understanding in society, while widening horizons and self-understandings of people (Barnett, 2013). Therefore, this desirable effect of technology brings with it the opportunity to undertake research globally and collaborate with communities and industry, and is also a way of attracting new students. However, as Rogers (2003) argues, technology always brings with it both desirable and undesirable effects. An undesirable effect noted by Barnett (2013) is the narrowing of voice, for example, collaboration with industry can bring a narrowing of interests, and competition between universities, as well as for profit and non-profit educational institutions is likely to increase (de la Harpe & Peterson, 2009; Shark, 2015).

If universities are the critic and conscience of society, then we should think seriously about what kind of university we want to be. A university may reshape itself by choosing values that will guide it through a changing world. Therefore, taking into account today's global problems, I align with Barnett (2011b, 2013) and would argue for reimaging a university as a combination of ecological and multi-vocal characteristics. The notion of the multi-vocal university is interesting because it may also be applied within a university. Barnett (2013) argues that to become a multi-vocal university it must expand its "collective spaces of understanding, inquiry, and reasoning on which all communities can draw. And its own capacities to adopt many modes of engagement, and many voices, will support this capacity to offer *resources* of reason to the wider world" (p. 275). One resource of reason is social constructionist dialogic practice and is pertinent to my research (Gergen, 2015). It is a resource that can support technology adoption leaders and teachers as they collaborate in workgroups to develop new understandings, engaging in inquiry and reasoning as they adopt technology. The social constructionist notion of dialogic practice is introduced in chapter 3, methodology and is discussed in detail within the context of the findings in chapter 8 and finally in chapter 9, conclusion.

Challenges faced by higher education today have come about through technological advancement, economic policies and recent political influences. Clark (2004) argues that universities have changed the way they operate over the past 40 years. Brought about by increasing pressure for universities to respond to "new demands of government, industry and societal groups, while maintaining and improving their traditional fields of research,

teaching and student learning" (p. 1). Up until the mid-20th century, universities were largely autonomous, elitist institutions (Stevenson & Bell, 2009) in which small classes of high-achieving students focused on academic learning through the traditional methods of lectures and discussion. I concur with Findsen (2011) and Stevenson and Bell (2009) that the influences of globalisation, neo-liberalism and technological advances have undermined this traditional foundation of academic learning in universities. In a discussion of global forces affecting NZ higher education, Findsen (2011) defines globalisation as "international forces that impact on the NZ economy and system of higher education" (p. 224), fostering global sameness rather than diversity, and neo-liberalism as "a system of beliefs and practices that promotes individual decision-making and choice" (p. 235). The implementation of neoliberalist ideals in 1980s NZ resulted in user-pays policies, one of which passed a portion of the cost of a university education to the student. In discussing political influences on the higher education sector, Stevenson and Bell (2009) conclude that fee-paying students are likely to develop high expectations of teaching quality, reasonable class sizes and access to resources. Thus, Stevenson and Bell argue that since the mid-20th century higher education institutions have been in a continual state of transition as they contend with numerous challenges. Recent challenges have been identified as:

1. widening access and meeting consumer needs as demand for higher education continues to grow (Bowen & Guthrie, 2015; Boys, 2014; Rhoads, 2015);
2. developing "better-educated human capital" in order to remain competitive in a "knowledge intensive world" (Bowen & Guthrie, 2015, p. xviii), including improving the employability of graduates (Boys, 2014);
3. improving completion rates and reducing time-to-degree while managing costs to maintain equality and slow the increases in tuition fees (Bowen & Guthrie, 2015);
4. producing more research, being innovative and collaborating with other institutions (Boys, 2014);
5. coping with rising costs while continuing to meet expectations (Boys, 2014; Shark, 2015); and
6. coping with the risk of competition as non-traditional institutions offer new forms of learning (de la Harpe & Peterson, 2009; Shark, 2015).

To address these challenges, Boys (2014) argues that higher education institutions should improve their "educational services through strategic, organisational, technological, curricular and physical changes" (p. 3). One way of doing this is through the

development of online courses that have the potential for lowering costs and accommodating increasing enrolments (Bok, 2013). However, Bok (2013) argues that more research is required to determine "how effective online courses will be in maintaining or improving current levels of learning, cost, and student retention" (p. 198). Due to the effort and money required to implement online or blended learning on a large scale, Bok (2013) suggests that this is a matter of urgency.

Universities in NZ are bound by the Education Act (1989) and influenced through national tertiary education funding policies. Karran (2009) argues that universities are facing an erosion of academic freedom, a characteristic that is "vital to the proper functioning of universities" (p. 17). Put most simply, academic freedom refers to the ability of teachers and students to be able to "study, learn, teach and express ideas" freely (Karran, 2009, p. 17). However, at an institutional level, the Education Act (1989) confines NZ universities to the "independence and freedom to make academic, operational, and management decisions" as long as they are consistent with the "efficient use of national resources, the national interest and demands of accountability" (Education Act, 1989). While the Act does not enable the NZ Government to issue directives to a university, the government is able to exert influence through funding mechanisms. Recently, the NZ Government has provided additional funding for STEM (science, technology, engineering and mathematics) subjects. Such influences have implications for institutional strategic plans as well as the types of programmes offered to students, and employment of teachers. This recent political focus on STEM subjects reinforces the perspective that educational and technological advancements are key drivers of occupations that focus on knowledge construction, along with the expectation that university graduates will develop the technological capabilities to provide economic competitiveness for NZ.

The role of universities in a knowledge economy

The term 'knowledge economy' is credited to social theorist Peter Drucker (Stevenson & Bell, 2009), who made the distinction between knowledge-based occupations, in which people work with their minds, and manufacturing-based occupations, in which people work with their hands (Bates & Sangra, 2011). This perspective can be observed in societies where the Internet and global competition for economic markets have propelled a shift towards jobs that rely on knowledge creation rather than manufacturing, placing emphasis on the importance of learning as a tool for "sustainable development and innovation" (Wang, Tan, Liang, & Zhang, 2014, p. 204). Therefore, as the knowledge economy becomes a reality, it has become more acceptable that universities develop

graduates with the technological capabilities to drive such an economy. Historically, education has been seen as a key factor in assuring the economic productivity and competitiveness of societies (Ball, 2013). Therefore, the transition from industrial-based to knowledge-based economies has implications for universities. A major implication being that graduates should be equipped with capabilities for economies driven by knowledge-based occupations, rather than skills for manufacturing-based economies, and this is what Selwyn (2011) argues makes the notion of a knowledge society a reality. He explains that the knowledge society, which is constructed on the notion of technological advancement, is now seen as providing economic prosperity to a nation. Additionally, Stevenson and Bell (2009) argue that knowledge creation is viewed as a source of competitive advantage in the global economy, which strengthens the perspective that investment in human capital is the path to economic success. This, they argue, is the rationale for the investment and expansion of the higher education sector. However, for graduates to support a national economy, Price and Kirkwood (2011) argue, universities should understand how to use technology effectively for teaching and learning.

Knowledge creation and academic learning

As experts in knowledge production, universities have a key role in preparing graduates for a knowledge economy. Bok (2013) argues universities provide three keys to a nation's progress: breakthroughs in "science, technology, and other fields"; development of "expert knowledge"; and "well-trained adults", ready to perform "demanding jobs in an advanced, technologically sophisticated economy" (p. 12). Now that knowledge has become the source of economic advantage for nations, "knowledge generation, processing and transmission" has "become the key factor of production" (Stevenson & Bell, 2009, p. 9). This requires universities to "develop flexible capabilities that permit them to weave together new and old, change and continuity, in sustainable form" (Clark, 2004, p. 1). Such capabilities are important in a society that Selwyn (2011) argues views knowledge as primarily advanced through technological means, implying that knowledge creation is reliant on technology. Accordingly, it is becoming more acceptable that universities play a key role in developing graduates with the technological capabilities to drive a knowledge economy (Bates & Sangra, 2011; Selwyn, 2011). However, as Findsen (2011) argues, the notion of preparing graduates to become knowledge producers has implications for academic learning.

In discussing the notion that knowledge construction is fundamental to economic competitiveness, Codd (1997) argues that the ideology of instrumentalism would result in the lack of distinction between vocational and academic learning. "The ideology of

instrumentalism favours some forms of knowing over others, which then become marginalized" (Findsen, 2011, p. 224). For example, it could be argued that the recent emphasis on STEM subjects in NZ universities marginalises other disciplines. In discussing this ideology, Findsen (2011) argues that technology is an instrument that emphasises the development of skills to be performed, new technology to master and knowledge to be absorbed. In this world view, he explains, "knowledge becomes defined as a commodity, product or a performance" (p. 224). Moreover, Codd (1997) argues that the notion that knowledge can be pursued for intrinsic purposes, and that it does not have to produce something, is central to an academic education. This highlights his view that universities must remain as critic and conscience of society so as not to become instrumental in producing graduates who are non-critical thinkers.

Technology has been promoted as having the potential to transform learning and teaching, yet some researchers suggest that there is little evidence that this is occurring (Englund et al., 2017). Findsen's and Codd's arguments shed light on reasons why some teachers negatively associate technology adoption with vocational education. Established university structures and traditional models of teaching and learning are challenged by technology (Watling, 2009, p. 84). Therefore, some teachers fear that technology will "compromise and disrupt" students' engagement with traditional teaching methods (Selwyn, 2009, p. 157), thereby threatening academic culture to the point that they lose control over their teaching (Singh & Hardaker, 2014). Traditional education stems from the liberal philosophy of teaching that derives its origins from the Greek philosophers Socrates, Plato and Aristotle (Kanuka, 2008). The aim of a liberal education or academic learning, Kanuka (2008) explains, is to develop rational, intellectual and moral wisdom, and to question all assumptions in the search for truth. Therefore, the deployment of technology that facilitates online quizzes, for example, is seen as interfering with the objectives of a liberal education, the aim of which is to extend students intellectually, and without a focus on employment (Kanuka, 2008; Surry, Stefurak, & Kowch, 2011).

The lecture method may have been effective for relatively small classes of homogeneous students in the past; however, today, the massification of education (increasing student numbers) situates teachers in classrooms that hold 150 to 1,500 students. Retaining a traditional model of university teaching that in the past prepared graduates for a non-digital society and an industrial economy is not appropriate for today's user-pays students. I argue that universities should instead reimagine university teaching to develop students as knowledge constructors in an economy in which knowledge is advanced primarily through technology.

Reimagining university teaching

Having established that technological advancements have transformed how knowledge is created, and that the traditional method of university teaching does not support the notion of knowledge construction, I argue that university teaching should be reimagined to address this issue while remaining true to the foundational values as expressed by Codd (1997). In determining the functions of a university, Wilhelm Von Humboldt (1767–1835) cited by Hohendorf (1993), proposed that a university should engage in research and teach general education based on the sciences rather than vocational training. Von Humboldt argued that a teacher's role is to engage students in the learning process and to support them to undertake research (Hohendorf, 1993). His perspective underpins the construction of knowledge with concepts of critical thinking and creativity that are grounded in ethical ideals. These concepts align with a transformative framework for learning that takes into account the world view that knowledge is socially constructed and therefore subject to critique rather than unchallengeable (Findsen, 2011). By drawing on these perspectives, the focus of technology in education may be placed on knowledge construction rather than the development of vocational or technical skills.

University teachers tend to be hired because of their disciplinary knowledge; therefore, they may not have a background in teaching or the time to sift through the bourgeoning literature on technology-enabled learning. ADUs in NZ universities are equipped to provide support for these teachers to develop their teaching practice. For the reasons presented in this section of the literature review, I argue that academic developers should support teachers to reimagine their university teaching as technology-enabled learning. Academic developers are well placed to assist teachers to take account of the ideas expressed above while remaining critical about all aspects of technology, to ensure that university education remains focused on academic learning rather than vocational learning. When teachers understand the implications of technology for students' learning, they can remain focused on academic learning.

This concludes section 1, the impact of technological advancement on universities. Much of an academic developer's work is to assist university teachers to improve students' learning outcomes. Therefore, the concepts discussed in this section are crucial to the work of academic developers who support teachers to implement technology-enabled learning. The literature provides the justification and direction required to reimagine university teaching as technology-enabled learning in order to prepare graduates who are knowledge creators, ready to enter a technologically advanced society and able to

contribute to the knowledge economy. In section 2, I discuss theories and literature related to the adoption of technology in higher education.

Section 2: Technology adoption in higher education

Section 2 reviews the literature related to research question 1 – How does the decision-making process motivate teachers to adopt technology? – and question 4 – Why do teachers reject or discontinue using technology? This section begins with a critique of technology adoption models and then goes on to explain Rogers's (2003) diffusion of innovations theory and the innovation-decision process. Next, I discuss the limited adoption literature related to types of decision-making, and discontinuance of technology. I follow with a discussion of studies that focus on barriers to adoption. I conclude this section with a discussion on the social construction of technology.

It has been reported that theories of technology adoption are useful for explaining the behavioural changes individuals undergo during the process (Straub, 2009; Thong et al., 2006). However, one theory, Rogers's (2003) diffusion of innovations is comprehensive enough to account for the research questions investigated in my research. After a critique of the models, I chose to use Rogers's theory to support the interpretation of questions 1 and 4 in this research. As discussed in chapter 1, numerous studies have investigated factors that hinder teachers from adopting technology in higher education, yet despite this extensive research, barriers remain today. There is a notable paucity of studies that seek to identify the types of barriers found in situated learning workgroup contexts in higher education. In particular, few adoption studies have focused on decision-making processes in workgroups, and why teachers discontinue or reject a technology. According to Rogers (2003), more research is needed to better understand types of decision-making, how technology is implemented and why technology is discontinued or rejected.

A comparison of adoption models used in higher education

For this research, I chose to draw on Rogers's (2003) diffusion of innovations because it contains a range of models and concepts that other models do not have. The decision to select Rogers's (2003) diffusion of innovations for this research was made through a comparison of models discussed in the higher education literature and other disciplinary literature on technology adoption studies. The technology acceptance model and the universal technology adoption and use theory model have been used in computer science to understand adoption by student teachers, adoption of online learning and implementation of laptop-based testing (Straub, 2009), and post-adoption to understand

consumer adoption of technology and brand loyalty (Y.-C. Lee, 2011). The expectation-confirmation model is an information technology (IT) continuance model used in computer science to investigate continued IT usage behaviour (Thong et al., 2006). The limitations of these models are (a) they are new and relatively untested in higher education (Straub, 2009) and (b) the studies that used them tended to rely on quantitative methods to identify factors relating to technology adoption (Thong et al., 2006). A third model, the concerns-based adoption model, was developed to examine the process of educational change by teachers as well as those who have change-facilitating roles (Anderson, 1997). Straub (2009) explains that while the model has not been widely used in higher education, it has been used to study teacher change in curriculum, teacher consultation, technology change and adoption. However, the model is limited because it relies heavily on the change facilitator leading the change and it disregards the positive perceptions teachers have of technology implementation – instead portraying them as "resistant luddites" (Straub, 2009, p. 636).

Rogers's (2003) diffusion of innovations is well established in the adoption literature and has influenced other theories of adoption (Singh & Hardaker, 2014; Straub, 2009). There has been some criticism of Rogers's theory, for example, that it was developed from quantitative studies related to agriculture and medicine and therefore has limited application elsewhere. However, Rogers has continued to modify his theory, dating from 1962, and the most recent edition of his text (the fifth edition) provides examples of contemporary technology studies. Other critiques of his model are that it has not identified the affective factors of individuals involved (Singh & Hardaker, 2014) and that while it explains why adoption occurs, it does not identify how to facilitate adoption (Straub, 2009). Despite these critiques, Rogers has provided a range of diffusion of innovation theories and models to draw on, and they continue to be used in higher education. A number of recent studies on the adoption and diffusion of technology in higher education have drawn on Rogers's theories (Graham, Woodfield, & Harrison, 2013; Macfayden & Dawson, 2012; Porter & Graham, 2015; Schneckenberg, 2010; Singh & Hardaker, 2014). To answer my research questions, I needed to understand better the types of decision-making that influence teachers' motivations to adopt, and why teachers reject or discontinue technology. Rogers's diffusion of innovation provided a theoretical view for my investigation.

Innovation, adoption and diffusion

Rogers (2003) defines an innovation as "an idea, practice, or object that is perceived as new by an individual" (p. 12), regardless of whether it is new or beneficial to the

individual (Straub, 2009). As technology has become the most common type of innovation, bringing about major social change in the way people live and work, Rogers argues, the terms may be used interchangeably. His diffusion theory comprises a set of models that predict how individuals and groups respond to an innovation as well as how that innovation spreads throughout an organisation (Abrahams, 2010; Rogers, 2003). According to Rogers, adoption theory focuses on the choices an individual makes to accept or reject an innovation and he has developed an innovation-decision model to explain the adoption process that individuals and groups undertake. Additionally, diffusion theory explains the types of social change that occur when an innovation spreads between individuals and groups in an organisation or society (Rogers, 2003). Macro-level and micro-level theories are also part of the adoption and diffusion process (Carr, 1999). Top-down, macro-level theories focus on institutional large-scale change initiatives where innovation tends to involve broad aspects of curriculum and instruction, and may include a wide range of technologies and practices (Carr, 1999). Conversely, micro-level theories are focused on individual adopters who adopt a specific innovation (Carr, 1999). Studies that have investigated the diffusion of innovations have tended to focus on the organisational or macro level of analysis, while adoption studies have tended to concentrate on the individual or micro level of analysis (Straub, 2009). Next, I describe the characteristics of Rogers's diffusion of innovations.

Diffusion of innovations

The diffusion of innovations explains the types of social change that occur when an innovation spreads between individuals and groups in an organisation or society (Rogers, 2003). The diffusion of innovations comprises four elements: the innovation, communication channels, time and social change. These elements are briefly explained as follows:

1. The characteristics of an innovation will explain the rate at which it is adopted; therefore, the more positive a person is about an innovation's characteristics, the more likely it is to be adopted (Rogers, 2003). The characteristics are relative advantage, compatibility, complexity, trialability and observability (Rogers, 2003).
2. The second element relates to an organisation's communication channels, which are the mechanisms by which information about an innovation passes from person to person, for example, discussion between colleagues, observing the innovation in use, or simply web searching for information about the innovation (Rogers, 2003; Straub, 2009). Rogers argues that most people tend to rely on the subjective recommendations of like-minded colleagues, rather than objective

scientific studies. Like-minded colleagues tend to have similar beliefs, and therefore the flow of information between them is more likely to be effective in developing knowledge about the innovation and a positive attitude towards adoption or change. However, Rogers cautions that when colleagues do not hold similar beliefs, they will not be open to differing perspectives and therefore will be less likely to change.

3. That adoption occurs over time is the third element in diffusion. First, time is related to the speed at which an innovation is adopted by people in a social system. Second, time is a factor in the innovation-diffusion process, which begins with the first stage, when a person develops knowledge about an innovation, to the final stage, when they make the decision to adopt or reject it. Finally, the more innovative people are, the faster they will adopt an innovation.

4. The fourth and final element is the social system. A social system encompasses the context, culture or environment in which people engage in problem solving to achieve the goal of successfully adopting an innovation (Rogers, 2003; Straub, 2009). However, Rogers warns that in an organisation, the social and communications structure of the system can either facilitate or impede the spread of an innovation because of the development of social norms by group members (Rogers, 2003). Norms or standards of behaviour can occur at "community, cultural and organisational levels" (Rogers, 2003, p. 26). These norms can be a barrier to change, particularly if some members of the group resist an innovation and others follow suit.

Rogers suggests that diffusion derives its special character from the newness of an idea, which carries a degree of uncertainty during the adoption process. Diffusion theory predicts that both intended and unintended consequences are likely to occur when an innovation is invented, diffused, adopted or rejected, thus leading to social change (Rogers, 2003). A model that is situated within the diffusion of innovations is the innovation-decision process and this is explained next.

Innovation-decision process

The innovation-decision process is a social construct that explains the choices individuals and groups make to adopt or reject an innovation, and the extent to which it is integrated into a particular context or environment (Rogers, 2003; Straub, 2009). Rogers proposes that individuals move through five stages in order to make the decision to adopt or reject an innovation. I have included a brief description of each stage (see Table 1).

Table 1. Stages in the innovation-decision process

Stages
1 Knowledge stage The individual gains an awareness of the technology and begins to understand how it functions
2 Persuasion stage The individual forms either a positive or a negative attitude towards the technology
3 Decision stage The individual engages in activities that will determine whether to adopt or reject the technology
4 Implementation stage The individual adopts the technology, and may also reinvent it
5 Confirmation stage The individual or group seeks to reinforce the decision they have made to adopt or reject the decision if they feel in conflict with the technology

Adapted from Rogers (2003, p. 199)

Rogers cautions that because each stage is not sharply distinctive, individuals who pass through the stages may not recognise when one stage ends and another begins. He concludes that stages do exist in the innovation-decision process, but that more research is required to determine whether each of the five stages in his model exist, particularly in the field of education. Studies have provided more evidence for stages 1, knowledge, and 3, decision, than for stage 2, persuasion, and there is limited data on the distinctiveness of stage 4, implementation, and stage 5, confirmation (Rogers, 2003). Additionally, Seligman (2006) argues that studies should examine how and why the stages in the technology adoption process become related. The questions in this research were not modelled on Rogers's innovation-decision process as my aim was to inductively explore the process of adoption in teachers' workgroups. However, the innovation-decision process was key in interpreting and understanding the progression of stages teachers underwent in workgroup settings.

Adopter categories

Rogers 2003 suggests that as individuals in a social system adopt technology in an "over-time sequence" (p. 276) they may be classified within adopter categories that indicate when they are first likely to begin using an innovation. The categories are: innovators, early adopters, early majority, late majority and laggards. The adopter categories have led some researchers such as Moore (2002) to determine strategies for working with individuals in adopter categories. Innovators are venturesome (Rogers, 2003) and tend to

be the first to adopt new technology due to their appreciation for it (Moore, 2002). Innovators require comprehensive information about the technology, effective technical support and access to the latest technology (Moore, 2002). Innovators are crucial for introducing a new innovation in the system (Rogers, 2003). Due to early adopters' tendency to evaluate an innovation, they often trigger its use in the system (Rogers, 2003). Therefore, Moore (2002) asserts that early adopters prefer to start with a pilot project, conducting each phase with milestones to ensure a timely completion point. As such, early adopters tend to be the ones that other potential adopters look to for advice and information about an innovation (Rogers, 2003). The early majority tend to adopt an innovation after early adopters but before the average individual in a system (Rogers, 2003). To encourage the early majority to adopt an innovation, Moore (2002) recommends that they should be able to get information and support from a trusted person who understands their needs, an assurance that the innovation will work and consistent messages about how the innovation. The early majority may consider the innovation for some time before adopting it (Rogers, 2003). Rogers (2003) describes the late majority as sceptical, approaching adoption with caution and not adopting until most others have done so. They are unlikely to feel safe to adopt until they have removed uncertainty about the innovation (Rogers, 2003). Consequently, Moore (2002) suggests that the late majority may fear technology, therefore will not have high aspirations about it. Moore (2002) recommends that the late majority be presented with a comprehensive package denoting the whole solution to their needs; the technology, information, and training etc., presented as a safe, high-quality product. Finally, the laggards are the last to adopt an innovation in the system and Rogers (2003) describes them as having traditional values that make them suspicious of innovation. Moore (2002) recommends the importance of discussing with laggards their sceptical views on the innovation and to work with them on overcoming those.

Decision-making

Next I discuss types of decision-making, which Rogers (2003) has categorised as authoritative, collective and optional decisions. Few studies have examined why and how authoritative, collective and individual decisions are made during the adoption process (Rogers, 2003). In particular, few adoption studies have specifically addressed collective decision-making. Next, I discuss what is known about decision-making in adoption studies.

Authoritative decision-making

Authoritative decisions are made by the few individuals within an institution who have the power, status or expertise to make such decisions (Rogers, 2003). Authoritative decision-making may be seen as an element of a top-down, organisational or institutional adoption strategy (Bohle Carbonell et al., 2013) and has been shown to influence the beliefs and attitudes that teachers develop over time (Ertmer & Ottenbreit-Leftwich, 2013; Straub, 2009). Accordingly, the negative impact of top-down decision-making can result in teachers becoming resistant to change (Bohle Carbonell et al., 2013). However, authoritative decisions result in the fastest rate of adoption, depending on how authoritative the decisions are (Rogers, 2003). In an institutional study of blended learning, Bohle Carbonell et al. (2013) concluded that teachers tend to become resistant when they feel that they have been excluded from the change process.

Collective decision-making

Collective decisions are made by group consensus (Rogers, 2003). There is a surprising paucity of studies on collective decision-making in adoption studies. One context in which collective decision-making is seen as an objective is in a community of practice (CoP). Johnson (2001) proposes that CoP leaders differ from course leaders or teachers, as members are led voluntarily, and are therefore able to contribute to the leadership of the group. He also suggests that CoPs encourage active participation and collaborative decision-making by individuals, as opposed to authoritative decision-making (C. M. Johnson, 2001).

Optional decision-making

Optional decisions are made by individuals independently of others in the institution (Rogers, 2003). Teachers who make an individual decision to adopt an innovation for a course that they teach have been found to do so because they have a passion for technology (Ng'ambi, 2013), viewing it as a positive means of enhancing teaching and learning (Bond & Goodchild, 2013; Kregor et al., 2012). Their motivation to adopt is based primarily on achieving pedagogical goals (Bennett, 2014; Kregor et al., 2012) such as improving their students' learning (Bond & Goodchild, 2013; Kregor et al., 2012; Ng'ambi, 2013), specifically through methods such as student-centred learning, collaborative learning and skills development (Backhouse, 2013). Teachers' attitudes towards technology adoption were found to be positively affected by taking into account their beliefs during the process. Involving teachers in the decision-making process (Lei & Morrow, 2010) and giving them freedom to make their own pedagogical decisions (Porter & Graham, 2015) can result in more meaningful and motivating adoption projects.

This section has established that very few studies have explored how and why decision-making occurs for teachers who adopt technology in workgroup settings. Accordingly, research question 1 (see p. 13) was designed to investigate this gap. Next, I review the literature that describes the factors that hinder teachers from adopting, including studies that have focused on the discontinuance of technology.

Barriers to technology adoption

Over the past two decades, a significant body of work investigating the factors that inhibit teachers' adoption of technology has been undertaken, yet despite this research, these barriers remain (Abrahams, 2010; Birch & Burnett, 2009; Buchanan, Sainter, & Saunders, 2013; Handal, MacNish, & Petocz, 2013; Kregor et al., 2012; Lei & Morrow, 2010; Singh & Hardaker, 2014; K. Smith, 2012; Tsai & Chai, 2012). Research into barriers have traditionally been undertaken at the institutional and individual level of analysis, while recent research has tended to utilise a meta-analysis methodology. See, for example, Singh and Hardaker (2014). Understanding these barriers is important for academic developers, who are tasked with identifying best practice to support teachers to prepare for new technology (Reid, 2014). Teachers' adoption behaviours tend to be categorised into institutional, cognitive and affective barriers (Ertmer & Ottenbreit-Leftwich, 2013; Straub, 2009). These barriers are explained next.

Institutional barriers

In higher education, there are two major institutional barriers to technology adoption: firstly, the lack of strategic vision for technology and, secondly, the lack of support by management. In a review of the literature on barriers to the adoption of e-learning (electronic learning), Singh and Hardaker (2014) define the term management as those who are often called senior management or top management in an institution. Citing a lack of support by management for the adoption process, they argue that management should instead model the use of technology, be willing to develop new knowledge about teaching and create an organisational culture that promotes technology adoption.

Studies that have examined institutional factors have argued for management to provide strong leadership, policies and strategic planning, and clear institutional visions to guide the design and delivery of e-learning within institutions (Birch & Burnett, 2009; King & Boyatt, 2015; Laurillard, 2014; Singh & Hardaker, 2014). Indeed, Singh and Hardaker (2014) propose that the university as a whole should determine the direction of technology for learning and teaching. These studies share the perspective that institutional change will only occur when the whole organisation shares a vision (Taylor

& Newton, 2013). In contrast to these studies, Trowler (2008) argues that faculties tend to operate independently of one another; therefore, achieving an institutional-wide agreement on one vision would be unlikely. Similarly, other studies have concluded that taking an institutional approach to technology adoption would not account for the customisation required for each faculty (Bohle Carbonell et al., 2013) and that there is no one-size-fits-all approach (Moskal et al., 2013).

A significant barrier for teachers is gaining support from management who have the power to accept or reject technology (Gunn & Herrick, 2012; Whitworth, 2012). The question of who determines the success of an innovation may be addressed by the "notion of invisible success" (Whitworth, 2012, p. 145), which refers to a situation in which some stakeholder groups deem an innovation project successful and others do not. In viewing a technological innovation through the lens of the diverse objectives of stakeholder groups rather than pedagogical outcomes, Whitworth (2012) found that the success or failure of an adoption depends on the perspectives of each of the stakeholder groups who sponsor, design, use and support an innovation. For example, Whitworth's study examined the adoption of an innovation that was considered a success by teacher adopters and resulted in the successful dissemination of changed practice. However, this outcome was not part of the key stakeholders' objectives; therefore, they did not consider the pedagogical outcome when they made decisions about the sustainability of the project. Another example of invisible success is when an individual teacher implements a technology separately from faculty involvement; once the technology is implemented, the success may not be defined or publicised (Reid, 2014). Teachers who adopt technology as individuals are sometimes labelled lone rangers who embrace technology with a view to improving their own teaching practices, yet because of this individuality their learning does not become institutionalised (Hardy, 2010).

Bates and Sangra (2011) point out that leadership alone does not result in technology integration, arguing that success requires an institutional environment that supports change, engagement with key people, and the developing and sharing of a vision for the use of technology. They also argue that planning for technology at an institutional level should take place in conjunction with planning for academic programmes and departmental budgets. This would have the advantage of keeping departmental or workgroup level planning in alignment with institutional planning. Bates and Sangra (2011) offer leaders six recommendations to support the successful integration of technology in higher education institutions:

1. Where the importance of technology is recognized in an institution, it is more likely to be integrated. In particular, understanding the financial implications of technology and communicating the importance of technology to all key staff.

2. Successful planning requires the development of visions and goals for the use of technology within institutions. Such planning should leverage better learning outcomes, more flexibility of students, and increased cost efficiencies that may be measured through a formal evaluation process.

3. Leaders should develop a process to engage faculty with the visions, goals and strategic thinking around the role of technology for learning and teaching.

4. The intuitional strategy should be wholly supported by all members of the executive leadership team and this support should continue over time, including when changes are made in the executive team.

5. Planning should be viewed as an ongoing process and become a fixed feature of institutional planning.

6. A process for creating and maintaining "an environment that supports and encourages the integration of technology" (p. 100) in the institution should be developed once the strategic vision has been set. "Of particular importance is the need to link strategic directions for technology to an annual academic programme planning and budgeting process in each faculty or academic department" (p. 100).

If executive leaders followed these recommendations, they would support faculty to move forward in harmony, assured that the work they put into technology adoption was worthwhile and in alignment with the strategic goals of the institution.

Cognitive barriers

Studies have identified teachers' lack of technical skills and pedagogical knowledge as a cognitive barrier to adoption (Laurillard, 2014). Additionally, teachers' engagement with ineffective professional development that does not meet the diverse needs of teachers has been identified as a barrier to the adoption of technology (Laurillard, 2014; Reid, 2014). Up to now, suggestions to overcome cognitive factors have included the provision of a variety of professional development opportunities, online guidance and CoPs (King & Boyatt, 2015), as well as the customisation and tailoring of professional development to meet teachers' specific needs (Birch & Burnett, 2009). Bohle Carbonell et al. (2013) argue that the transformation of teaching is only likely to occur when teachers change their

beliefs to view a learner-focused approach to teaching and e-learning as their natural way of working. Yet these suggestions to overcome cognitive barriers do not account for studies that identified that professional development has been ineffective in changing teachers' beliefs and developing their pedagogical knowledge. My research aims to identify whether the problem of ineffective professional development remains a barrier for teachers who adopt in workgroup settings.

Affective barriers

Affective barriers encompass teachers' beliefs and attitudes as well as their anxieties towards technology. Ertmer (2005) argues that pedagogical beliefs, technological beliefs and personal beliefs interfere with a teacher's willingness to change (Ertmer, 2005). Studies have found that teachers have difficulty adapting to new technology when they feel that their current beliefs and practices are threatened. Such a radical change in teaching requires teachers to reduce their face-to-face relationships with students (Hanson, 2009) while at the same time resituating their beliefs and practices according to new teaching spaces (Westberry, McNaughton, Billot, & Gaeta, 2014). Moreover, this process can result in a disembodied identity when teachers are not ready to take on such a change (Hanson, 2009). In an NZ study of university teachers' adoption of technology in a departmental workgroup, Westberry et al. (2014) argued that teachers' current approaches to teaching must be accommodated in terms of the time and support required to resituate themselves in new learning and teaching spaces.

A second major affective barrier to technology adoption is teachers' anxiety about technology. Studies argue that to avoid teachers resisting technology adoption, anxious behaviours should be taken into account (Singh & Hardaker, 2014; Straub, 2009). Anxiety is problematic because it affects teachers' self-efficacy, that is, their perception of their capability to use a technology for teaching (Kregor et al., 2012). The anxiety evolves from a fear that their use of technology will result in a negative outcome, for example, being unable to use it in front of students and therefore looking foolish (Mac Callum, Jeffrey, & Kinshuk, 2014). Consequently, a lack of self-efficacy and conflicting pedagogical beliefs are likely to lead to resistance to adoption (Reid, 2014).

Few studies have examined reasons for the discontinuance and rejection of technology by teachers in higher education. Two studies that relate to my research are described next. An Australian study that investigated the sustainability of video conferencing (Andrews, Smyth, Tynan, Vale, & Caladine, 2008) concluded that few higher education institutions have successfully adopted and sustained the use of technology. Despite a

belief by teachers in the positive aspects of technology, the reasons given were a lack of involvement by stakeholders in the decision-making processes and that teachers did not change their teaching practices in order to use the technology to its full potential. This finding demonstrates that both institutional and cognitive factors are barriers to the sustainability of the innovation. Moreover, when examining teachers' perceptions of online software, Thornton (2008) found, firstly, that teachers facilitated more effective teaching when they aimed to understand their pedagogical practices rather than focus on technology and, secondly, that teachers who learned a set of basic Blackboard LMS functions used the technology adequately but tended to persist with a content-oriented conception of teaching. These findings showed that for some teachers cognitive factors were dealt with successfully, resulting in a focus on pedagogical practices, whereas for others an undesirable consequence of sustaining the LMS was that it concealed a failure to change teaching practices. It seems that these teachers were able to continue using teacher-focused approaches to technology while at the same time appearing successful in adopting and sustaining a technology.

This section has focused on institutional, cognitive and affective barriers to technology adoption in higher education. The review of literature identified that few studies have examined teachers' reasons for rejecting and discontinuing technology; therefore, research question 4 (see p. 13) was designed to address this gap. Next, I discuss the social constructionism of technology.

Social constructionism of technology

When teachers adopt a digital technology for teaching, they make decisions about how they will implement it within their teaching practice, and these decisions have implications for students' approaches to learning. In this section, I discuss philosophical orientations of technology. Having argued in chapter 1 that a single definition of technology is unlikely, in this section I will discuss Dusek's (2006) three definitions or characterisations of technology: technology as hardware, technology as rules and technology as system (p. 31). The 'technology-as-tools' position views technology as socially shaped by society. The 'technology as system' orientation views technology as constructed by all those who come in contact with it, and the 'technological determinism' position views technology as shaping society both positively and negatively. For my research, I will draw on the technology as system definition to interpret how teachers become part of a technological system when they adopt technology for teaching, and the implications for their practice.

Technology as tools

According to Dusek (2006), the first characterisation, technology as hardware, explains the difference in how people use tools and machines. As suggested by Mumford, Dusek argues that people are able to manipulate tools, whereas a machine is dependent on the skill of the person running it. For example, people readily customise tools such as smartphones by downloading applications relevant to their needs. On the other hand, a machine such as a car is reliant on the driver having learned the skills to drive it.

The technology-as-tools orientation views technology as neutral – neither good nor bad (Dusek, 2006); therefore, the person using it is able to control it. In educational contexts, media researcher Richard E. Clark continues to argue that technology (media) does not influence student achievement. Using an analogy, Clark (2001) explains that just as the truck that delivers our milk does not change our nutrition, neither can any type of media "make any unique contribution to learning" (p. ix.). After conducting extensive media studies, he concluded that it is the instructional strategies that educators employ that make learning effective, not the technology itself. Clark's research is discussed in further detail in section 4 of this chapter. Similarly, educational reformer David Jonassen (1947–2012) argued that as carpenters are not controlled by the tools they use for building, nor are students controlled by the computers they use for learning (Jonassen, 2000). In contrast, Jonassen, Howland, Morre and Marra (2003) view a computer as a tool for students to construct knowledge with. From this perspective, technology is perceived as a neutral tool, ready to serve the aims of the educator (Kanuka, 2008). This perspective may encourage teachers to consider how they might manipulate technology to achieve their pedagogical aims. Jonassen favoured a cognitive and constructivist approach to learning with technology. In the 1990s, he argued for teachers to adopt learner-focused approaches to teaching that would encourage students to learn with technology and thereby become active knowledge constructors. He explained that, conversely, teacher-focused approaches to teaching encouraged students to learn from media, reducing them to passive knowledge users. Recently, researchers such as Ertmer and Ottenbreit-Leftwich (2013) have revived Jonassen's argument, proposing that a social constructivist learning approach to teaching with technology rightly places the emphasis on pedagogy that supports students to develop higher order thinking skills. However, Kanuka (2008) argues that technology is never neutral and cautions teachers to be wary of focusing on pedagogical instruction to the exclusion of the social impact of technology and its effects on learning outcomes. This perspective is discussed in more detail in the next two sections.

Technology as system

The second characterisation, technology as rules, distinguishes between hardware as tools and hardware as software (Dusek, 2006). From a social construction of technology perspective, software consists of code that is co-constructed by software engineers. These lines of coded instructions are rules that tell a tool or parts of a machine how to function or work. The third and final characterisation is technology as system and it encompasses the first two definitions as well as the addition of human beings who are necessary to the constructing of technology (Dusek, 2006).

Drawing on the three characterisations, Dusek (2006) argues for a "consensus definition sometimes characterised as the technological systems approach to technology" (p. 35). "The technological system is the complex of hardware (possibly plants and animals), knowledge, inventors, operators, repair people, consumers, marketers, advertisers, Government administrators, and others involved in a technology" (Dusek, 2006, p. 35). The technological system as defined by Dusek relies on people to construct technology. For example, people in organisations have provided the built workplaces for technology to be designed and developed. Designers have utilised knowledge from theories and models in order to design the technology. Software consists of code that has been co-constructed by software engineers and the hardware itself is constructed through manufacturing. Once created, marketing campaigns are constructed to sell the technology to consumers. Trainers teach consumers how to operate the technology, while support staff are available for technical support and repairs. From a social construction of technology (SCOT) perspective, there is no doubt that technology is constructed (Dusek, 2006). Moreover, for the past two decades, advocates of the technological systems approach have been aligning themselves with the SCOT approach (Dusek, 2006).

In contrast to the technology-as-tools approach, in which the person using the technology is outside the tool, the systems approach makes technology encompass humans (Dusek, 2006). People are not outside the system; they are inside the system. Therefore, when we view all the people and objects in the system, we can understand how technology might influence teachers. In an examination of the place of technology in society, Winner (1993) argues that a SCOT perspective emphasises the creation and acceptance of technology but not the impact of technology on society – in this case, the people inside the system. However, Dusek disagrees, arguing that social constructionists address the impact of technology through the systems of meaning that groups attribute to that technology. Yet, the technological system definition discussed previously clearly

illustrates how the ideological perspectives of those who design and manufacture technology are prevalent within them, and that they may have an unexpected impact on those who use them.

Hidden ideological perspectives in technology have been explained by McLuhan (2013), who coined the phrase 'the medium is the message'. McLuhan posited the assumption that media contain hidden ideologies that have implications for social settings that may go unrecognised. McLuhan proposed that each type of media is a medium (environment, channel, mode or method) that produces a message (a social effect). He concluded that regardless of whether or not the media contained content, the important element was the message conveyed to people by the medium. Often this message is invisible to the user because each medium produces a different message or social effect that in turn has an impact on the senses. The character and structure of the medium within which a person functions makes an impression on that person, because the environment itself conveys "critical and dominant messages by controlling the perceptions and attitudes of those who participate in it" (Postman & Weingartner, 1971, p. 17). For education, then, this means that each learning environment will convey a message to students that will have an effect on their approach to learning.

Taking this notion into account, then, it is the learning process that becomes vital to meaning making, not the content. The perceptions students construct in a learning environment are those that the medium allows them to develop. For example, the medium of the lecture method is a theatre, and the layout with the lectern at the front of the room and the seats facing the front provides the message that learning is a process of transmission and receiving. The class begins when the teacher arrives. The teacher is the source of knowledge who determines what will be taught, who will speak, what the correct answer is and when it is time to stop learning and leave (Jaffee, 1998). Consequently, the classroom provides the teacher with power that in turn reinforces how students should behave in that environment. The lecture room reinforces the strategy of note taking, so that students can learn that content later for assessment purposes. Therefore, during the lecture students are not focused on higher order thinking, such as analysing, evaluating and making judgements about what is being said. This demonstrates that the physical environment of the classroom can inhibit the extent to which students can develop graduate competencies (Fisher & Newton, 2014). Next, I discuss how the construction of technology has implications for individuals and societies.

Technological determinism

Technological determinism is an orientation that suggests that "technology causes or determines the structure of the rest of society and culture" and that "as technology develops and changes, the institutions in the rest of society change" (Dusek, 2006, p. 84). For example, email led to a decline in letter writing and eventually the weakening of the once substantial postal service. Thus the principle of technological determinism is "that every event has a cause, or every event is an effect of some cause or set of causes" (Dusek, 2006, p. 85).

Technological determinism is based on two assumptions: that technology shapes society in both positive and negative directions. Therefore, some teachers view technology as affecting society and education in a negative manner, and others see it as having a beneficial effect on learning and teaching (Kanuka, 2008). The assumption of both opponents and advocates is that technology determines social change, and influences the person that uses it (Dusek, 2006; Kanuka, 2008). Kanuka (2008) explains that some individuals tend to see technology as a way of positively shaping the form and content of learning. For example, Garrison and Vaughan (2008) concluded that technology can transform learning experiences in positive ways, thereby increasing the quality of learning. The assumption is that technology itself will lead to enhanced or transformed educational experiences and that the effects of such change will be inevitable (Kanuka, 2008; Njenga & Fourie, 2010). Positive technological deterministic perspectives are seen in the literature when studies portray the affordances of technology as having the potential to effect learning. For example, Peter Drucker, management consultant and educator, claimed that universities would become relics by 2027 because of developments in online learning (Lenzner & Johnson, 1997).

In contrast, media theorist Neil Postman (1931–2003) took a sceptical view of the implementation of technology in education, despite agreeing that it brought benefits to society. Postman argued an alternative view in order to challenge educators to think about the impact of technology on our lives. Postman's view was that to live intelligently in a technological society, people must learn to use technology rather than be used by it. He proposed that technology education should be included in the curriculum; not so that students would learn how to use technology, but in order to critique how the use of technology affects society, education and their personal lives (Postman, 1999). An understanding of the philosophical orientations that underpin the construction of technology and the implications for education will support teachers to make informed decisions during the adoption process.

This concludes section 2, a discussion of the theories and studies that have focused on technology adoption in higher education. A critique of adoption models applied in a higher education context identified that Rogers's (2003) diffusion of innovations and innovation-decision process would be a useful interpretive lens for this research. This review identified few studies that have investigated types of decision-making and reasons for rejection and discontinuance in workgroup settings. Therefore, I designed questions 1 and 4 to address these gaps. A discussion of the social constructionism of technology identified that the technology as system perspective underpins this thesis. Perspectives on quality learning and scholarly practice for university teaching in multiple learning environs will be discussed next in section 3 of this chapter.

Section 3: Learning and teaching with technology

Section 3 reviews the literature related to question 3: What are teachers' approaches to teaching with technology? This section begins with a brief history on the adoption of technology and associated leaning theories in education. I then move onto a synthesis of the sizeable literature on teachers' conceptions of and approaches to teaching, and the implications for students' approaches to learning. I align this literature with a model by Kirkwood and Price (2013) in order to analyse teachers' conceptions of and approaches to teaching with technology. Next, I draw on Trigwell's (2001) model of university teaching to demonstrate how these concepts work in practice. A discussion on how the concepts of meaning making, Knowles's (1972) adult learning principles, and social constructivist learning theory underpin scholarly university teaching is provided. Finally, I discuss studies that have examined teachers' and students' perspectives on teaching and learning in virtual space.

Learning technology and associated learning theories

Technologies are constructed according to the ideology of the designers, and a historical view of the literature revealed that learning theories play a role in these constructions. This literature demonstrates how the ideas of those who construct technologies are revealed in the functionality, as well as the impact of these constructions on teachers' attitudes.

The first version of packaged education emerged at the turn of the 20th century as correspondence courses were delivered to students' homes (Russell, 2005). Between the 1920s and 1960s, the audiovisual instruction movement (training films, overhead projectors, slide projectors, training simulators) and mass media (radio, television and

film) delivered content to students. These methods were successfully used by organisations such as the military to train large numbers of people from diverse backgrounds (Reiser, 2001). However, television failed to be widely adopted in education mainly because of the poor quality of programmes, many of which consisted of a teacher delivering a lecture (Lowyck, 2014; Reiser, 2001). Consequently, television was discontinued through teacher resistance, the expense to schools and its inability to present the conditions necessary for student learning (Reiser, 2001).

In the 1940s and 1950s, early computer-assisted instruction (CAI), commonly known as drill and practice programs, were developed by IBM researchers for use in public schools (Conole & Oliver, 2007; Reiser, 2001). Developed by psychologists John B Watson and B F Skinner, CAI programs are underpinned by the behaviourist theory of learning. Behaviourism posits that learning occurs when students change their behaviour. This change occurs as a result of students completing a series of small tasks alongside receiving positive or negative reinforcement (Bernauer & Tomei, 2015). Examples are students completing drill and practice techniques or rote memorisation of dates. Such tasks are ideal for CAI as the program is able to scaffold students through a series of tasks and provide them with immediate feedback on their progress. In order to bring about observable changes in behaviour, students are required to engage in active rather than passive learning (Kanuka, 2008). However, this notion of active learning may mislead teachers into thinking that they are supporting students to learn deeply. The key to understanding the impact of behaviourism on students' approaches to learning is to ask whether the CAI program enables students to use knowledge as evidence to reason and reflect, and whether their mental models are changing. CAI programs that focus on the development of low-level thinking skills and do not provide adult learners with the opportunity to share their learning experiences or self-direct their own learning would not be appropriate for university teaching.

In the 1970s, the terms educational technology and instructional technology replaced the term audiovisual instruction to describe the application of media for teaching (Reiser, 2001). Stand-alone microcomputers began to appear in universities in the 1980s with the expectation that they would radically change the education system; however, this did not occur. Commercial products such as Microsoft Office and multimedia programs were available for use in education; however, these were short-lived because of the not-invented-here syndrome, the cost of commercial products and development of in-house programs (Lowyck, 2014). Although cognitive and constructivist learning theories were emphasised at this time, they were not widely adopted (Lowyck, 2014). Nevertheless,

Jonassen (2000) developed the concept of mindtools, which posits that students can construct knowledge in partnership with Microsoft Office software when cognitivist and constructivist learning theories are applied. Cognitivist learning theory was developed by psychologists in response to behaviourism, which views learning as behavioural, whereas cognitivists argue that learning occurs in the mind. The theory emphasises how the mind acquires, processes, stores and recalls information, which led to the metaphor that the mind works like a computer with a focus on input, process and output (Bernauer & Tomei, 2015).

A significant change occurred in the early 1990s when stand-alone computers became networked, changing the way society communicated through the provision of the World Wide Web, email and multimedia. Furthermore, e-learning was realised in the form of LMSs that utilised a browser-based desktop computer. Although the LMS was focused on supporting face-to-face classes and reducing costs (J. Lee, Zo, & Lee, 2014), its implementation has contributed to the need for academic developers to support teachers to implement it effectively (Reiser, 2001). Constructed for ease of delivery of content, the LMS was adopted by institutions just as social constructivist learning theory was becoming more prominent in education. Recently, the trend for learning analytics has revived behaviourism with its focus on LMS tools used to control and track students' learning, as well as automatic grading of online assessments and generic feedback statements (Kanuka, 2008). Consequently, the philosophical underpinning of the construction of the LMS has caused tension between the LMS providers and institutional decision makers, and academic developers and teachers who espouse a social constructivist approach to university teaching.

Social constructivist learning theory entails two perspectives: constructivism and social learning. Constructivist theory was developed from the work of psychologists Jean Piaget and Jerome Bruner, and explains how people construct knowledge. The theory suggests that people construct a new conceptual understanding of subject matter by comparing new information to be learned with their existing prior knowledge (Gagnon & Collay, 2006; Selwyn, 2011). The social aspect of constructivism was derived from Lev Vygotsky's work on social learning. The social learning approach presupposes that students will find it easier to construct new knowledge when sharing perspectives, experiences and thinking through new concepts and problems in discussion with peers (Gagnon & Collay, 2006). Accordingly, the role of the social constructivist teacher is facilitative. The teacher should develop teaching strategies that support students to foreground and reflect on current knowledge and previous experiences of new concepts

to be learned and then to actively engage in learning processes based on inquiry and interpretation in order to make meaning (Selwyn, 2011).

In the early 2000s, the Internet transformed from Web 1.0 public consumption of information to Web 2.0 public construction of information through the development of social media and social networking platforms. Additionally, Creutz and Wiklund (2014) argue that e-learning has been extended by the concepts of mobile learning (m-learning) and ubiquitous learning (u-learning), both of which take advantage of the dimensions of time and place. The term u-learning was coined by Mark Weiser and refers to Heidegger's (1962) notion that only when a tool is broken does it become visible to the user (Creutz & Wiklund, 2014). Accordingly, when a technology is widely adopted and diffused, it essentially becomes invisible to the user as the focus shifts from using the device to what the mind can do with it (Creutz & Wiklund, 2014). In conjunction with these new modes of learning, social constructivist learning theory and technology-supported CoPs became prominent in higher education institutions in order to facilitate the use of mobile technology (Lowyck, 2014).

In the current decade, mobile laptops and tablets have shown educators how personalised technology, commonly called devices, can free learners from having to use technology at a specific place and time. Recently, J. Lee et al. (2014) described smart learning as a new model of learning that draws on and extends everything we know about learning with technology. Smart learning focuses on formal and informal learning, social and collaborative learning, and personalised and situated learning, with an application and content focus using smart devices such as phones, tablets and laptops (J. Lee et al., 2014). Beyond today, the future of technology in education is unknown. However, the 2016 Horizon Report (L. Johnson, Brown, Adams Becker, Cummins, & Diaz, 2016), which forecasts technology use in education for the subsequent five years, suggests that robotics and artificial intelligence will support instruction in higher education. George Siemens developed connectivist theory which he describes as a learning theory for the digital age, designed to address learning with technologies that utilise features of connectivity. Siemens (2004) argues that cognitivist and constructivist theories describe learning that takes place in the mind and so they do not address learning that occurs outside of people and is stored and manipulated within technology. Connectivism is underpinned by the principles of constructivism, network theory and chaos theory (Seimens, 2004). However, Garcia et al, (2013) and Kop and Hill (2008) argue that a lack of empirical research literature reduces the support required for it to be viewed as a learning theory.

Conceptions of knowledge, teaching and learning

A key role for academic developers is supporting teachers to understand the impact of their conceptions of teaching on their approaches to teaching and, importantly, students' approaches to learning. Research into teachers' conceptions and beliefs about good teaching (Entwistle, Skinner, Entwistle, & Orr, 2000) explains the relationship between teachers' epistemological view of knowledge development, their thinking about the nature of knowledge and their conception of teaching. The term 'conceptions of teaching' in higher education has been derived from phenomenographic research comprising interviews with teachers and students (Entwistle et al., 2000). However, Biggs (1996) suggests that while phenomenology has influenced the improvement of teaching in higher education, it is conceptually isolated from other research in this area. Instead, the cognitive sciences use the terms 'beliefs and practices' (Pajares, 1992), which are grounded in the literature on constructivist learning theory (Biggs, 1996). Yet both terms are used interchangeably in the literature on technology adoption and academic development in higher education. In Table 2, I have aligned three models pertinent to this research that describe conceptions of knowledge development, teaching and learning. These models describe how teachers' perspectives about knowledge development can change over time (Entwistle et al., 2000).

Table 2. Conceptions of knowledge development, teaching and learning

Stages	**Conceptions of knowledge development** Entwistle (2009)	**Conceptions of teaching** (Entwistle et al., 2000, p. 7)	**Conceptions of learning** (Entwistle, 2009, p. 32)
May be viewed as:	A content-oriented conception of teaching	A teacher-focused approach to teaching	A surface approach to learning
	Knowledge as absolute or information to be reproduced	Teaching as imparting information	Acquiring factual information
	That there is value in understanding multiple perspectives	Teaching as transmitting structured knowledge	Memorising what has to be learned
	An awareness that knowledge can be provisional	Teaching as directing active learning	Applying and using knowledge

Stages	**Conceptions of knowledge development** Entwistle (2009)	**Conceptions of teaching** (Entwistle et al., 2000, p. 7)	**Conceptions of learning** (Entwistle, 2009, p. 32)
May be viewed as:	A learning-oriented conception of teaching	A learner-focused approach to teaching	A deep approach to learning
	Knowledge used as evidence to reason among alternatives	Teaching as facilitating understanding	Understanding what has been learned
	Knowledge used to commit to a personal reasoned perspective	Teaching as encouraging conceptual change in students	Seeing things in a different way

The first column, teachers' conceptions of knowledge development (Entwistle, 2009), describes how teachers think about the development of knowledge. The first three stages may be combined to describe how teachers think about knowledge when they view it as a set of facts or information to be learned. When teachers undergo a change in thinking about the nature of knowledge, it leads to corresponding changes in the way they teach (Entwistle et al., 2000). For example, the final two stages show that teachers are able to focus on what students can do with or think about knowledge when they encourage them to take a reasoned position on an issue.

The second column, conceptions of teaching (Entwistle et al., 2000, p. 7), aligns with teachers' conceptions of knowledge development and describes how they believe that they should teach knowledge. Teachers with a content-oriented conception of teaching are likely to be focused on how to get knowledge across to students (Trigwell & Prosser, 1996). This objectivist tradition views knowledge as existing independently of the knower, and understanding is about coming to know that which already exists (Biggs, 1996). On the other hand, teachers with a learning-oriented conception of teaching tend to consider how students will use knowledge in authentic ways in order to develop higher order thinking skills such as analysis, critical thinking and argument. Thus, meaning is created by the student and is not "imposed by reality or transmitted by direct instruction" (Biggs, 1996, p. 348). In this conception, teaching is learning oriented, focused on promoting conceptual change in the student.

The third and final column, conceptions of learning (Entwistle, 2009, p. 32), is underpinned by research undertaken by Marton and Saljo (2005), who conducted interviews with students to develop an understanding of their conceptions of learning.

Marton and Saljo (2005) found that teachers' conceptions of and approaches to teaching had corresponding implications for students' approaches to learning. Consequently, studies have found that content-oriented conceptions and teacher-focused approaches are associated with students taking surface approaches to learning, whereas teachers who hold learning-oriented conceptions and learner-focused approaches influence students to adopt deeper approaches to learning (Gow & Kember, 1993; Trigwell & Prosser, 2004). For example, when it is a teacher's aim to transmit content to students in order that they recall it for an examination, students will tend to try to memorise and reproduce that content in order to meet assessment outcomes (L. Johnson et al., 2016). However, when teachers encourage students to take deep approaches to learning, students are more likely to use content to make meaning, to develop a personal understanding of it and to communicate ideas (L. Johnson et al., 2016). However, this is not necessarily always the case, as Marton and Saljo (2005) also found that, despite teachers taking a learner-focused approach to teaching, students will sometimes take a surface approach if learning conditions are not optimal. Therefore, Marton and Saljo argue, students should not be characterised as either deep or surface learners.

Encouraging students' approaches to deep learning

As discussed in section one of this chapter, a key aim of the NZ Education Act (1989) is to produce university graduates who are intellectually independent. Teachers who have a learning-oriented conception of teaching tend to facilitate deep learning in students, that is, understanding and encouraging conceptual change in students (Entwistle et al., 2000). Accordingly, students are more likely to take deep approaches to learning when learner-focused teachers use knowledge to challenge their existing mental models, and support them to develop reasoning and reflection capabilities (Bain, 2004).

Deep learning is likely to occur when teachers challenge students' mental models by encouraging them to ask questions about their own real-life or work contexts. When teachers create a natural, critical learning environment, where students can ask and attempt to answer questions that are not only intriguing but also important to them, they engage in deep learning (Bain, 2004). Furthermore, L. Johnson et al. (2016) argue that students engage deeply in learning when they make connections between the curriculum, the real world and the application of new knowledge and skills. Additionally, Entwistle et al. (2000) conclude that when teachers encourage students to think of knowledge as using evidence to reason among alternatives, they are more likely to take a personal, reasoned position on an issue (Entwistle et al., 2000). Engaging in metacognitive processes (reflection) is another teaching method that encourages students to take deep

approaches to learning. Entwistle (2009) argues that teachers can influence a deep approach to learning if they keep in mind that students need to develop "the disposition to understand for oneself" (p. 36) and to be aware of metacognition or the process of monitoring one's own learning and studying, and adjusting them as necessary. Hence, metacognitive processes involve helping "students to learn to learn, examine and assess their own learning and thinking" (Bain, 2004, p. 56). Teachers' conceptions of and approaches to teaching have a major impact on the approach that students take to learning, and therefore how they learn to become intellectually independent thinkers. However, there are also implications for technology-enabled learning. For example, L. Johnson et al. (2016) argue that deeper learning approaches are a key driver of technology adoption in higher education, as they require teachers to shift their pedagogy from teacher-focused to learner-focused approaches to teaching. This notion is discussed next.

Conceptions of learning and teaching with technology

Teachers' thinking about knowledge and teaching approaches corresponds to their beliefs and thinking about teaching with technology. Kirkwood and Price (2013) developed a taxonomy that illustrates the "relationships between conceptions of teaching, approaches to teaching, and approaches to teaching and learning with technology" (p. 329). The taxonomy is useful for academic developers as it predicts the kinds of learning technology teachers might select and the teaching strategies they might develop in relation to their conception of teaching. The taxonomy has been adapted in Table 3, and is explained next.

Table 3. Relationships between conceptions of teaching, approaches to teaching and approaches to teaching and learning with technology

Conceptions of teaching and learning with technology			
Conception of teaching	Approach to teaching	Strategic	Tactical
Teacher centred	Transmits knowledge	Views technology as the agent of change	Replicates or supplements current practices
		Viewed as technologically deterministic	Uses technology to present information

Conceptions of teaching and learning with technology			
Learner centred	Focused on developing learners	Teacher is viewed as the agent of change	Transforms current practices by asking how technology can support the achievement of learning goals
		Viewed as pedagogically determined	Students actively use technology to inquire, reflect, share and construct knowledge

Adapted from Kirkwood and Price (2013, p. 329)

The taxonomy aligns with Table 2, Conceptions of knowledge, teaching and learning. Except that Kirkwood and Price contrast teacher-focused and learner-focused approaches to teaching, rather than providing stages of thinking that teachers may move through. Perhaps for ease of understanding, researchers have tended to contrast teachers' approaches to teaching, viewing them as either teacher focused or learner focused (Brookfield, 2015; Entwistle et al., 2000; Entwistle, 2009; Kember & Kwan, 2000). However, it is important to keep in mind that teachers are more likely to work through the various stages of conceptual development over time, rather than make one giant leap from one approach to another. Additionally, Kirkwood and Price (2013) argue that teachers' conceptions of teaching and learning with technology are also influenced by their philosophical understanding of technology, which is indicated in the strategic category of Table 3. These ideas are discussed next.

The taxonomy indicates that teachers with a content-oriented conception and teacher-focused approach to teaching are more likely to transmit content to students, using the lecture method, for example. Accordingly, these teachers will tend to use technology to replicate the lecture method through webinars, and by posting PowerPoint presentations and lecture notes online. Kirkwood and Price (2013) argue that this conception and approach to teaching leads to teachers conceiving of a technologically deterministic perspective of teaching with technology. Such a perspective views technology as a medium capable of shaping students' learning by replicating teachers' strategies. Thus, teachers view technology as the agent of change, rather than themselves. This may explain the perspective that technology can replace teachers.

On the other hand, teachers with a learning-oriented conception and learner-focused approach to teaching are likely to encourage students to develop higher order thinking through strategies that encourage them to achieve learning goals. Accordingly, they require students to use technology to work both individually and collaboratively to engage in knowledge construction and reflection activities, for example. Kirkwood and Price (2013) argue that this conception and approach to teaching leads to teachers conceiving of a pedagogically deterministic perspective of teaching with technology. Underlying this view is the technology-as-tools orientation, an assumption that teachers can manipulate and therefore control technology. Such a perspective views the teacher as the agent of change, rather than the technology, as the teacher develops the pedagogical strategies that enable learning goals to be achieved with the technology. This view also aligns with Jonassen et al.'s (2003) notion that when students learn with technology, they become knowledge constructors. Next, I describe a model of university teaching that provides a framework for teaching practice that takes into account teachers' conceptions and approaches to teaching with technology.

A model of university teaching

I have drawn on Trigwell's (2001) model of university teaching to support the interpretation of data for this research as it can be used to develop teachers' practice as well as to critique their practice. The model consists of a set of criteria that academic developers and teachers can draw on when evaluating practice. I have argued for university teachers to develop a learner-oriented conception of and learner-focused approach to teaching in order to encourage students to take deep approaches to learning (Trigwell, 2001). This is one description of good teaching, as it brings about high-quality learning and is scholarly (Ramsden, 2003; Trigwell, 2001). Trigwell (2001) developed his model based on a set of dimensions and criteria that account for teachers' conceptions of teaching, and can be used to support teachers in developing their practice. The dimensions are shown in Table 4 below. Please see Trigwell (2001) for the questions that accompany each of the dimensions.

Table 4. A model of university teaching

Dimensions and characteristics of good teaching
1 Teaching/learning context: The teaching environment
2a Teachers' thinking: Teachers' thinking (conceptions)
2b Teachers' thinking: Teachers' thinking (knowledge and reflection)
3 Teachers' planning: Teachers' planning
4 Teachers' strategies: Teachers' strategies
.

Trigwell (2001, pp. 69–71)

How students make meaning and the relationship to teachers' approaches to teaching is discussed next.

Meaning making

In higher education, effective teaching strategies are those that encourage students to take deep approaches to learning (Entwistle, 2009; Ramsden, 2003). However, to develop effective strategies, an understanding of how students learn and what they are actually doing when they are engaged in deep learning is essential. Next, I discuss the term meaning making, which is a metaphor for learning. Postman and Weingartner (1971) argue that meaning making is underpinned by the nature of perception, that is, how people perceive the world. Postman and Weingartner (1971) propose that, first, we perceive the world, and having perceived it slightly differently from others, we then construct the world using the same language system. This assumption has major implications for learning and teaching, and these are described next.

Traditional university teaching is based on the assumption that students receive information. What the teacher tells them is what the teacher intends for them to learn, usually content (Postman & Weingartner, 1971). However, drawing on the meaning

making metaphor, no matter what the teacher intends the students to learn, they may not. A NZ study that investigated what students individually learned in the classroom found the following: students already knew approximately 40% of what teachers intended them to learn, a third of what each student learned was not learned by any other student in the class, and a quarter of the specific concepts and principles that the students learned only occurred because of their collaboration with peers or use of resources (Nuthall, 2005). These findings reinforce the notion that a student's personal viewpoint is often unknown to the teacher; therefore, the teacher should focus on understanding learning from students' perspectives (Hattie, 2009). By understanding learning from students' perspectives, teachers will be better able to plan learning that takes account of their culture and experiences. To do this, teachers should understand the process of meaning making, and I draw on Postman (1999) to explain this next.

According to Postman and Weingartner (1971), perception comes from within people, not the world around them. Everything that an individual perceives is filtered through the human nervous system (Postman & Weingartner, 1971). For example, as babies, we perceive hunger, warmth and happiness through our human nervous system. As we grow older, we develop experiences of the world. We come to understand that we are unique in the world because our perceptions reflect our experiences, our assumptions and our needs. Therefore, to be effective in a social setting, we must rely on seeing others' perspectives. Postman and Weingartner argue that the ability to learn is the ability to give up an inappropriate perception and to develop new, more viable ones. However, they also argue that we are only likely to change our perception when we are dissatisfied with our current position. Hattie (2009) argues that if students do not perceive that they should be dissatisfied with their current thinking, then they will not act to change their current perceptions. Thus, being dissatisfied may not necessarily lead people to change; it may only cause them to understand that they have the ability to change their perception if they wish. Finally, Postman and Weingartner argue that people have developed language to name, classify and categorise what we perceive in the world; thus, the meaning of perception is how it causes us to act. Therefore, people are likely to interpret others' explanations according to their unique perception of the world. Thus, teachers should be aware that students will interpret their explanations and instructions according to their unique perception. This may explain, for example, why some students do not interpret assessment questions as expected.

Postman and Weingartner (1971) argue that in education, the phrase meaning maker places the focus on the uniqueness of the student and thus there are no limitations to

what or how a student might learn. Therefore, teachers can be free of the notion that some students may have fixed learning abilities and can plan to challenge students' perceptions through effective approaches to teaching. In the next two sections I explain how the principles of andragogy (adult learning) and social constructivist learning theory can support teachers to plan and design effective meaning making experiences for students.

How adults learn

Teachers are more likely to develop strategies that encourage students to use deep approaches to learning when they view adult learners as meaning makers with an innate desire to direct their learning and share their experiences. Malcom Knowles (1972) developed the principles of andragogy (how adults learn) to highlight the importance of taking into account adults' cultural, educational, workplace and life experiences. These principles align with social constructivist theory and should be taken into consideration when planning learning experiences to support adult learners to make meaning and therefore construct knowledge. Firstly, Knowles (1972) argues that teachers should shift the focus from what they are doing to what the adult learner is doing, and secondly, they should engage them in learning through inquiry. These principles are underpinned by two psychological assumptions: that adults want to self-direct their learning and that adults want to share their experiences with others (Knowles, 1972).

Knowles (1972) argues that people achieve a self-concept of self-direction when they psychologically become adults, causing them to want to self-direct their learning and to be perceived by others as self-directing. So when adults are situated in a learning environment where they are not able to be self-directing, this causes a tension between their self-concept and the teacher, and they may react with resentment and resistance, which will interfere with their learning (Knowles, 1972). Secondly, as people mature, they develop life experiences that shape who they become (Knowles, 1972). Teacher-focused approaches such as lectures and readings do not take account of adults' experiences, and so if their experiences are ignored, they may feel rejected as a person (Knowles, 1972). Teachers can tap into adult learners' experiences by encouraging learner-focused and participatory teaching strategies that enable them to share their knowledge and experiences (Knowles, 1972). These two principles illustrate the argument that students are not empty buckets waiting to be filled, and that it is therefore futile for teachers to transmit content (Knowles, 1972; Postman & Weingartner, 1971). Instead, teachers can draw on social constructivist learning theory to support students to construct knowledge.

Social constructivist learning theory

As discussed in section 2 of this chapter, it has long been argued that technology supports constructivist principles in a learning environment (Selwyn, 2011). For decades, Jonassen (2000) argued that educational technology could and should be underpinned by constructivist principles such as authentic learning, case-based learning, solving complex real world problems, exploration of multiple representations of reality, emphasis on knowledge construction over knowledge reproduction, collaborative construction of knowledge and reflection on experience. Moreover, Seymour Papert extended the principles of constructivism further to develop the notion of constructionism (Selwyn, 2011). He argued that students learn best when they are able to build objects such as robots that are able to do something, such as move or speak. Here, Papert's students are intellectually challenged as they work with concepts that require higher order thinking. However I agree with Biggs (1996), who argues that social constructivist learning theory is often confused with types of teaching strategies. For example, group work leads to knowledge construction, but lecturing involves only transmission and memorising. If we consider the concepts that underpin meaning making, any teaching strategy has the potential to challenge students' perceptions if they align with the learning goal to be achieved. I suggest the confusion arises because the lecture has been the predominant method in university teaching. Alternatively, a variety of considered teaching strategies will better enable graduates to develop the multiple skills required to become intellectually independent constructors of knowledge.

Social constructivist theory emphasises participatory, learner-focused forms of education (Selwyn, 2011) that support meaning making and take account of adult learning principles. Therefore, it is a learning theory that is appropriate for university education. Next, I draw on the work of Reece and Walker (2007) to explain how a social constructivist approach to teaching and learning may be designed. The learning session is developed in five stages and each stage should be designed to support students' engagement in knowledge construction (Reece & Walker, 2007). In stage 1, students are introduced to the topic to be learned; for example, this may be in the form of learning goals or concept maps. In stage 2, students are encouraged to examine their current understanding of the topic. This stage in particular should support students to view knowledge from different perspectives, and this is usually achieved through discussion. Collaborative processes support students to draw on their existing knowledge of the topic and to foreground their underlying beliefs in relation to their cultural background and experiences. In stage 3, learning is restructured, as students are introduced to new theories, concepts, skills or attitudes. When engaging with new information, students

begin to assimilate their existing knowledge with these new concepts and skills. In stage 4, students apply learning, with a focus on theory to practice. An important aspect of constructing knowledge is supporting students to use new understandings to make connections to their life, work or future career (Horton, 2011). Finally, in stage 5, the session is concluded. The conclusion stage provides an opportunity for students and teachers to review and evaluate what has been learned. Reece and Walker (2007) recommend teachers determine whether students' conceptions of the topic have changed by comparing what they knew at stage 2 with what they now know at stage 5. These five stages make a complete learning session. A learning session may span a few hours, a week or even weeks at a time, depending on what should be learned and the level at which it should be learned. Drawing on this literature, I argue that when adult learning principles and social constructivist theory are combined, they underpin students' make meaning processes. I complete this section by discussing studies that have examined teachers' thinking about teaching and learning in virtual space.

New learning environments

This next section discusses the current literature on mobile devices, social media and social networking that characterise and provide access to new learning environments. This research draws on Sköld (2012) to define virtual space for learning and teaching in university contexts. See chapter 1, page 5. Therefore the studies and technology discussed in this section should be viewed within the context of Sköld's (2012) definition. As opposed to physical learning environments such as classrooms and lecture theatres, new learning environments may be viewed as virtual space where learning can take place. In a learning context, virtual space is accessed through networked computers (Bell, 2008), for example, through mobile devices, such as smart phones or iPads/tablets (Kukulska-Jume, 2012) which provide access to social media (Manca & Ranieri, 2016) or social networking such as Facebook (Selwyn, 2009). Therefore these new learning environments are not the same as the physical learning environments and as Sköld (2012) argues, each has benefits and drawbacks that should be accounted for when designing learning tasks. Accordingly, Torrisi-Steele and Drew (2013) make the link between technology such as those discussed in this research and virtual space when they argue that teachers who have the skills to utilise technology in traditional settings, are often unable to exploit the affordances of technology to deliver effective learning experiences in new learning spaces. In other words, it is important for teachers to understand the benefits and disadvantages of virtual space when designing learning tasks. As stated In

chapter 1, I will use the specific terms given to technology by the authors of the studies discussed in this section.

Mobile technology such as smartphones and laptops provide students with access to social media. Mobile learning as a mode of teaching developed from the notion that mobile devices frees students and teachers from the desktop computer (JISC, 2015). Therefore, mobile devices provide the potential for students to learn in authentic contexts that have relevance to learning goals. Mobile learning may be defined as the "exploitation of ubiquitous handheld hardware, wireless networking and mobile telephony to facilitate, support, enhance and extend the reach of teaching and learning" (JISC, 2015, p. 3). Evans (2014) argues that research into the application of social media for teaching and learning is limited. Next, I discuss what is known about teachers' perspectives on social media and mobile devices.

The following literature suggests that teachers lack an in-depth knowledge of new technology and virtual space. Studies found that not only did teachers lack an understanding of social media and new modes of teaching, such as mobile learning (Kukulska-Hulme, 2012), they were also uncertain about their usefulness for teaching (Rambe & Nel, 2015). For example, Brown found that teachers perceived social media as appropriate in some contexts, such as promoting a learner-focused approach to teaching, but not at all times, and not in all teaching contexts. So it is not surprising that teachers consider mobile learning peripheral to the delivery of their courses (Kukulska-Hulme, 2012).

Teachers have also been concerned that students' engagement with traditional educational delivery might be disrupted by social media (Selwyn, 2009). For example, teachers have feared that mobile learning might cause students to be distracted by mobile devices and to engage in superficial learning activities, and that the quality of interaction between students and teachers would decrease (Handal et al., 2013). Some of this lack of knowledge may stem from teachers' own limited use of social media. A recent study found that social media use by teachers tended to be limited to personal sharing and connecting with peers in professional networks rather than integrating the media into their teaching practices (Manca & Ranieri, 2016). A lack of time is also a factor that teachers view as an inhibiter to developing a knowledge of mobile technology, as well as the design and preparation of digital materials (Kukulska-Hulme, 2012; Rambe & Nel, 2015).

A change in learning environments requires teachers and students to manage their interactions in different ways. In a critique of the research into virtual space, pedagogy and learning task design, Sköld (2012) found three dominant positions. First, that growing use of virtual space requires "the development of a theoretical and practical online pedagogy" (Sköld, 2012, p. 5). Second, due to the notion that every virtual space is a distinctive learning environment, learning tasks should be designed to take account of the benefits and shortcomings of the virtual space where such tasks will be undertaken. Finally, the academic discourse on virtual space, pedagogy and learning task design has been strongly influenced by social constructivist views of learning that encompass student participation, active meaning making and communication.

Ramsay and Terras (2015) argue that teachers need to understand students' behaviour across educational contexts, for example, "how to learn using mobile technology and how to manage and structure learning behaviour within and across new contexts of learning" (p. 375). They claim that when learning shifts from a fixed time and place to a virtual space, teachers and students tend to undergo a spatio-temporal displacement, for which there are no obvious behavioural cues. Therefore, Ramsay and Terras (2015) offer two teaching strategies to develop students' capabilities for learning in virtual space. Firstly, students should develop metacognitive skills to manage the distraction of multifunctional devices, and secondly, they should learn to self-regulate their behaviour, particularly as there are few rules in virtual space. Next, I discuss students' perspectives on learning with social media.

Although students are not the focus of this research, understanding students' perspectives on the use of social media for formal learning is essential if teachers are able to engage them in new virtual space. Despite students widely adopting social networking sites such as Facebook and Twitter for personal reasons, teachers who attempt to integrate these virtual space into formal learning interactions may find that students are divided over their willingness to take part. In reviewing the Facebook newsfeeds of university students for formal learning situations, Selwyn (2009) demonstrated that discussions were predominantly personal rather than educational, suggesting that students may not want to use Facebook for formal learning exchanges. Furthermore, Jones, Blackey, Fitzgibbon and Chew (2010) identified that students viewed social media as two distinct domains – a learning space and a personal space – and many students did not want to combine these spaces. Therefore, Jones recommends that when designing learning in social media spaces, teachers should cater for students' preferences to combine the two domains or to keep them separate. However, such a divide may put teachers who are already tentative

about social media in a quandary about how to implement it for learning and teaching. This section has identified that there is limited research into teachers' conceptions of teaching with mobile devices, social media and social networking. These technologies provide teachers and students with access to virtual space or new learning environments. Therefore, teachers' approaches to teaching with technology, and in particular how they think about virtual space when designing learning tasks (Sköld, 2012) was investigated in my research. Understanding teachers' approaches to teaching in virtual space is essential to developing effective technology-related professional development opportunities.

This concludes section 3, which began with an historical perspective of technology adoption in education that illustrated the importance of understanding the ideologies that underpin the construction of technology in order to develop teaching practice appropriate for university teaching. This research is underpinned by the technology as system perspective that places teachers inside the system, influencing the way they think about technology for teaching. I have argued that a learner-focused conception of and approach to teaching can influence students to take deep approaches to learning. I justified the use of two educational models to interpret the interview data for the case studies in this research. They are Kirkwood and Price's (2013) taxonomy of approaches to teaching and learning with technology and Trigwell's (2001) model of university teaching. Finally, I argued that both of these models underpin high-quality and scholarly university teaching as well as the concepts of meaning making, principles of adult learning and social constructivist learning theory. This review of literature has identified the need for further investigation into teachers' approaches to teaching and pedagogical strategies in virtual space. I designed question 3 to address this gap. Next, I discuss the work of ADUs and academic developers in supporting teachers to adopt technology-enabled learning.

Section 4: Preparing to teach with technology

Section 4 reviews the literature related to research question 2 – What pedagogical knowledge do teachers develop about teaching with technology and how do they develop it? – and question 5, implications for approaches to professional development in higher education. I begin with a discussion of academic development in higher education contexts. Then I discuss the challenges academic developers face in creating effective programmes of professional development, and move on to explain the implications of technology-related studies that have found 'no significant difference' on students'

learning outcomes. Finally, I review the literature on academic developers' conceptions of and approaches to professional development.

Academic development in universities

ADUs were created in the 1970s to focus on the improvement of teaching in universities. In NZ, ADUs were established to curtail high student dropout rates and long completion times (Grant & Barrow, 2013). Therefore, bringing about change in teaching and learning with the purpose of improving student learning remains a key aspect of an ADU's remit today (Beckton, 2009; Fostaty Young, 2008; Healey, Bradford, Roberts, & Knight, 2013). Accordingly, the work of academic developers and the programmes of learning that they offer for teachers have strong links to improving the learning experiences of students in universities.

In NZ, Australia, the United Kingdom (UK), North America and Europe, the term academic development is often used synonymously with the terms educational development, professional development or faculty development (Mårtensson, 2015; Matthews et al., 2015; Patel, 2014). The term professional development is often used in the literature to describe the types of formal learning opportunities that teachers undertake to develop themselves as academics within a university context (Beaton & Gilbert, 2012; McAlpine & Akerlind, 2010; Moon, 2001). Accordingly, the term academic development unit (ADU) may be seen as a generic phrase for units with specific designations housed outside of the academic mainstream but within individual institutions such as the Faculty Development Centre or Centre for Teaching and Learning.

Over time, the term academic development and the various definitions to describe it have shifted depending on the context and geographical location in which they are used (Leibowitz, 2014). For example, Blackmore et al. (2004) describe the purpose of academic development as "the support of learning and the development of learning in others" (p. 26). However, they also include "the idea of the university" (p. 26) as a way of prompting developers to remain focused on the day-to-day engagement of academic development practice. Similarly, Brew (2002) has extended the notion of individual academic development to the "development of academic institutions, and the development of courses and curricular, course teams, faculties, and departments" (p. 6). It may be undertaken by academic developers as well as departmental and faculty managers and by academics themselves, thus identifying the growing scope of work and sites of academic development (Brew, 2002). Similarly, Leibowitz (2014) suggests that:

> 'Academic development' is about the creation of conditions supportive of teaching and learning, in the broadest sense. Similarly, we learn by conducting research, and our research, including research on teaching, should enhance teaching. This is the nexus of 'academic development'. (p. 359)

In this instance, Leibowitz's (2014) description of the work of academic developers is focused on teaching and research. Leibowitz argues that teaching involves creating conditions that support teaching and learning, whereas research should focus on the field of academic development and on the scholarship of teaching and learning. Though it is difficult to ascertain a definitive view of academic development, these perspectives are more harmonious than divergent (Leibowitz, 2014).

Aligning an ADU with an institution's strategic objectives creates opportunities as well as tensions. Over time, academic developers have acquired the capacity to respond to a variety of institutional concerns while developing "disciplinary field habits, norms, routines, and common understandings" (Mårtensson, 2015, p. 303). Centres have shifted their focus from individual teachers and traditional teaching methods to e-learning activities and a focus on "strategic interventions at institutional and national levels" (Clegg, 2009, p. 403). It is not uncommon for new teachers to begin teaching with a PhD but a lack of formal teacher training (Becker & Denicolo, 2013; Bernauer & Tomei, 2015). Yet Patel (2014) argues that in the current university climate in which there is a focus on the improvement of student outcomes and retention, teachers are "under scrutiny with regard to their professional development and readiness to teach their discipline within pedagogical frameworks" (p. 245). This scrutiny also applies to the effective implementation of e-learning, with issues ranging from motivating teachers to adopt technology, to understanding how to improve the quality of face-to-face and online teaching, to course design for new virtual space. To cope with this remit, ADUs have hired learning technologists, staff who provide advice on the use of technology in teaching (Knapper, 2001). In some institutions, separate technology centres have been created while in others technology specialists have been integrated into the ADU. This rearranging of technology specialists and centres continues in institutions today just as ADUs continue to be restructured to meet the requirements of executive management.

Celia Whitchurch's work on the third space in higher education, argues for a new 'space' that acknowledges the blurring of roles between academic and professional areas of activity (Whitchurch, 2013). This notion raises questions about roles, identities and dilemmas for staff who operate in such a space (Whitchurch, 2013). Some researchers have situated academic developers in the third space as they increasingly straddle both

professional and academic areas, engaging in project-oriented approaches across the university (Clarke, Hyde, & Drennan, 2013; Macfarlane, 2011; Whitchurch, 2009). Similarly, Macfarlane (2011) describes how a new category of blended professionals called para-academics are unbundling the role of traditional academic practice in higher education. Para-academics tend to specialise in one element of the tripartite academic role of teaching, research and service/administration tasks (Macfarlane, 2011). Para-academic roles include for example, academic developers, learning technologists, teaching assistants or student support advisors. Seen in this light, para-academics may be situated within Whitchurch's (2008) notion of the third space. This unbundling of roles has occurred due to new pressures being placed on academic workloads. For example, the massification of higher education bringing with it increasingly diverse needs of students, e-learning, and the increasing nature of specialist academic roles (Macfarlane, 2011).

Organisational power structures

At AUT, the ADU (CFLAT) balances the needs of executive leadership, senior leadership and teachers. In a discussion on the definition of leadership, Debowski (2012) differentiates the roles of leadership and management, yet describes them as having complementary skills. Debowski describes leadership as the process of identifying a preferred direction, developing a vision for that direction and encouraging and motivating staff to work towards that vision, whereas she describes management as those who develop the process to make the vision a reality. Beckton (2009) argues that there is an expectation that ADUs will take on much of the responsibility for improving the quality of learning and teaching within the university. Though ADUs can make a wide impact when they work strategically with the university to meet its objectives (Gibbs, 2013), senior leaders have not always understood what ADUs do and how they go about their work (Healey et al., 2013). This requires ADUs to engage in a balancing act in order to meet the needs of senior leaders whose aim is institutional enhancement as well as the needs of teachers who seek "autonomy in its pursuit of academic challenge, freedom, and integrity" (Gibbs, 2013, p. 358; Kensington-Miller, Brailsford, & Gossman, 2012; Loads & Campbell, 2015).

Several studies have found that organisational power structures can place academic developers in conflict with the colleagues they are there to support, creating a power imbalance that can influence the outcome of professional development projects. Besides ADUs, senior leaders may also lead professional development activities (Boyd et al., 2015). These senior leaders may require short-term input or longer-term collaboration

with academic developers when pursing their own professional development projects, yet such collaborations have not always been successful because expectations can differ. For example, while a team of academic developers and departmental teachers were instigating changes to curriculum, Cordiner (2014) found that the senior leaders within the department held different expectations as to how the change should occur. This resulted in a 'power play' between the team leaders, creating a "fraught change process" (p. 209) for the developers and ultimately interfering with the process of change. Additionally, Gibbs (2013) cautions that some managerial attempts to be strategic about improving teaching has resulted in more negative than positive consequences, suggesting that "educational development can become to be seen as a tool of oppressive, and ignorant, management if it is not careful" (Gibbs, 2013, p. 12).

Moses (2012) suggests that a power imbalance is less likely to exist between teachers and academic developers, despite ADUs operating in a political environment, because teachers understand that they also work in such an environment. Moses argues that it is only when ADUs act as leaders of the institution that the power balance shifts. Therefore, ADUs tend to be seen as safe places where teachers are able to go for advocacy and support along with the option to withdraw from a professional development activity if they wish (Moses, 2012).

Challenges for professional development programmes

Recent research suggests that further attention is required to address the gap between traditional teaching practices and new ways of teaching with technology. The effectiveness of professional development methods have been called into question as the gap between existing practices and new practices remain unaddressed (Bohle Carbonell et al., 2013) and the rate of adoption remains low (Reid, 2014). Currently, academics are facing a multitude of changes such as increasing workloads (Delgaty, 2013; Tynan, Ryan, Hinton, & Lamont Mills, 2012), curriculum updates, new quality standards and measures, technological initiatives and increasingly diverse groups of learners (Teräs & Herrington, 2014). Yet, despite these pressures, Tynan et al. (2012) and Teräs and Herrington (2014) have argued that professional development needs are often neglected. Two concerns in particular have been identified: firstly, changing teachers' conceptions of teaching and, secondly, redressing the balance between technical and pedagogical development (Reid, 2014).

Changing conceptions of teaching

The aim of professional development related to technology-enabled learning is to close the gap between existing and new practices (Bohle Carbonell et al., 2013). However, this can only be achieved by supporting teachers to reconsider the appropriateness of their conceptions of teaching (Kirkwood & Price, 2013). Specifically, professional development programmes for teachers should focus on supporting them to reflect on and change their conceptions of and approaches to teaching (Kirkwood & Price, 2013; Kopcha et al., 2015; Reid, 2014; Selwyn, 2011). However, the following evidence shows that this is not occurring.

Despite the evidence that learner-focused approaches to teaching are more effective for students' learning than a content-focused approach, the delivery of a lecture remains the dominant model in university teaching today (Kirkwood & Price, 2013; Laurillard, 2012). In a study that evaluated a 12-week online higher education teacher training module, Rienties et al. (2013) found that though teachers had increased their knowledge of technology and pedagogy, they did not change their teacher-focused approaches. Similarly, Owens (2015) found that UK National Teaching Fellows espoused learner-focused beliefs as they continued to teach in teacher-focused ways, utilising online environments to transmit information to students rather than engaging them in participatory activities. A study on the professional development needs of higher education teachers found that many of them were still replicating a traditional instructional paradigm focusing on content delivery in blended and online environments (Almpanis, 2015). Furthermore, in a study of teachers' use of Web 2.0 tools, teachers recognised that they needed to develop new knowledge about technology, but did not equate this with the need to change their pedagogical approach (Newland & Byles, 2014). Finally, in an examination of university teachers' beliefs and practices post-teaching with technology, Scott (2014) found that teachers only changed their practices when they realised that students' learning preferences conflicted with their own teaching goals.

Balancing technical and pedagogical development

Another barrier to changing teachers' conceptions and development of pedagogical knowledge is the imbalance between technical skills and pedagogical development. Professional development programmes have tended to use technology as a catalyst to change teachers' practices (Selwyn, 2011), resulting in a focus on the development of technical skills rather than pedagogical knowledge (Kirkwood & Price, 2013; Teräs & Herrington, 2014).

Few solutions have been provided for balancing technical and pedagogical strategies when designing professional development programmes. However, Beckton (2009) argues that it is more important to develop teachers' knowledge than focus on tasks such as guidelines for technology use or the design of learning materials. Other authors suggest that the integration of technical and pedagogical development opportunities and ongoing support should closely match teachers' needs when designing professional development programmes (M. G. Jones & Harmon, 2011; King & Boyatt, 2015; Porter & Graham, 2015; Reid, 2014). However, to do that, teachers' needs must be identified. As discussed in section 3, I concur with Kirkwood and Price (2013) that to overcome the imbalance, approaches to professional development should focus teachers' attention on themselves as the agent of change, rather than the technology as the agent of change. Therefore, the relationships between the philosophical underpinnings of technology and pedagogy should become a significant aspect of teachers' professional development. Next, I will discuss no significant difference studies.

No significant difference studies

Teachers searching for evidence of how technology improves learning are likely to be disappointed. Despite the growing number of publications, research has been unable to determine the effectiveness of technology on learning (Kirkwood & Price, 2013; Oliver, 2013). Additionally, recent meta-studies tend to show no significant difference in terms of learning gains when compared with traditional instruction (Cain, 2010). The term no significant difference (NSD) refers to the literature on media comparison studies that compare student outcomes between face-to-face and distance courses (Russell, 2005). These studies began in the 1920s when researchers questioned whether students taught by teachers would achieve the same results as those studying via correspondence courses (Russell, 2005). Research into audiovisual educational practices began in the 1940s (Reiser, 2001). Called 'media comparison studies' (film, radio, TV, computer), they tended to "compare how much students learned after receiving a lesson presented via a particular medium" versus how much students learned from a teacher on the same topic (Reiser, 2001, p. 57). Over the decades, courses were compared for their modes of delivery, such as printed materials, radio, television, video and online learning, in order to determine which was most effective. Since this time, however, similar studies continue to conclude that there is NSD (Russell, 2005).

Recent NSD studies include that of Nguyen, Barton and Nguyen (2015), who investigated the use of iPads in higher education, and found that while they enhanced the learning experience of students, they did not lead to improved learning outcomes. While

examining the effectiveness of online instructional videos for undergraduate students, Cooper and Higgins (2015) found that they could not establish a conclusive evidence base to show that they had improved learning and teaching. However, they did suggest that videos do no harm to students' learning, and therefore the use of videos to support real world application is beneficial and should be encouraged. Finally, in a study on the barriers to serious games in higher education, Tsekleves, Cosmas and Aggoun (2016) found that it is unclear how games can best be incorporated within formal education systems. In education, serious games may be defined as those that have been explicitly developed for educational purposes and not intended to be played for entertainment (Abt, 1970). A recent second-order meta-analysis study summarised 40 years of research to address the question of whether technology use affected student achievement. The researchers concluded that their findings supported research by Clark (1983) and Hattie (2009) that technology is having no or little effect on student learning (Tamim et al., 2011). Additionally, the results of a US study by Arum and Roksa (2011) suggested that after two years of college, a majority of students showed little improvement in their capacity for critical thinking, reasoning and writing.

What has become known as the media effects debate came about when two leading researchers, Clark and Kozma, disagreed about whether technology made a difference to students' learning. Beginning in the 1980s, Clark (1983, 2001) researched the effect of media on learning by isolating the variables of media from teaching instruction, and by carrying out meta-analysis studies. In these studies, the dependent variable classifies the student, while the independent variable classifies the media (Russell, 2005). By changing the media, researchers observed the effect on student outcomes (Russell, 2005). Over time, Clark (2001) has concluded that while media delivers content, it does not affect student achievement. He continues to argue that it is instructional methods (pedagogical strategies) that educators employ that make learning with technology effective.

Conversely, Kozma (1994) argued that researchers need only establish the conditions that would be sufficient to bring about learning. In challenging Clark's (1983) findings, Kozma (1994) argued that the conditions that cause learning in one situation may not occur in another; therefore, "media theories and research must reflect both the capabilities of media and the complexities of the social situation within which they are used" (p. 14). In other words, Kozma suggested that media have affordances (functionality) that influence the choice and use of pedagogy; for example, social media applications have affordances that enable students to generate content in virtual space.

However, I suggest that this notion may lead to the confusion that it is the technology itself that influences learning because the technology provides a space or a form of learning benefit in which it may occur. I suggest that a device or virtual space is incapable of enacting a teacher's work, that of exploring with students their conceptual thinking and supporting them to develop higher order thinking skills such as reasoning and reflection. Certainly, students can demonstrate their conceptual thinking in virtual space; however, I align with Clark's view that it is the pedagogical strategy designed by the teacher that creates the intellectually stimulating conditions required for effective learning.

Kozma's (1994) focus on affordances and learning benefits may have influenced the numerous NSD studies today that examine the potential for technology to improve learning and teaching (Selwyn, 2011). Indeed, Njenga and Fourie (2010) describe the authors of such studies as those who sell technology to educators. They argue that using the language of marketers, research is "transformed into a belief system", in which the past tense, used to communicate research findings, is substituted for the present and future tense, for example, technology that "can and will" rather than "has and does" (p. 201). In this example, Njenga and Fourie's (2010) perspective is located within the 'technology as system' philosophical perspective, which places teachers inside the system, enabling marketers to influence their conceptions of and approaches to teaching with technology.

Two interpretations can be made of NSD studies: firstly, that technology in education does no harm and, secondly, that converting a face-to-face course into an online course does not help to improve student outcomes (Russell, 2005). To improve student outcomes, the course must be redesigned for the online or virtual environment. Russell (2005) argues that the design of online courses has improved through the adaptation of instruction to technology, rather than the technology itself. Assessment is integral to course design, therefore learning outcomes should be clearly linked to assessment activities (Ramsden, 2003). Additionally, Laurillard (2002) argues that technology changes the curriculum and the way in which content is learned, therefore assessment processes need to change if they are to correspond with student learning processes. The Clark-Kozma media effects debate has been resurrected in the past decade as researchers who have become disillusioned with the lack of technology integration in higher education adopt Clark's (2001) viewpoint, that technology itself cannot improve learning and teaching. They argue as Clark did that it is the pedagogical instruction that makes the

difference in students' learning (Ertmer & Ottenbreit-Leftwich, 2013; Kirkwood & Price, 2013; Sappey & Relf, 2010; Swan, Lin, & van't Hooft, 2008).

In conclusion, the Clark-Kozma debate highlights the differences in philosophical thinking that underpin thinking about the effectiveness of technology. It also aligns with Kirkwood and Price's notions of technological determinism and pedagogical determinism as discussed in section 3 of this chapter.

Conceptions of and approaches to professional development

How academic developers go about their work is influenced by their approaches to academic development. Golding (2014) argues that to shape teaching practice in creative ways, it is important to devise broad conceptions that provide a link between academic development, the identity of developers, and approaches to improving learning and teaching practices. In recent years there has been an increasing interest in applying situated learning theory in professional development contexts. The concept of situated learning was developed by Lave and Wenger (1991), who drew on Vygotsky's concept of social learning. Situated learning posits that students will construct knowledge through authentic learning experiences, that is, in contexts that reflect the way that knowledge can be useful in a real world setting (Herrington, Reeves, & Oliver, 2010). Applied in a professional development context, teachers situate their learning about teaching with technology as they implement them in practice. The social learning aspect provides an opportunity for teachers to share tacit knowledge, enabling experienced teachers to support those who are less experienced (Lave & Wenger, 1991). Furthermore, Swan et al. (2008) argue that by situating professional development in classroom practice, teachers will recognise themselves as agents of change, learn to construct their own understanding of technology and experience the chaos that is the reality of technology implementation.

Professional development with a psychological emphasis on changing the individual has been surpassed by a sociological conception that emphasises models for organisational change (Gibbs, 2013). A sociological conception requires academic developers to refrain from thinking about professional development as a training and development model that includes "deficit assumptions about academics' skills and knowledge" (Boud & Brew, 2013, p. 219). Therefore, Boud and Brew (2013) have drawn on situated learning theory to develop the practice model, which attends to activities that emerge from the everyday work of teachers. These activities are "embedded in the context of real world relationships, opportunities and constraints" (Loads & Campbell, 2015, p. 356). Thus, the crux of this model is to focus on the everyday issues that concern teachers, those things

that make a difference to their identity and their work, and to find ways of addressing them within the context of everyday practice (Boud & Brew, 2013). Academic development then shifts from "what do teachers need to know" to "what they do to enact their work" (Boud & Brew, 2013, p. 214). In Boud and Brew's practice model, success is determined by judging how well the team as a whole engages with the new practice, not by how much each individual has learned.

As discussed in chapter 1, recent literature on approaches to professional development has signalled a shift from an institutional workshop model to a situated learning model. Although some researchers have concluded that the traditional approach is ineffective, Reid (2014) argues that there is no agreement as to the most effective format for professional development in higher education. The traditional institutional model has emphasised an individual teacher's development of knowledge and skills through engagement with conferences, postgraduate programmes, workshops, seminars or consultancies (Mårtensson, 2015; Weller, 2011). In comparison, a situated learning model employs collaborative learning approaches as a means of promoting professional development for teachers within the contexts in which they work (Hardy, 2010). These two approaches and the implications for technology adoption are contrasted next.

The workshop approach

At the institutional level of professional development, the traditional workshop remains a significant learning and teaching intervention; however, its effectiveness is being called into question. As ADUs emerged in the 1970s, the initial focus of academic development was on the individual academic (Gibbs, 2013) and the main method employed to develop the lecturing skills of academics was the staff teaching seminar (Fraser & Ling, 2014; Grant & Barrow, 2013). Within each institution's context, ADUs established programmes of professional development workshops that demonstrated what might, or should, concern teachers (Boud & Brew, 2013), thus providing a shop window of the core aspects of academic developers' work. Although workshops and conferences remain the primary format for institutional professional development (Swan et al., 2008; Weller, 2011), there have been concerns that the workshop is out of date. A number of factors support this view. Firstly, there is an assumption that the workshop is a training model utilising a transmission method of teaching (Swan et al., 2008). Secondly, workshops require teachers to call on multiple locations in the institution to gain the support they require, for example, help desk support, technology training and educational developers located in separate departments (Reid, 2014). Thus, the location of professional development support and resources is seen as a barrier to adoption. Thirdly, while the

workshop has helped time-poor teachers to develop teaching and technical skills, there is a view that the limited length of the workshop does not provide adequate time for teachers' existing beliefs and practices to be challenged (Debowski, 2016; Swan et al., 2008). Finally, there is the view that the workshop has tended to focus on technical or how to skills rather than pedagogical or theoretical development (Reid, 2014; Swan et al., 2008). As a result, these issues have emphasised the need for alternative approaches to professional development that will be more successful in encouraging lectures to adopt effective pedagogical methods for new e-learning contexts.

The workgroup approach

Teachers who come together to form workgroups are a part of the many cultures that exist within higher education institutions. Within a university context, Debwoski (2012) defines culture as "a complex mesh of attitudes and values that underpin the communities in which [academics] operate" (p. 186). Trowler (2008) describes cultures in universities as "multiple, generated and sustained at the level of the workgroup within departments" (p. 15). Recent studies have used various terms to describe groups of teachers who engage in a common project, for example, learning communities and CoPs (Buckley & Du Toit, 2010; King & Boyatt, 2015; Laurillard, 2014), disciplinary communities (Krause, 2012), teaching groups (Heinrich, 2015) and team projects (Bohle Carbonell et al., 2013; Hutchings & Quinney, 2015). In these studies, the common denominator is the teachers who come together to engage in a project. Therefore, workgroups may be defined as teams of teachers who collaborate on a common project over a period of time, for example, teachers who teach on the same course, or a curriculum planning team (Trowler, 2008) or small groups who are developing e-learning projects (Singh & Hardaker, 2014).

A situated learning perspective encompasses the notions of CoPs, teaching teams and workplace learning (Boyd et al., 2015). Studies have found that professional learning communities provide multiple opportunities for team members to reflect on and share ideas about teaching experiences and practices, including accessing support from online social networks (E. M. Johnson et al., 2011; Laurillard, 2014; Lei & Morrow, 2010; Singh & Hardaker, 2014). The CoP or the faculty learning community models are increasingly used by academic developers to drive a wide range of changes in academic practice. For example, CoPs have been used to support early-career academics (Cox, 2013), collaborative academic research and writing groups (Turner, Brown, & Edwards-Jones, 2014; Weaver, Robbie, Kokonis, & Miceli, 2013) and to promote pedagogical development (Clavert, Löfström, & Nevgi, 2015).

What is not clear, however, is how effective these professional learning communities are in changing teachers' conceptions of and approaches to teaching with technology. Three factors have been found to influence the successful adoption of technology in workgroup contexts: a positive climate, knowledge of pedagogy and leadership. Firstly, McFadzean and McKenzie (2001) highlight the importance of creating conditions in which groups and individuals feel positive about the technology to be adopted and the upcoming changes during the planning phase. Additionally, Bohle Carbonell et al. (2013) argue that projects are more likely to be successful if a climate is created that encourages an exchange of ideas, experiences and training sessions in which members support each other to build and share knowledge. Secondly, Hardy (2010) focuses on the specifics of what teachers should learn in workgroups, for example, questioning one's own teaching practices, learning how to use the technology before implementing it with students, and developing principles and pedagogical practices in the application of technology. The following section reviews the literature on emerging types of workgroups utilised for professional development in higher education.

Communities of practice

As traditional workplace learning shifts towards a social constructivist view of learning, teachers are joining CoPs (Lave & Wenger, 1991). CoPs are created by teachers who share similar concerns or passions for their work and want to learn how to do it better (Wenger, McDermott, & Snyder, 2002). According to Buckley and Du Toit (2010), three elements constitute a CoP: the domain, the community and the practice. The domain is the identity of a community that is shaped by the members who share an area of interest and collaborate to construct knowledge and competence in that area. The community comprises the members who work together building a collegial and supportive relationship. Finally, the practice represents the community members who are also practitioners and who over time share experiences, stories, tools and solutions to problems. Learning communities are seen as integral to developing successful high-performance organisations in today's economy (Wenger et al., 2002). They are driven by the notion that the "most valuable knowledge in any organisation is 'tacit' and that people need to share their knowledge and collectively bring their intelligence to bear to solve important problems" (Buckley & Du Toit, 2010, p. 495). Additionally, Buckley and Du Toit (2010) argue that "people in a successful CoP share the following characteristics: common purpose, common cultural context, co-location, common timeframe, voluntary participation and multiple, shifting and overlapping membership and participation" (p. 496). However, I argue that this is a descriptive account of success in a community. It focuses on members' actions, what they enjoy, but does not take into consideration what

members learn, how they learn and whether learning is effective for their individual contexts.

Disciplinary and cross-disciplinary communities

In a study of teachers' perspectives on belonging to disciplinary communities, Krause (2012) found that while they strongly identified with disciplinary research communities, this was not the case for discipline-based teaching communities. Krause (2012) proposes that the reason for this finding is that teachers have limited opportunities to discuss issues about teaching. These issues were identified as epistemological issues about curriculum design, the place of graduate attributes in practice and how students learn in disciplinary contexts. Therefore, Krause recommends further research into teachers' work in disciplinary contexts. As opposed to a disciplinary community, Healey et al. (2013) propose that a cross-disciplinary community comprises a diagonal slice of teaching staff across departments, resulting in members from differing levels of seniority, the purpose of which is to break down differences that may hinder change. However, Healey et al. (2013) argue that while cross-disciplinary communities may result in the development of creative and effective ideas, there are limits to how much individual teachers can change their teaching if their departmental colleagues do not. Gibbs (2013) agrees, suggesting that innovation and change can be difficult when "the local culture and values are hostile to change" (p. 7) or do not take teaching seriously.

Departmental groups

Trowler (2008) argues that "workgroups within departments are the most significant aspects of social life for teachers because when they go to work they go to their departments, engaging with colleagues and events" (p. 20). As departments are key organisational units in which teaching and learning experiences are designed and implemented, they are targets for effective change processes (Healey et al., 2013). However, Healey et al. (2013) also argue that change can be a challenging process as there is a tendency to discard radical ideas and revert to familiar ones in the face of opposition or external pressures. What might work or be accepted in one culture or workgroup might not work in another (Trowler, 2008). Therefore, Healey et al. (2013) suggest that the support of leaders at the departmental level can improve their confidence for achieving goals and helping them to take on a more effective distributive leadership role within their institutions.

Teaching groups

This section discusses Heinrich's (2015) notion of teaching groups. Heinrich (2015) suggests that few teachers are involved in learning communities, despite the opportunity

they offer to develop their teaching. Instead, Heinrich argues that teaching groups have the potential to improve teachers' engagement with teaching and learning about teaching because they share the purpose of engaging with teaching in a specific context. In her study, Heinrich found that teachers tended to belong to one or more teaching groups, making them a viable setting for professional development. However, she acknowledges that the type of culture that exists within teaching groups is unclear. Therefore, Heinrich suggests additional research into teaching groups to determine the type of teaching groups that exist, how they relate to organisational structures and whether they act like communities.

Online learning communities

Similarly to other professional learning communities, online learning communities are viewed as good opportunities for teachers to share resources and discuss teaching approaches for technology implementation (Swan et al., 2008). They are a platform for the informal exchange of good practice between teachers (Macdonald, 2008). The advantages of online communities are that they accommodate both part-time and full-time academic workloads, and teachers who are separated by geographical distances, and can fill the gaps between face-to-face meetings (Macdonald, 2008). Therefore, any kind of workgroup may set up an online learning community as an addition to or alternative to a face-to-face community.

In discussing the engagement levels of online communities, Macdonald (2008) differentiated between 'course-related communities', which consist of a fixed group of staff associated with a particular course, and 'interdisciplinary communities', which catered to teachers from across all faculties. Macdonald found that course-related teachers were more engaged with the online community than the interdisciplinary community, as they had a specific purpose and focus. In contrast, the interdisciplinary community had a generic focus and members lacked clarity of purpose when deciding whether or not to contribute. Furthermore, Houghton, Ruutz, Green and Hibbins (2015) investigated teachers' experiences of participating in a teaching CoP and found that the members preferred to meet on a monthly basis, mostly rejecting online discussions between meetings. Three reasons were given for rejecting the online discussions. Firstly, teachers found the LMS and blog technology difficult to use. Secondly, teachers feared that the open website would be used as a surveillance device by supervisors, faculty and university management, citing a lack of privacy and trust. The final reason given was that teachers were time poor. Houghton found that over time teachers came to view the

teaching CoP as a toolkit meeting that focused solely on technology. To avoid this focus, teachers tended to form their own micro communities outside of the community.

Shaping pedagogical change in university teaching

Over the past 40 years, the remits of ADUs and the roles of academic developers have established the field of academic development through scholarship and practice. Academic developers have proven that they are able to contribute to and draw on scholarship in order to inform and drive pedagogical change at institutional and national levels. For example, in the 1990s academic development initiatives radically changed teaching through the adoption of learning outcomes within higher education institutions (Gibbs, 2013). Academic developers have been constructing a practice literature that is likely to appeal to teachers' pragmatic needs. The SOTL is widely used as a mechanism for teachers to understand more about how students learn on their courses and as a strategy for reflecting on their own teaching (Boud & Brew, 2013). Studies about what works are frequently reflected in the SOTL literature, often as a result of collaborative inquiry between academic developers and their colleagues. Additionally, trends in research on academic development show a wide-ranging and systematic endeavour to capture and progress the scholarship of the field.

Academic development is a young field. As such, the professionalisation and credibility of ADUs and academic developers are constantly called into question (Kensington-Miller et al., 2012; van Hattum-Janssen, Morgado, & Vieira, 2012). Although academic developers tend to be employed as academic staff, they are aware that some of their colleagues may question their ability to undertake such a position. Therefore, attaining credibility is important for academic developers. They may see themselves "as 'in between' characters" (Kensington-Miller et al., 2012, p. 124) juggling the duties required of an academic developer as well those of a teacher in order to remain current and credible, and to meet institutional requirements such as research outputs. The credibility of academic developers appears to hinge on what others see them doing, yet their work is increasingly invisible. Kinash and Wood (2013) argue that the better they are at initiating and facilitating change, the less likely it is that others will know that they were a key part of that process.

Not all academic developers hold an education degree or teaching accreditation; however, in an NZ study, Kensington-Miller et al. (2012) found that heads of ADUs concluded that higher education experience and interpersonal skills were more important than having a formal educational qualification. Additionally, concerns that academic

developers lack discipline-specific knowledge have been rejected by Boud and Brew (2013), who suggest that a shift to a practice model of academic development leads to more sophisticated discourses about academic work within the context in which it occurs, thus superseding a discipline-based model. Furthermore, academic developers view engagement in their own professional development as critical. For example, developers tend to be members of higher education organisations such as the Higher Education Research and Development Society of Australasia and the Staff and Educational Development Association (Kensington-Miller et al., 2012) or the Australasian Society for Computers in Learning in Tertiary Education. In NZ, academic developers may also join the organisations Academic Staff Developers of the Universities of New Zealand and Tertiary Education Research in New Zealand. Would academic developers be better able to shape pedagogical change if they viewed themselves within Whitchurch's (2009) notion of the third space? Whitchurch (2015) argues that "Working in these conditions is likely to involve an awareness of how and to what extent boundaries might be pushed or redefined, where there is potential for new spaces to be created, and the associated costs and benefits" (p. 98). However, Macfarlane (2011) argues that the unbundling of core academic tasks risks separating academic work from its underpinning rationale and key purpose. Stoltenkamp, Heyde and Siebrits (2016) discuss work of third space professionals in the higher education setting and its impact on building trust relationships and innovative approaches. The study which explored a live-streaming project and related pedagogical approaches by instructional design experts, found that trust relationships can be threatened by technicist approaches. Similarly, to Whitchurch, this study found that the work of third space professionals were not recognised or respected by others in the university. Thus they argue that relationships fostered by third spaces professionals can be undermined due to the difficulty of maintaining such relationships.

Interestingly, Whitchurch (2015, p. 82) no longer includes "The Professional Development project" as an example of an instructional project in the third space (Whitchurch, 2008, p. 385). Perhaps academic developers do not view themselves in such a space? The third space could be one way for academic developers and ADUs to reconsider and shape their roles in relation to working with academic teachers. On the other hand, I would question why an academic developer would want to be viewed within a third space, particularly if they undertake research, service activities and often or even occasionally teach on efts papers. This is the work of an academic and therefore I suggest that academic developers would prefer to retain the status of that academic space. In conclusion, I concur with Whitchurch (2015) who recommends that individuals

and institutions consider whether the third space exists for them, how it exists and "what might be the conditions and variables affecting this" (p. 98).

This concludes section 4, which began with a discussion on the evolution of ADUs in universities and the work of academic developers. A discussion of organisational power structures identified that the improvement of teaching and learning in a university is not solely the responsibility of a university's ADU. Senior leaders can also take on the role of leading technology adoption projects in their respective faculties and this can result in conflict between the leaders, teachers and academic developers. The current proliferation of SOTL research reflects that technology adoption is a key priority for academic developers. However, in order to be able to shape pedagogical change effectively for technology-enabled learning, academic developers should address factors relating to the ineffectiveness of technology-related professional development identified in this review. These factors are changing teachers' conceptions of and approaches to teaching with technology, overcoming the imbalance between technical skills and pedagogical development, and supporting teachers to understand the underlying philosophical implications of NSD studies on the development of pedagogical strategies. To overcome these issues, recent studies have been concerned with a shift in technology-related professional development from the traditional workshop approach to socially situated learning contexts. However, few studies have established the effectiveness of professional development in workgroup settings to solve the specific issues identified in this review. This review of literature has identified the need for further investigation into the pedagogical knowledge teachers develop about teaching with technology and the methods they engage in to develop it. I designed question 2 to address this gap. Next, I discuss the implications of this review of literature for my research questions.

Implications for my research

I have argued that university teaching should be reimagined as technology-enabled learning in order to address the significant impact technological advancement has had on developing the knowledge economy. It could be suggested that society is relying on universities to produce graduates that are intellectually independent and ready to take their place as knowledge creators in a knowledge economy" (Wang, Tan, Liang, & Zhang, 2014, p. 204; Bates & Sangra, 2011; Selwyn, 2011; Education Act, 1989;). Increasingly, society is relying on universities to produce graduates that are intellectually independent and ready to take their place as knowledge creators in the knowledge economy. In section 2, I compared Rogers's (2003) diffusion of innovations with other

models used in higher education and due to its comprehensiveness concluded that it would best provide an interpretive lens for this research. Having identified that few studies have investigated types of decision-making in workgroup settings, I designed question 1 (see p. 13) to address this gap. Question 4 (see p. 13) was designed to identify factors that influence teachers' reasons for rejection and discontinuance of technology in workgroup settings. A discussion of the social constructionism of technology identified that this research is underpinned by the technology as system perspective that places teachers inside the system, influencing the way they think about technology for teaching. From the literature, I identified theories and concepts that characterise quality learning and scholarly practice that should underpin technology-enabled learning.

In section 3, I identified learning theories that have contributed to the SCOT adopted for education during the previous century. I argued that technology-enabled learning is underpinned by a learner-focused conception of and approach to teaching that can influence students to take deep approaches to learning. I justified the use of Kirkwood and Price's (2013) taxonomy of approaches to teaching and learning with technology and Trigwell's (2001) model of university teaching to interpret the interview data for the case studies in this research. I designed question 3 (see p. 13) to address the gap that has identified the need for further investigation into teachers' approaches to teaching and development of pedagogical strategies for virtual space.

Section 4 focused on the work of ADUs and academic developers to support teachers to adopt and implement technology-enabled learning. Of relevance to my research were a few studies that demonstrated conflict between senior leaders who take on the role of leading technology adoption projects, the teachers and academic developers in a supporting role. One aim of this research was to identify whether conflict occurs in departmental workgroup settings that are led by senior leaders. Of greater significance to my research were studies that identified the ineffectiveness of technology-related professional development. Therefore this research has focused on literature that has identified a shift in technology-related professional development from traditional workshop approaches to socially situated learning contexts. Yet few studies have established the effectiveness of professional development in workgroup settings to solve the specific issues identified in this review. What is known about the characteristics of workgroup settings was discussed in detail. The literature review demonstrated that teachers adopt technology in many different types of workgroup settings in universities. Four workgroup settings were selected for my research and are unique to AUTs' teaching and learning context. The selection of and characteristics of these workgroups will be

described in the methodological design section of chapter 3. I designed question 2 to address the need for further investigation into the pedagogical knowledge teachers develop about teaching with technology and the methods they engage with to develop such knowledge in workgroup settings.

The purpose of question 5, implications for approaches to professional development, was to draw together the findings to questions 1–4 to provide an answer to the main research question. The main research question was: What factors impede teachers in workgroup settings from adopting and implementing technology-enabled learning? Next I conclude this chapter by introducing the justification for selecting a qualitative, multiple case study of inquiry to conduct this research.

Introduction to the methodological approach

The following factors identified in the review of literature contributed to the selection of a qualitative, multiple case study for my research. A significant reason for conducting this research was that teachers' voices are unrepresented in the literature on technology adoption in higher education. Qualitative studies can facilitate a social constructionist democratic research process; therefore, the methodology was designed to give teachers an opportunity to contribute their voices to the literature.

Rogers argues that research approaches to adoption studies have been overly quantitative and that qualitative studies are required for studying the consequences of technology adoption. Furthermore, research into teachers' perspectives on technology adoption is limited, and there are calls for more qualitative studies to be undertaken. For example, Handal et al. (2013) argue for qualitative studies that investigate how teachers are using mobile devices for teaching and learning. Moreover, Delgaty (2013) has concluded that within the e-learning literature, there is a lack of information regarding the context in which studies are situated, "making it difficult to apply the results to other settings and as a result difficult to inform practice" (p. 1174). Significantly, a case study inquiry addresses this problem through its focus on describing the setting where the research takes place.

Finally, I identified the following reasons for undertaking this research at the meso or workgroup level of analysis. First, despite the large body of literature that has examined the adoption and diffusion of technology at the macro level of analysis in higher education, there are a dearth of studies located within the meso or workgroup level of analysis. Second, the review of literature revealed few studies that have examined whether socially situated learning contexts overcome the barriers that have contributed to the research on the ineffectiveness of approaches to technology-related professional

development. Finally, Rogers's (2003) innovation-decision process provides a framework for understanding the stages teachers engage with when adopting and implementing technology in workgroup settings. In section 2, I identified areas that Rogers recommended for further investigation and incorporated them into the design of the research questions. These under-researched aspects are an examination of whether the five stages in the innovation-decision process exist for teachers in educational contexts, further studies about types of decision-making, particularly authoritative and collective decisions at the adoption stage, and an examination of the consequences of implementing an innovation.

An examination of these factors within workgroup settings suggested a multiple case study of inquiry within a qualitative approach would be appropriate. Multiple case studies provided the methods for examining the innovation-decision process to see how it works in teachers' differing workgroup settings. Through focus groups and semi-structured interviews, the qualitative design surfaced teachers' perspectives on technology adoption. A further justification of the methodological design within a social constructionist paradigm is discussed next in chapter 3, methodology.

Chapter 3: Methodology

Two problems identified in the literature on technology adoption in higher education were the catalyst for this research. Firstly, teachers' voices are lacking in the literature on technology adoption, leaving them unable to respond to claims that they are reluctant to adopt technology for teaching. Secondly, technology-related professional development has been ineffective in changing teachers' approaches to teaching with technology. The purpose of this research was to investigate factors that impede teachers from adopting and implementing technology-enabled learning when engaging in socially situated learning approaches to professional development. The primary research question was: What factors impede teachers in workgroup settings from adopting and implementing technology-enabled learning? The research was undertaken in 2014 at AUT with 28 teachers who had adopted technologies in four workgroup settings.

I begin this chapter by explaining my decision to use a social constructionist paradigm for this research, the characteristics of the social constructionist paradigm that underpin this research and my decision to use a qualitative case study approach to inquiry. Next, I describe the design and implementation of the research. Finally, I discuss the ethical protocols undertaken to ensure the safety of participants and conclude with the strategies employed to demonstrate the trustworthiness of this research.

Social constructionism

My interest in this research stems from years of teaching in higher education contexts, more recently in the field of academic development, and from my experiences of developing a social constructionist pedagogy that informs my teaching practice and is enabled by technology. Additionally, in my work as a teaching consultant, I am increasingly exposed to the problems my colleagues face when working collaboratively in their departmental workgroups. As will be discussed in chapter 8, social constructionism has much to offer academics whose professional activities, such as programme development, rely on developing effective working relationships with colleagues. Having completed this research, I view social constructionism as a progressive theoretical perspective that could have a positive impact on academics' teaching practice. My views on technology-enabled learning developed from my first foray into teaching computerised accounting when I joined the AUT Faculty of Business. In the 1990s, when teaching an information systems paper, I drew on Jonassen's mindtools approach to support students' understanding of theoretical concepts, and

observed that students were able to engage with higher order thinking skills when using personal computers and Microsoft Office software. Because of its ubiquity in society and the workplace, I have come to view technology as an essential element of authentic teaching, learning and assessment.

My teaching beliefs and experiences influenced the way I thought about inquiring into the issues that were the catalyst for this research. To answer the research questions, a paradigm was required that would ask for in-depth accounts of multiple teachers' experiences, and descriptions and interpretations of how they constructed and/or co-constructed a new reality of technology-enabled learning for their practice. Additionally, the theoretical perspective would support the reimagining of university teaching that takes account of technological advancements in society. Given my teaching and research interests, my world view and the nature of the research questions, a social constructionist, qualitative approach to the research was justified.

Burr (2003) argues that social constructionism is difficult to define as constructionist researchers tend to have little in common with each other apart from some recurrent characteristics that are linked to form a kind of family resemblance. Consequently, I have predominantly drawn on Gergen's (2015) perspective of social constructionism to guide the methodology for this research. In describing social constructionism as an approach to human inquiry, Gergen (2015) argues:

> If properly understood, constructionist ideas enrich existing knowledge-making pursuits, while opening new and exciting vistas of possibility. Rather than a growing scepticism, constructionist ideas invite us to appreciate multiple perspectives. They vastly expand the range of our capacities to innovate, and our potentials for living together in more viable ways (pp. 61–62).

For constructionists, "the aim of research is to interpret, construct, and/or change the world in valued directions" (Gergen, 2015, p. 66). Drawing on these descriptions, two major assumptions have influenced the methodology for this research: firstly, social constructionism is concerned with social change and, secondly, it provides a focus for transforming practice (Gergen, 2015).

Characteristics of social constructionist research

The research paradigm used in this study is social constructionism and it is underpinned by a relativist ontological perspective. Relativism is a term used to describe the co-construction of reality (Lincoln & Guba, 2013). Ontology is the attempt to define the nature of reality and to describe how people think about the world (Lincoln & Guba,

2013). Therefore, an ontological perspective describes how the researcher conceives of reality. Social constructionism is underpinned by ontological perspectives that influence epistemological ways of thinking about the world, in which epistemology is an attempt to understand "the nature of the relationship between the knower" and what can be known (Lincoln & Guba, 2013, p. 37). The relationship between ontology and epistemology within a social constructionist paradigm is discussed in the following assumptions.

Social constructionism may be thought of in terms of assumptions: "things that someone would absolutely have to believe in order to be a social constructionist" (Burr, 2003, p. 2). The following constructionist assumptions are relevant to this research and are discussed next: consensus, interpretation/social construction, rich description, supportive practices and value invested.

Consensus

Social constructionism is a world view that suggests that reality is socially constructed by people as they go about their lives (Burr, 2003; Gergen, 2015). Therefore, each of us perceives the world as a different place (Burr, 2003). Phenomena such as education and the notion of successful students are social constructions so deeply imbedded in culture that we believe they exist (Gergen, 2015). Our belief of existence is communicated through language, another social construction. In a socially constructed reality, language is a means of communicating our beliefs about the nature of the world. Words describe phenomena that are social constructs and they are given ontological status when communities of people, usually experts, agree on their definition, thus reflecting social consensus (Gergen, 2015; Lincoln & Guba, 2013). Though constructionists view social reality as constructed, this does not mean that they view objects as not real (Crotty, 1998). It means that when constructionists describe objects or events, they are reporting a description of it using languages that have been constructed by people (Gergen, 2015).

Interpretation/Social construction

Social constructionism is also known as interpretative research, the premise being that constructionists "do not find knowledge, they construct it" (Merriam, 2009, pp. 8–9). Researchers construct knowledge by trying to account for the subjective ways in which people have interpreted their experiences, how they have constructed their reality of a situation and the meaning they have ascribed to their experience (Merriam, 2009). People's construction of reality stems from their cultural background and experiences. Therefore, if everyone is perceiving the world uniquely, this implies that there are numerous mental constructions of reality. It also means that there is more than one way to interpret a situation and therefore knowledge may be described as contextual (Lincoln

& Guba, 2013). Constructionism is relativistic, "meaning that knowledge is viewed as relative to time and place, never absolute across time and space, thus the reluctance to generalise" (Patton, 2015, p. 125). This is why relativist ontological researchers seek subjective meaning or multiple truths rather than one truth (Lincoln & Guba, 2013). Therefore, these concepts underpin qualitative inquiry. In this research, I sought to surface teachers' multiple perspectives in order to seek meaning, connections and explanations that revealed multiple subjective truths. In doing so, I constructed my subjective interpretation of teachers' perspectives of technology adoption in an attempt to make sense of the findings in a narrative format for the teachers' themselves and TALs in similar institutional settings.

Rich description

Rich descriptions of participants' perceptions humanise research findings (Gergen, 2015). Importantly, findings that are reported as rich descriptions are representative of participants' voices in research. The constructor's voice is the voice that is heard (Lincoln & Guba, 2013). As teachers are the participants in my research, the teachers are the voices in my research. The voices of teachers and the constructions or knowledge derived from my research consisted of the consensual voice of a group that society has labelled as university teachers (Lincoln & Guba, 2013). Teachers' constructions are dependent on their background, values and the tacit assumptions or propositional theories they hold about teaching (Lincoln & Guba, 2013). Therefore, the voices of the participants shaped every construction in my research through their values. Drawing on Lincoln and Guba (2013) in my research, the multiple case study method enabled participants to present their own perspectives and beliefs, that is, state their own constructions about adopting technology in their workgroup. When reading the case study narratives, readers can be vicariously transported to the worlds of the participants, which provides an opportunity for them to raise questions and draw their own conclusions about the research (Gergen, 2015). In this research, the multiple case study approach enabled reporting that provided rich description in the form of participants' quotations, required for judgements of transferability and contextual information about the particulars of each workgroup.

Supportive practices

Social constructionism democratises the research process. It does this by providing an avenue for participants to remain in their real-life setting during the research process and, as discussed above, for their voices to be privileged. Gergen (2015) argues that participants are demeaned by studies that seek to control conditions in order to predict their behaviour. He proposes that people are continuously in motion, interacting and

constructing meaning, and therefore predicting their behaviour is problematic. Additionally, Gergen (2015) argues that when studies aim to reveal one true answer to any question, they suppress the potential for other answers. He concludes that while the empiricist researcher's voice is heard, the participants' voices are silenced. Conversely, constructionist research that seeks to reveal multiple truths supports participants to be heard on their own terms. Lincoln and Guba (2013) argue that participants should be able to have some control over the representations that are made of them, by choosing the issues, claims and concerns they want to voice, rather than focusing solely on the researcher's interests. A catalyst for this research was that teachers' voices were lacking in the research, and that they were portrayed in the literature as reluctant or slow to adopt. In this research, teachers were able to provide their perceptions of why such a viewpoint persists in the literature. Additionally, a multiple case study approach examines teachers' perspectives on technology adoption grounded in their particular real-life work setting.

Value invested

Constructionists make their values clear during the research process and this is known as a researcher's reflexivity. Because researchers tend to participate in the disciplines they are researching, the research will reflect the traditions and values of these disciplines as well as their own viewpoints (Gergen, 2015). However, not everyone will share their viewpoints; therefore, the research should be accompanied by critical reflection (Gergen, 2015; Patton, 2015; Willig, 2013). This reflection should focus on researchers' standpoint in relation to the phenomenon under study, and identify how their subjective perspectives shape the research process and findings, and inform their understandings (Patton, 2015; Willig, 2013). I have discussed the values I bring to this research in the introduction, methodology and conclusion chapters. Having discussed social constructionist characteristics concerned with social change, I now focus on transforming practice.

Social constructionism as transforming practice

Social constructionism offers an approach to transforming practice in valued directions (Gergen, 2015). Constructionists seek to create practice that is more desirable or valued than current alternatives (Gergen, 2015). From a social constructionist standpoint, multiple subjective perspectives create social reality. Yet, although multiple subjective interpretations of a problem provide a better understanding of the issues at hand than one interpretation (Foss & Foss, 2012), they also increase the possibility for disagreement of interpretations. Collaborative work settings in universities, for example, are likely to surface differing perspectives among group members, perhaps causing disagreements and

tension. In responding to such tensions and with a view to transforming practice, constructionists may draw on the important resource of dialogic practices (Gergen, 2015). Dialogic practices are underpinned by social processes that support the building of relationships. Therefore, relationships can be improved through dialogic practices. Gergen (2015) proposes that groups develop new options for practice when they engage in dialogue about constructionist ideas. This viewpoint emphasises the value of relationships, moving beyond individualism to find a way of understanding ourselves as co-creators of social processes (Gergen, 2015). For this research, I have drawn on four social constructionist dialogic practices to support the building of relationships between stakeholders and teachers in workgroup settings. These dialogic practices are engaged relationships, transformative dialogue, relational education and collective intelligence (Gergen, 2015). In chapter 8, I draw on each of these four dialogic practices to discuss the potential for addressing the pressure points I conceptualised in my research.

Decision to use a multiple case study approach

Social constructionism is an inquiry framework for a qualitative approach (Patton, 2015). A qualitative, multiple case study approach to inquiry was selected for this research so that the research questions could address teachers' concerns grounded in their own particular workplace contexts. The questions required the gathering of data from multiple teachers in order to construct multiple perspectives in relation to technology adoption. The research questions would only be adequately addressed through the investigation of teachers' perspectives of technology adoption within several types of workgroup settings. Therefore, a multiple case study provided the necessary means of facilitation. I based my decision to select a multiple case study approach on the following qualitative research characteristics:

- to focus on the understanding of technology adoption not solely as a process, but from the perspectives of teachers within the university;
- to surface and examine teachers' multiple perspectives from within the reality of multiple and diverse workgroup settings in which technology adoption occurs in the university;
- to report the research in the form of case studies, a narrative style that provides rich descriptions and examples of teachers' perspectives about what is going on in teachers' workgroups when they adopt technology.

These qualitative characteristics are explained in more detail in the section on multiple case study research.

Research design and implementation

In this section I begin by describing the design of multiple case study research, purposeful sampling and methods for data gathering. Then I go on to explain how I analysed the data and developed the cross-case findings.

Multiple case study research

A case study is time and context specific with a focus on understanding individuals, institutions, processes or phenomena (Merriam, 2009; Stake, 1995; Willig, 2013). A case study is unique in that the activity under investigation is called the 'case' and is a way of making clear the focus of the inquiry (Merriam, 2009; Stake, 2006). The case, which is an attempt to analyse 'what is going on here', may also be called a quintain (Stake, 1995, 2006) or a unit of analysis (Merriam, 2009). In my research, technology adoption is the case and is called the case. As Lincoln and Guba (2013) explain, an inquiry is "an effort to describe 'what's going on here', the 'here' being the focus, and its context, to which the problem pertains" (Lincoln & Guba, 2013, p. 63). Asking what and how questions to examine what is occurring or what's going on here is a defining characteristic of the single case study and multiple case study approaches to inquiry.

A multiple case study may be defined by the following three characteristics. Firstly, as the case is defined by the activity under investigation, the study must have definable boundaries (Willig, 2013). Secondly, the study is undertaken in the participants' natural environment, for example, a workplace setting (Stake, 2006). Finally, a case study offers the opportunity to investigate how the case performs in different settings, thus providing diverse and multiple perspectives from which to examine the problem (Stake, 2006).

Examining the case within varying settings is achieved by identifying case studies: those that have a relationship to the case, but are diverse in nature (Stake, 2006). In this research, the multiple case study was delineated by the following characteristics. First, the 'case' in this research is the technology adoption process. Second, the setting for the inquiry was AUT. Third, four case studies were selected to examine how the case (the technology adoption process) worked in differing settings (teachers' workgroups). Third, the participants in each of the four case studies were teachers who had been or were part of a workgroup that adopted a technology. Finally, I interviewed the teachers during the workday at AUT, which is the setting in which they worked.

Stake (2008) categorises single case studies as intrinsic and multiple case studies as instrumental, to ensure that attention is paid to addressing the research question as well as the design of the study. An intrinsic case study is selected to understand the case rather than to build theory (Stake, 2008) and therefore has limited transferability (Baxter & Jack, 2008). In contrast, the purpose of an instrumental, multiple case study is to 'go beyond the case', providing insights into an issue to facilitate theory generation (Stake, 2006, p. 8). Willig (2013) proposes that case studies may be used to test existing theory, refine theory, or clarify and extend theories. In a multiple case study, a conceptual framework is developed to encompass the relationships between the case studies, thereby strengthening an understanding of the case under investigation (Stake, 2006; Willig, 2013).

Stake (2006) argues that a multiple case study is not designed to compare case studies, although he acknowledges that when generalising across case studies it is difficult to avoid making comparisons. He concludes that when case studies are viewed in comparison, they compete for the attention of the case and its focus is lessened. Instead, Stake proposes that to develop a better understanding of the case, the comparative attributes of each case study should be de-emphasised and attention be concentrated on the setting and interaction of the case knowledge. For that reason, a comparative analysis of the four case studies in this research was not undertaken as the case under investigation was not an in-depth analysis of the contexts in which technology adoption occurs. Instead, by focusing on the case, that is, the technology adoption process, the teachers' perspectives that emerged in the case studies could be contrasted for similarities, differences and uniqueness in order to develop cross-case assertions that would address the research questions (Stake, 2006).

Stake (2008) defines research questions as themes or issues: problematic relationships that guide the research purpose and are linked to political, social, historical and personal contexts. My research questions were derived from the debates and gaps in the extant literature. The answers to the research questions provided an in-depth understanding of technology adoption at AUT from the perspective of teachers. The next section describes how the case studies and participants were selected for this research.

Purposive sampling

Multiple case study research is different from other qualitative research in that two levels of sampling are required. First, the contexts for the case studies must be selected; then, participants who have knowledge of the research problem are identified (Merriam, 2009).

In multiple case study research, purposive sampling is generally used for the process of selecting case study contexts and research participants because, as Stake (2006) argues, even with large multiple case studies the sample size is often too small to justify a random selection. Nevertheless, purposive sampling is beneficial for case study research. According to Patton (2015), purposive sampling enables the selection of information-rich case studies from which particularised insights and in-depth understanding are produced rather than empirical generalisations. Furthermore, Merriam (2009) argues that purposive sampling provides researchers with the opportunity to sample participants who have expertise in the activity under investigation, thus strengthening the answers to the research question.

Selecting the case studies

Stake (2006) proposes three main criteria for selecting the case studies. First, each case study must be relevant to the case, second, the case studies should be contextually diverse and, finally, the case studies should provide opportunities to learn about the complexity of the case and the contexts within which the case occurs. Stake (2006) suggests that a multiple case study could benefit by selecting case studies that he describes as typical and atypical. Both typical and atypical case studies are selected to maximise what can be learned from the activities that are undertaken in the contexts. However, the inclusion of an atypical case study ensures a diversity of contexts and special insights that may not be gained from the typical case studies (Stake, 2006).

The four case studies for this research were purposively selected by determining the contexts in which teachers had adopted technology in the university. I undertook an inquiry to determine these contexts by asking all six of the CFLAT advisors to inform me of any teacher workgroups they had knowledge of or had supported for technology adoption across the university. The advisors provided me with the three workgroup settings investigated in this research. The workgroups settings are departmental workgroups, CoPs, and learning and teaching fund projects.

Prior to 2011, teachers at AUT adopted technologies by attending institutional professional development workshops. It brought to mind that while researching university teachers' practices for online environments, I had interviewed eight teachers who had attended a series of four workshops on the Blackboard LMS in 2003. Now in 2014, these teachers had experiences of adopting and teaching with technology over a 10-year period and could provide a unique, long-term perspective of technology adoption for this research. These teachers were selected to be an atypical case study (Stake, 2006) in this

research because it was anticipated that they would be able to provide a long-term perspective on the culture of technology adoption in the university that the other three case studies could not.

In this research, the three typical case studies are described as case study 1: departmental workgroups, case study 2: communities of practice (CoPs), case study 3: learning and teaching and development fund projects (LTDF). The atypical case study is case study 4: long-view teachers.

Selecting the participants

Participants for my research were selected using snowball sampling, a common form of purposive sampling (Merriam, 2009; Richards & Morse, 2013). Snowball sampling involves two stages: first, the initial identification of a few participants who meet the criteria established for participation in the research and, second, asking these participants to refer the researcher to other participants (Merriam, 2009). The criterion for participation in my research was that a teacher had adopted a technology within one of the four case study contexts. To locate potential participants for case studies 1, 2 and 3, I asked CFLAT advisors to provide me with a list of potential participants. To locate participants for case study 4, I checked the university phone book and found that six of the eight teachers were still teaching at the university. At this stage of the research, the lists provided me with more than enough teachers to interview. Please see Table 5 for a summary of the selection criteria for the case studies and participants.

Table 5. Summary of selection criteria for case studies and participants

Case studies	Case study criteria	Teacher selection criteria
Departmental workgroups	Teaching teams located in faculty departments, and led by senior faculty managers, such as heads of school, heads of department, or paper coordinators who have the authority to mandate the adoption of a technology to a workgroup	Teachers who had adopted a technology as part of a teaching team in a departmental workgroup
Communities of practice (CoPs)	Community of practice (CoP) workgroups, resulting from the restructured CFLAT initiative in 2011	Teachers who had adopted a technology as a member of a community of practice
Learning and teaching development fund grants (LTDF)	Learning and teaching development fund (LTDF) workgroups, resulting from the restructured CFLAT initiative in 2011	Teachers who had adopted a technology as a result of applying for and receiving an LTDF grant
Long-view teachers	A series of four professional development Blackboard LMS workshops held in 2003	Six teachers who attended the four Blackboard LMS workshops in 2003 – at the time of data gathering each teacher had a minimum of 10 years' experience of technology adoption

Recruitment of participants

In this research, focus groups and individual interview methods were used to gather data. The methods will be explained in detail later in this chapter. In May 2014, I began recruiting participants for two focus groups and individual case study interviews. Each focus group consisted of six teachers and each case study consisted of four teachers. Each of the case studies in the study were restricted to four participants, which provided enough information to answer the research questions as well as manage the amount of data within the specified time frame of this research project. In total, 12 teachers attended the focus groups and 16 teachers were interviewed for the case studies.

Recruiting began with the focus groups because they would be conducted first. Using the list of potential participants, I categorised the participants' names with the corresponding workgroup setting. Next, I sent email invitations one at a time to potential participants within each workgroup setting. The reason for selecting focus group participants who had adopted technology in specific workgroup settings was so that I could gather data that related to each of the case study settings. None of the potential participants declined to

attend the focus group; however, when teachers could not attend a focus group but indicated that they wished to take part in the research, they were given an invitation to participate in an individual interview. On replying to my invitation, some of the focus group participants suggested names of other potential participants and I added them to my lists.

Once the 12 focus group participants were selected, I began selecting participants for the individual interviews. Once again I sent email invitations one at a time, waiting for an affirmative reply before sending the next. Four teachers declined to take part in the study. When I had reached the required number of participants, I stopped selecting. Next, a follow-up email was sent to the interview participants informing them that I would contact them in July to make an interview appointment between the months of August and November 2014 and that they should contact me if they had a preferred date. Some participants informed me that they would be on sabbatical, at conferences or had other appointments; therefore, we worked around these events.

I sent an email inviting two of the long-view teachers to participate in a focus group and an email inviting four teachers to participate in an individual interview. Fortunately, they all agreed. Please see Appendix B for the email invitations. The next section describes the data gathering methods used in this research and explains how they were implemented.

Methods

The methods used to gather data in this research were focus groups, individual semi-structured interviews and analysis of written documentation. The qualitative methods used to gather data contributed to the development of the research findings.

Focus groups

The reason for gathering focus group data in this research was to inform the development of the questions for the individual case study interviews. Traditionally used in social science research (Merriam, 2009), the purpose of a focus group is to bring people together in order to listen and capture their attitudes, experiences or perspectives on a focused topic or specific set of objectives (Krueger & Casey, 2000; Richards & Morse, 2013). Used as both an interview and an observational technique (Teddie & Tashakkori, 2008), the focus group allows researchers to gain access to issues around a topic. particularly when not much is known about that topic (Richards & Morse, 2013).

Pilot focus group

Before conducting the two focus groups with the research participants, I ran a pilot focus group session to practice moderation techniques and develop confidence. I sent an email invitation to eight staff members of the Blackboard LMS help desk team inviting them to be part of the pilot focus group and informing them of the reason for it. The Blackboard LMS help desk team was chosen because they have knowledge of adopting the Blackboard LMS, and as they work with teachers on a daily basis, they have some idea of the issues they face. Therefore, the focus group questions were able to be adapted for the pilot focus group. Six of the help desk team agreed to participate. The questions were adapted to take account of the team's work context and the pilot focus group ran for 45 minutes. I experienced some difficulties with the moderation and this enabled me to hone my interviewing skills. For example, I found it difficult to concentrate on what each participant was staying as I was concerned with how the participants tended to speak at length and jump in one after another without a break. This left me unsure about the best way to move them onto the next question. When one participant spoke for a lengthy period of time, I found it difficult to stop her but made the attempt. At the end of the session, I invited feedback on my moderation skills. While the feedback was mostly positive, the participant who I stopped from speaking told me she felt offended. I thought I had been polite; however, I went into the research focus groups thinking that I might not be able to stop a participant who spoke at length for fear of offending them. On the other hand, one participant who was very shy told me that she appreciated me asking for her opinion as she felt unable to enter into the conversation. As a result of the pilot focus group, I felt more confident about what to expect and that I could probably handle most of the situations that might arise in the participant focus groups.

Developing the focus group questions and managing the process

The research questions for this study were developed by determining the gaps in the extant literature. For the focus groups, research questions 1–4 were expanded as discussion prompts. Wilkinson (1998) argues that it is the interaction between participants that yields high-quality data in focus groups. Therefore, the open-ended questions were designed to encourage active discussion between teachers in the group in order to probe for the issues that concerned them most about adopting technology. Please see Appendix B for the focus group schedule and questions.

For this research, two focus groups were conducted. Each group consisted of six teachers, with at least one teacher sampled from each of the case studies. Wilbeck et al. (2007) suggests that smaller groups are best for encouraging interaction between group

members, a typical size being 6–10 participants (Cohen, Manion, & Morrison, 2011; Merriam, 2009; Richards & Morse, 2013). When participants agreed to be part of a focus group, I provided them with an information sheet about the research study, a consent form and details (place and time) about the focus group session. Both of the focus groups were held on the case study university campus. To record the focus group sessions, I used a transcription service called TranscribeMe (see http://transcribeme.com). The TranscribeMe app was downloaded onto my iPhone and used to record the session as an audio file. An iPod was used to make a second recording for backup purposes. Please see Appendix B for the information sheet and consent form. The next section provides a narrative of the process I undertook to conduct the first focus group. It highlights the procedures followed, the work of the prompt questions and purposive sampling in action.

Narrative: The focus group interview (group 1)

It is three o'clock, and I have arrived one hour before the focus group starts to set up the interview room. After I clean the tables with an orange-scented cleaning spray, I lay the tablecloth and place the refreshments on it. There is water and apple juice as well as a variety of canapés. Chocolates are placed in a bowl to complete the setting. I place seven chairs around the table and set the iPhone and iPod in the middle.

As not all of the teachers know each other, I welcome them and make introductions as they arrive. While they are chatting, I ask teachers who have not completed the consent form to sign one and supply them with a participant information sheet. It is five minutes before the designated start time of 4 pm. Everyone has arrived and all of the consent forms have been signed.

We move to sit at the round table and start the focus group. Following the prompts on the focus group interview schedule, I begin by turning on the recording devices. I remind participants that we should keep our conversation confidential to comply with ethics procedures. Everyone nods in agreement. I start with an opening question designed to make participants comfortable speaking towards the iPhone and to help the transcriber identify each participant. I ask them to state their name and the school or department where they work. I tell them that it would be helpful if they could say their name when they speak but not to worry if they forget. To help with transcription purposes, I had predetermined that when the opportunity arose I would thank the participant by name after they had spoken. I begin with the first research question.

The first set of question prompts immediately raises some difficult issues for some of the participants. A seriousness permeates the room and one teacher becomes angry as he

recounts an experience in which he felt unfairly treated by a colleague. As we consider question 2 the mood lightens. The discussion progresses and I observe that although teachers undertook similar adoption activities, their experiences are quite different. It is with a sense of wonder that I recognise that the purposive sampling of teachers from each of the cases is working to capture their differing perspectives on the topic.

An earlier concern that a participant may speak for too long does not eventuate. I notice that they are considerate, taking turns at speaking, being careful not to talk over one another. I wonder if they are applying their teaching skills to the focus group process. Relaxing, I concentrate on the conversation, writing down points to be raised for clarification.

The conversation continues. Then we are all laughing. They are sharing funny stories about technology incidents. I have funny stories to tell. But I do not tell them. I keep listening. Sometimes the conversation drifts into the realm of another question. When this happens, I do not ask the question again. Instead, I let the conversation flow.

As the conversation unfolds, a range of emotions cross their faces. They are trying to imagine what it would be like to teach in the year 2050. One participant explains that he would like teaching in the future to be like the past – the Greek agora. Sitting under a tree having a discussion with a group of students. "But what about the technology?" asks another participant. I become aware that as they interact, questioning and sharing experiences, they are co-constructing knowledge. The prompt questions are working to encourage interaction.

Unexpected themes are emerging. As one participant describes the intrusion of mobile devices in his personal life, the example brings to mind similar experiences for others. One participant is laughing when she says, "students feel loved when you respond to their texts at 2 am in the morning". Now everyone laughs and some share similar stories while others describe the rules they place around mobile use outside of office hours. We are all intrigued by the viewpoints that are being shared and it can be jolting when a completely different perspective emerges.

Throughout the interview, I have been conscious of time. I estimated approximately 10 minutes per question and we finish the last question promptly at 5.30 pm. I switch off the recording devices and thank the participants for sharing their views. We move back into the main room, where participants continue chatting. At 6.30 pm, when the last of the participants have left, I tidy the room.

Later, I reflect on the focus group interview. Running the pilot and paying attention to detail in preparing the schedule had honed my skills in focus group moderation. The main strength of the focus group was the group dynamic and this was achieved through the use of purposive sampling and questions designed to prompt interaction among the participants. During the focus group, I observed teachers interacting, sharing and adapting their workgroup perspectives of technology adoption as well as trying to make sense of others' perceptions. Burr (2003) describes such discourse as a view of 'social reality in action' as people interact to develop fluid definitions. What resonates with the participant will be offered as a true explanation, while considering whether they agree or disagree with others' explanations (Burr, 2003). It is the social interaction in focus groups that creates synergies, encouraging members to act in ways they would not do in an interview or if they were completing a survey (George, 2013; Wilkinson, 1998). During the focus groups, participants made sense of their thoughts and actions through discourse, thereby co-creating meaning about what it is like to adopt technology in the university.

After uploading the audio file to the TranscribeMe website for transcription, I delete the backup recording from the iPod. TranscribeMe return the transcript of the focus group in Microsoft Word format within two business days as requested. After listening to the recording, I make minor edits to the text of the transcript. Next, each teacher is emailed a copy of the transcription to review and make corrections. This procedure is repeated for the second focus group.

Next I describe the interview method and explain how the individual interviews for the case studies were implemented.

Interviews

For this research, the individual interview method was chosen so that I could meet directly with teachers to surface their perspectives on what it is like for them to adopt technology in workgroup contexts in the university. In contrast to focus groups, interviews may be thought of as a one-on-one conversation with a purpose as the researcher elicits information from the participant (Merriam, 2009). Patton (2015) explains that interviews are used to tell peoples' stories by gathering their experiences, beliefs and concerns, taking us inside their "life and worldview" (p. 417). Through interviewing, we gain access to perspectives that cannot be observed, such as feelings, thoughts, past behaviours, "how people organise their world, and the meanings they attach to what goes on in the world" (Patton, 2015, p. 417). Interviews were selected for this research as it would have been too difficult to observe 16 participants as they

adopted technology over the course of a year or more. Therefore, the interviews provided a way of capturing participants' perceptions and views about technology adoption as well as descriptions of the activities they engaged in during the process.

Selecting the interview type and developing the questions

Patton (2015) categorises three types of interview. The first type is the conversational interview, which is unstructured and relies on conversation between the researcher and participant to generate the questions. The second type is the open-ended interview, which is structured and is used when it is important to ask the same question of each participant. The third type is the interview guide, which is also known as the semi-structured interview. I used the interview guide for my research. The interview guide lists the questions, issues or topics to be explored during the interview, yet does not preclude raising additional questions as the situation arises. Merriam (2009) suggests that the benefit of developing an interview guide with only a few broad, open-ended questions is that it provides the potential for gathering rich data as the researcher is able to concentrate fully on what the participant is saying and follow interesting and pertinent lines of questioning as they arise.

The appropriate interview type for a research study should be selected according to the amount of structure required to gather the data (Merriam, 2009). I chose the interview guide as I wanted to understand participants' perspectives of all aspects of a complex process. I decided to use structured questions to guide teachers through the process of technology adoption to ensure that the questions would be answered while allowing for in-depth discussion of concerns. The interview guide questions were developed from the themes that arose from the focus group data. Please see Appendix B for the interview guide.

Managing the individual, semi-structured interview process

When participants agreed to participate in an interview, I provided them with an information sheet about the research study, a consent form and a copy of the interview questions. Next, participants were invited to nominate a room on the university campus for the interview. Some teachers elected to be interviewed in their offices and others preferred to be interviewed in a private meeting room. An interview appointment schedule was developed to keep track of the names of participants, appointment times, rooms and forms. Please see Appendix B for the information sheet, consent form and interview appointment schedule. Each of the interviews averaged from one hour to one and a half hours. Following the same recording routine as the focus groups, the

TranscribeMe app on the iPhone was used to record the interview with the iPod used as a backup.

The interview phase centred on gathering and analysing interview data from teachers in each of the four case studies. When investigating multiple case studies, data is gathered and then analysed before the next case study is attended to, thus enabling any unusual or interesting findings to be explored further in the remaining case studies (Stake, 1995). Because of the teachers' busy schedules, I was unable to interview all four participants in one case study sequentially. To compensate, I reviewed the participant's responses to the questions after each interview. Early on in the interview process, I adjusted the wording of questions if it seemed that teachers had difficulty in answering them. If issues were raised that had not been accounted for, I included these in the schedule. Eventually, I became aware that further slight adjustments to questions did not necessarily make a difference to the way participants responded. Participants tended to interpret the questions within their own knowledge structures and in some instances spoke about what was important to them regardless of the questions being asked. Nevertheless, determining whether I was asking the most pertinent questions to answer the research questions was an ongoing source of concern for me throughout the interview process. Eventually, I concluded that returning to the literature and checking that the gaps and debates had been accounted for in the interview guide was all I could do to ensure the integrity of the questions.

The audio file was uploaded to the TranscribeMe website for transcription after each interview. At this stage, the backup recording was deleted from the iPod. TranscribeMe returned the transcript between two and six business days as requested. Next, I listened to the recording in order to make any minor edits to the text of the transcripts. Then I emailed the participant a copy of the transcription to review and make changes if the participant so wished. This procedure was repeated for the each of the interviews. Two participants made minor corrections to their transcripts.

Written documents

I used written documents to access background information about AUT that informed the context for this research. As a technique for making qualitative data, documents are collected and used to provide background or detailed information about the setting for a case study (Richards & Morse, 2013). In multiple case study research, it is essential to provide a detailed description of the setting so that readers can determine whether it contains similarities to their own institution and therefore whether the findings will be

useful to them. Documents are data "that exist independently of the research process" (Richards & Morse, 2013, p. 132). Documentation was inductively selected throughout the research process. I intentionally gathered publicly available documentation that described the background of AUT and its contribution to NZ as well as activities relating to teachers' adoption of technology in workgroup settings. For example, in chapter 1, I used the strategic plan to describe the societal and economic contexts within which AUT and teachers operate in NZ. Documents were gathered from the university library, by searching the university website and by asking university staff who might have knowledge of the information. A personal email from the director of CFLAT was used in this research to inform the reason for the restructure and new direction of the ADU. Merriam (2009) argues that while personal documents are a reliable source of data pertaining to a person's attitudes and belief, they are also highly subjective as writers determine what they consider important to be recorded. The document may not be a representative or reliable version of what has occurred; however, they do reflect the participant's perspective, which is what qualitative research strives for (Merriam, 2009). Taking Merriam's argument into account then, the email was included because it informed the purpose of this research, presenting the director's perspective and initiatives for new approaches to professional development at AUT.

During my final interview, a participant offered me a conference poster that illustrated her workgroup's technology adoption project. Using the information on the poster, I was able to corroborate some of the instances the participant spoke about in the interview. This reminded me that many of the LTDF posters were displayed on the wall in our centre. Although the information gleaned from the posters was not significant and only related to two of the case studies, they did provide another method for triangulating data. Therefore, the LTDF posters were another form of documentation used in my research.

The types of documentation gathered for this research included a text on the history of AUT, the strategic plan, an audit report on the ADU, institutional research on the implementation of technology for teaching, a personal email communication and LTDF conference posters. Much of the gathered documentation was not included in the text of this thesis; however, they did inform my thinking about technology adoption in relation to AUT as an institution and teachers in the workgroup settings. The next section describes the data analysis method used in this research.

Multiple case study analysis

The purpose of data analysis is to find answers to the research questions (Merriam, 2009). Stake (1995) argues that "the nature of the study, focus of research questions, and the curiosities of the researcher should determine which analytical strategy should be followed" (p. 75). In this research, the data required three analysis strategies to find the answers for the research questions. The focus group data were analysed according to Merriam's (2009) constant comparative method. Analysis of interview data used to develop the case studies and the cross-case analysis were undertaken using procedures recommended by Stake (1995, 2006).

Coding

When researchers analyse data, they are engaging in a sense-making process (Merriam, 2009). The purpose of making sense out of data is to make meaning and this involves consolidating, reducing and interpreting what the participants have said (Merriam, 2009). The data analysis process begins with coding (Merriam, 2009). The coding method that follows was used for both the focus group and interview data.

Coding is another term for segments of text in a data set that have the potential to answer a research question. Therefore, coding involves the researcher in the interpretation of the meaning of the data. To help the researcher with interpretation, Merriam suggests that codes should meet two criteria. First, codes should reveal information that not only answers a research question but encourages thought beyond what is immediately obvious. Second, the meaning of the code should be able to stand for itself. That is, the interpretation of the code should make sense in relation to the case under investigation, without having to refer to additional text in the data set. Once the data sets are coded, these codes are organised according to themes (Merriam, 2009). Inductive coding involves reading the data sets for answers to the research questions and then developing themes as they emerge rather than starting with answers or categories in mind (Merriam, 2009). This makes it likely that the refinement of themes will occur throughout the research process (Merriam, 2009; Stake, 2006). I drew on these concepts and processes to code the data gathered in my research, and where applicable, this is discussed in the following sections.

Analysing the focus group data

Merriam's (2009) inductive and comparative method of qualitative data analysis was undertaken with the focus group data. The method is based on the comparative method of data analysis (Glaser & Strauss, 1967) that Merriam (2009) argues is "widely used

throughout qualitative research without building a grounded theory" (p. 175). The focus group data were gathered to inform the development of the questions for the individual interviews. Therefore, the data were analysed to identify issues that most concerned teachers and required further investigation.

The two data sets from the focus group interviews were analysed together. This provided enough evidence to ensure triangulation of the data sources. For example, each important theme had at least three confirmations of key meanings (Stake, 2006). To prepare for data analysis, line numbering was added to each transcript. An audit trail was used to keep track of and identify a participant's coded data. I read through the interviews multiple times to develop a sense of the issues that most concerned teachers. Next, I undertook inductive coding as described above to locate patterns and meaningful instances in the data. By constantly comparing data, I was able to discern patterns. This involved comparing one code with another, looking for similarities, setting aside those codes that did not fit and rechecking that I had interpreted the codes sensibly. Thus, I was engaged in the process of gathering multiple evidence of a pattern recurring in the data (Merriam, 2009). Then I conceptualised that set of coded data as a theme. Themes "are abstractions derived from the data, not the data themselves" (Merriam, 2009, p. 181). Therefore, data that had been reduced to bits of information was brought together again in different groupings in order to create new categories of knowledge (Merriam, 2009). These themes were used to inform the development of the questions for the individual interviews.

The focus group data were not used to develop the narratives for each of the case studies. This was because the focus group questions were written for a different purpose from that of the individual interview questions. Therefore, the focus group questions were different from those in the interview schedule. The focus group data did what was intended; it raised questions, and identified concerns and issues that teachers faced in adopting technology in the workgroup settings. This is why the themes derived from analysis were useful in developing the interview questions. The interview questions that were derived from the focus group teachers' concerns and issues were answered by case study participants during the individual interview sessions. However, the focus group data gathered in my research will be used for another purpose. It will contribute to informing CFLAT's development of a new professional learning programme. The focus group themes indicate AUT teachers' views on the nature of professional development they wish to engage with. Please see Appendix C for the focus group data findings.

Analysing the case study data

The case study data were analysed by following Stake's (1995, 2006) categorical aggregation and direct interpretation methods. Additionally, I drew on my experience of focus group data analysis while following Merriam's (2009) inductive and comparative method. In terms of developing meaning from the data, I found the process to be similar, with the main difference being in the use of terms. In multiple case study research, Stake (2006) uses the term assertions to describe the findings or answers to a research question. Conversely, other qualitative researchers often use the terms themes or categories to describe the findings or answers to a research question.

For Stake (1995), case study analyses rely heavily on categorical aggregation and direct interpretation methods. Categorical aggregation involves inductive coding and identifying patterns to make sense of the connections between them, while direct interpretation involves examining unique instances in the data. Categorical aggregation entails finding patterns in the data, grouping them together and then drawing a conclusion about what it means. Stake (1995) explains that as the researcher thoughtfully considers the participant's words, instances that describe issues relevant to the study will emerge and then these instances are aggregated until "something can be said about them as a class" (p. 74). Conversely, direct interpretation is the process of identifying an important instance that only appears once in the data and then reflecting on that instance in order to draw meaning (Stake, 1995). He describes this as pulling the instance apart and putting it back together again more meaningfully, that is, "analysis and synthesis in direct interpretation" (p. 75). Stake concludes that although this type of analysis is very subjective, he cannot think of a better way to make meaning of the complex data in a case.

Data sets

The interview data were gathered to provide answers to the research questions in the form of four case studies. The data set for each case study consisted of four interviews. Each set of case data were analysed and reported in its entirety before moving onto the next. An audit trail was used to keep track of and identify a participant's coded data. This included preparing the transcripts for data analysis. The preparation included adding line numbering and applying a different colour to the text of each transcript. The colour made it easier to keep the thread of each participant's story in mind while coding and writing up the case study.

Coding

For each case study, I read the four interviews multiple times to develop a sense of the context of the case, the issues that concerned teachers, instances that surprised me and the ways in which teachers coped with the process of technology adoption. Then I used Stake's (1995) categorical aggregation and direct interpretation methods to interpret the data sets according to the emerging topics and issues relevant to the case.

Developing assertions

Once I had developed topics and issues for each research question, I drew a conclusion about what I perceived it meant for the teachers in the case and began to develop assertions for that question. This process was repeated for each case study. The case assertions were refined throughout the research process. However, the main development of assertions occurred during the writing of the case study narratives. Additionally, the action of rechecking that the case assertions corresponded with teachers' quotations led to further refinement during the cross-case analysis.

My reflection on case analysis

As a novice researcher, I found the case analysis process difficult. Therefore, I analysed and rewrote each case study multiple times to move them to a stage at which I could then refine over time. On reflection, the main difficulty I experienced was that the data could be aggregated in multiple ways. Yet not all of these ways were helpful in constructing assertions. The instances that were most obvious in the data were those that described events, for example, categories of professional development events. Yet this type of descriptive finding did not convey the depth of feeling I perceived when reading the transcripts in their entirety. Although there were few development opportunities for teachers to attend, I perceived that describing them would not provide the evidence to show that it led to teachers' inability to develop pedagogical understanding in virtual space. For that I needed to look at analysis in a different way. I turned back to Stake (1995), who explained that it is important to keep the case and key issues in mind when analysing data in order to understand relevant "behaviour, issues and contexts" (p. 78). Therefore, when I coded the data again, I read the transcripts multiple times in order to see data that demonstrated how teachers behaved during the process and the issues that made technology adoption difficult for them. I also kept in mind other cases as I coded, in order to think about the similar or different ways that teachers behaved in each workgroup setting. Although the analysis process was difficult, it was worth the perseverance as it brought teachers' perceptions, and the issues they faced, to life.

Reporting the case studies

Case studies are reported in a narrative style and consist of rich descriptions and details that illustrate examples of participants' perspectives (Cohen et al., 2011; Stake, 2010). Reporting should guide a reader to feeling actively involved in the research and help them to envisage where the findings may be applied to their own situation (Baxter & Jack, 2008; Stake, 2010). In this research, the case studies were written and refined to achieve a narrative that would represent the voices of the participants. The findings chapters, chapters 4, 5, 6 and 7, present each of the case study narratives from this research. To develop the narratives, I drew on recommendations by Stake (1995, 2006), Merriam (2009) and Green (2013). Next, I explain how I structured each narrative.

Workgroup setting

Each case study begins with some background information on the particularised workgroup setting. Then the four participants who were interviewed for the case are introduced. This overview provides a reader with a context in which to situate and consider the assertions for each case (Green, 2013).

Body of the narrative and teachers' quotations

The body of each narrative is broken into four sections. Each section has been organised under headings that reflect the research questions. Within the narrative, quotations have been used to bring teachers' viewpoints to life. Green (2013) concludes that the sheer volume of qualitative data makes it difficult to select sections of an interview to quote and to integrate those quotes into the structure of a narrative. Accordingly, Green (2013) proposes that researchers should select participants' words that will progress the argument and integrate them into the structure of the narrative in order to have a memorable impact on the reader. Green argues that a quote's purpose is anchored in the discussion that introduces and follows it. It is the discussion that signals to readers what purpose the quote serves, and whether they should "trust the authenticity and validity of the research itself" (Green, 2013, p. 111). Following Green's (2013) recommendations, I introduced each quote and followed it with my subjective interpretation of the instance.

Findings

In each case study, a set of assertions provides multiple answers to a specific research question (Stake, 2006). Therefore, the assertions at the end of each section are the answers to that research question. The assertions were developed from the evidence that was provided in the form of teachers' quotes in the body of the narrative (Green, 2013). Therefore, the evidence for each assertion may be found in the case study narratives (Stake, 2006).

Summary of the case study

Each case study concludes with a summary of all of the assertions related to the technology adoption process for that workgroup setting. A participant quotation is provided with the intention to evoke a memorable representation of that case study.

Developing the cross-case assertions

In multiple case study inquiry, the outcome of each case study is a set of assertions (multiple answers) to the research questions. Therefore, once I had finished writing the narratives, I had derived four sets of assertions for each of the research questions. In order to develop the findings for this research, I undertook cross-case analysis to reduce the four sets of research questions to one set. This one set of questions comprises the cross-case assertions (Stake, 2006) for this research. These conclusions were drawn from a cross-case analysis of each of the four case study's assertions. Cross-case analysis involves analysing, interpreting and triangulating across all of the case study assertions in order to synthesise and develop cross-case assertions (Stake, 2006). Cross-case analysis is a reductive process in that it reduces "much of the particularity of each case", but seeks "to keep the most important experiential knowledge" (Stake, 2006, p. 44). I adapted Stake's (2006) procedure for cross-case analysis to develop the cross-case assertions for this study.

Having spent a considerable amount of time analysing the case study data and writing the narratives, I had developed a strong sense of how teachers perceived technology adoption in each workgroup setting. Now I needed to develop a similar sense across all of the case studies. First, I organised all of the case study assertions into case study reports (tables) so that they would be easy to examine. Next, I read the case study reports in order to:

- understand the uniqueness of each case study;
- ask questions of the assertions, such as what issues did these teachers care about, and what problems did they consider most important;
- develop an in-depth understanding of the main concerns teachers had raised;
- question how the assertions related to what was already known in the literature as well as any new contributions that could be made to the body of knowledge.

In undertaking this analysis, my perceptions of the cross-case assertions were drawn from gaining a sense of what Stake (2006) recommends: the similarities, differences and uniqueness across the cases. For this research, the cross-case assertions represent the

pressure points that teachers faced when adopting technology in workgroup settings in the university. They are the findings from this research. This concludes the section on research design and implementation.

Quality checking

In the final section of this chapter, I begin by explaining the protocols undertaken to ensure the ethical integrity of the research. Finally, I discuss the strategies employed to ensure the trustworthiness of the research.

Ethical considerations

This section explains how I maintained ethical protocols during the research process. The ethical issues addressed in this study were insider research, informed consent, confidentiality and anonymity, and data storage. As this research involved human participants, approval of the process was obtained from the AUT Ethics Committee (AUTEC). Recruitment of participants, informed consent procedures, data gathering procedures and the recording and securing of data were all undertaken according to ethical protocols approved by AUTEC (please see Appendix A).

Insider research

Insider research refers to inquiry that is undertaken by researchers at their place of work. Although it is appropriate for researchers to study their institutions (Stake, 2010), ethical issues must be identified and addressed to keep employees protected. In my position as teaching and learning advisor in CFLAT, I had in previous years supported some teachers in the workgroup contexts identified for this research. AUTEC stipulated that I should not include any teacher that I had worked with in the previous two years. So that teachers would not feel obliged to participate or feel uncomfortable about rejecting an invitation for the research, I invited teachers who had worked with other CFLAT advisors to participate in the focus groups first. Additionally, I did not invite any teachers I had worked with to attend an interview.

Informed consent

Written informed consent was obtained from participants who took part in the focus group and case study interviews. A participant information sheet and consent form was sent via email to each participant and hard copies were made available at the focus group sessions and at each of the interview sessions. An opportunity to discuss the research with each participant was provided. As a result, a consent form was signed by each participant before the interview began.

Confidentiality and anonymity

Information collected for this research has only been used for the purpose it was intended. Information and data were gathered from participants in confidence and have not been disclosed elsewhere. Participant anonymity has been assured by removing identifying names from the transcripts and the case study narratives. In particular, the case study narratives were reported carefully to protect the identity of the participants. All copies of data including consent forms and transcripts have been secured in a locked cabinet on campus and are required to be shredded in 2021. Interview recordings have been deleted from my iPhone.

Trustworthiness

In qualitative research, the trustworthiness of a study is dependent on addressing the reliability, credibility and transferability of that research (Merriam, 2009). I will begin by addressing reliability.

Reliability

Qualitative research cannot be easily replicated like quantitative studies. Therefore, reliability is attended to through coherence, that is, questioning whether the findings are consistent with the data collected (Merriam, 2009). In this research, reliability has been addressed by providing a detailed coherent description of the research design and implementation.

Credibility

Social constructionist research does not seek to determine one objective truth or reality; rather, it aims for multiple truths. Thus, qualitative research can generate a multitude of data. Having completed this research, I now view qualitative inquiry as a complex undertaking that requires the management of substantial amounts of data while gathering multiple experiences of participants who individually construct or collectively co-construct new meaning about the issue being investigated. Therefore, being able to draw on strategies that enabled me to check the accuracy of my interpretation and findings was an important aspect of creating credible and useful research. The accuracy of interpretation and findings was achieved through member checking and triangulation. The technique of member checking may be used as an opportunity to "get the meanings straight" when interpreting data (Stake, 2010, p. 123). For this research, member checking involved sending the transcripts to all of the participants so that they could make corrections or comments (Stake, 2010). Next, I explain the triangulation methods used in this research.

Triangulation strategies support a researcher to increase the credibility of qualitative research findings (Merriam, 2009; Stake, 2006). Three types of triangulation were applied in this research: multiple methods, multiple sources of data and checking my interpretation of the data (Merriam, 2009; Stake, 2006). Triangulating multiple methods involves employing more than one method to check that the different types of data gathered corroborate and/or complement one another (Merriam, 2009; Willig, 2013). In this research, three methods of data gathering were used: focus groups, interviews and documentation.

Triangulating multiple sources of data involves comparing and cross-checking data that has been gathered, for example, at different times, in different places or from people with different perspectives (Merriam, 2009). For this research, I compared and cross-checked the data of participants in each case study. Then I compared and cross-checked data between each of the case studies. Additionally, I followed Stake's (2006) recommendation that researchers can be more assured of their cross-case assertions if they triangulate at least three confirmations of an important finding. However, this did not preclude me from identifying significant and unique instances in the data that related to the research questions. Stake (1995) describes this process as direct interpretation, the identification of an important feature that appears only once in the data and then reflecting on that instance in order to draw meaning. Triangulation also requires researchers to be sceptical of their interpretation of the data (Stake, 2006). Throughout the analysis and development of findings phases, I examined the data multiple times to be confident that I had captured participants' meanings through my interpretation. This proved to be difficult at times because some participants did not always complete a sentence before they moved onto another idea. Therefore, triangulation required another layer, that of being sceptical of my interpretations of the data. Consequently, on the few occasions when I needed confirmation that a participant would have finished a sentence as I interpreted it, I emailed that participant for confirmation.

Transferability

The findings of qualitative multiple case studies are not generalisable as they are in quantitative studies and this causes some researchers to see particularisation as a limitation of research. However, my research has been designed from a qualitative perspective, in which particularisation is a strength. Qualitative research uses the term transferability, which refers to "the extent to which the findings of one study can be applied to other situations" (Merriam, 2009, p. 223). In case study research, findings are particular to the contexts in which the research was conducted; therefore, they are

particularised findings rather than general findings (Stake, 2006). It is the description of the case studies that enables researchers to determine the extent to which their context is similar and whether the findings can be applied to their own situation (Merriam, 2009). Stake (1995) explains that when researchers intuitively combine a vicarious experience with their previous experiences, they reach new understandings or naturalistic generalisations. They may use the case study assertions to understand the case at hand, or they may use them to generalise to other cases. Social constructionism views knowledge construction as occurring within a context. Participants' cultural background will always shape their perceptions of the world. Therefore, qualitative research constructs meaning that is grounded in the life experiences of the participants. In multiple case study research, particularisation is an advantage as narratives are able to provide rich, thick descriptions of the contexts in which the research takes place.

Reflexivity

Social constructionism acknowledges that researchers bring disciplinary assumptions and experiences to a study that can shape the research process and findings. Reflexivity is a critically reflective process that involves identifying biases and determining how to manage them. Some biases I acknowledge that may have influenced the findings are a preference for a learner-focused approach to teaching, positive reactions to technology-enabled learning and an affinity with teachers in the university. I noticed that my biases were most visible during the data analysis phases. I questioned whether I was imposing my teaching beliefs on participants' perspectives. To minimise bias, I drew on theory to guide my interpretation of the data and cross-case assertions. Comparing data and findings with theory provided the opportunity for me to critically reflect on my own teaching beliefs and practices.

This concludes chapter 3, methodology. Next, I introduce the four case study narratives.

Introduction to the case studies

The following four chapters each represent one case study. The case studies have been written as narratives that reveal teachers' perspectives of adopting technology in a workgroup context at AUT. The cases and workgroup contexts are:

Chapter 4: Case 1 Departmental workgroups

Chapter 5: Case 2 Communities of practice (CoPs)

Chapter 6: Case 3 Learning and Teaching Development Projects (LTDF)

Chapter 7: Case 4 Long-view teachers (2004 workshop series participants with a long-term view of technology)

The perspectives of four teachers are represented in each case study. Except for two teachers in case 1 who were members of the same workgroup, each teacher was a member of a different workgroup. The case studies explain my interpretation of the interview data gathered between May and December 2014 and provide a snapshot of the teachers' perspectives at that time. The terms senior leadership and senior leaders refer to those who were not members of the workgroups in this research.

Each case study begins with a description of the workgroup setting and a brief profile of each of the four teachers who were interviewed. Anonymity was important to these teachers; therefore, their profiles and the types of technology that they adopted have been kept general. The body of each narrative is broken into four sections. Each section describes teachers' perspectives on one research question. Where quotations have been provided, a pseudonym connects the teacher with the case study and corresponding lines of interview data. For example, the following code (Case 4, Omar, 84–88) refers to the number of the case study, the teacher's pseudonym and lines 84–88 in the interview transcript. A set of assertions provides the findings or answers to the research question and marks the end of that section. Each case study concludes with a summary of the technology adoption process for that workgroup.

I have drawn on three theoretical sources to support my interpretation of teachers' perceptions of technology adoption. The theories used to support this interpretation were Rogers's (2003) diffusion of innovations, Trigwell's (2001) model of university teaching and Kirkwood and Price's (2013) relationships between conceptions of teaching, approaches to teaching and approaches to teaching and learning with technology.

The purpose of this research was to investigate factors that impede teachers from adopting and implementing technology-enabled learning when engaging in socially situated learning approaches to professional development. The main research question was: What factors impede teachers in workgroup settings from adopting and implementing technology-enabled learning?

The supporting research questions were:

1. How does the decision-making process motivate teachers to adopt technology?
2. What pedagogical knowledge do teachers develop about teaching with technology and how do they develop it?
3. What are teachers' approaches to teaching with technology?
4. Why do teachers reject or discontinue using technology?
5. What are the implications for approaches to professional development?

The next chapter presents case study 1, teachers who adopted technology in departmental workgroups.

Chapter 4: Case 1 - Departmental workgroups

This chapter describes and interprets how teachers adopted technology in departmental workgroups situated within faculties. In 2005, AUT's Learning and Teaching Framework instituted the idea of 'blended learning; providing direction to faculties and departments on the distinction between established forms of teaching and learning and e-learning (Allen, 2005). The Blackboard LMS, wikis, blogs, discussion groups, Facebook, Second Life and YouTube were suggested as valid approaches for supporting AUT students to learn and succeed. In addition, the document provided a guide for teachers on implementing blended teaching: "an excellent teacher will: 1. use a range of pedagogical resources and approaches for teaching and assessment based on an understanding of how students learn, in a way that promotes serious engagement with the curriculum, 2. use student-centred, interactive methodologies that promote independence of thought at all levels, whatever teaching mode is adopted and 3. take into account student diversity in ability, background and national origin."(Allen, 2005, p. 2).

The departmental workgroups represented in this research consisted of a group of teachers and a TAL. In this case study, the TAL is the decision maker, the person who selects the technology for the workgroup. For the teachers in each of their workgroups, the TAL was not necessarily their head of department. Additionally, the teachers were employed as full-time academics. Following the hierarchical structure of AUT faculties, each of these teachers had a line manager who was their head of department. The head of department reports to a head of school. The head of school sits under the umbrella of the dean of the faculty. I begin with a brief profile of the teachers who were interviewed for this case study. It is important to note that the TALs described in this case study are not the senior leaders discussed in chapter 8, the pressure point: senior leadership.

The Teachers: Veda, Rosie, Macie and Tane

Four teachers who had adopted technology in departmental workgroups were interviewed for this case study. Veda and Rosie had teaching positions within Faculty H. The TAL for Veda and Rosie's workgroup was their head of school. As individuals, they both expressed confidence in using technology for teaching. Macie had a teaching position within Faculty C and expressed a lack of confidence in using technology for teaching. The TAL for Macie's workgroup was her head of school. Tane was unique in that he had a teaching position and a course coordinator role in Faculty B. In his course coordinator role, he had responsibility for leading the workgroup in the adoption process

as mandated by the head of department. This responsibility sometimes set him apart from his workgroup colleagues as he came to be viewed as the authority figure. Therefore, Tane provided multiple perspectives on the adoption process, both as a departmental workgroup member and as a TAL who was carrying out a head of department's decision. A discussion of how the adoption process occurred for these teachers is provided next. Each section concludes with a set of assertions relating to the research question.

The decision to adopt

In this section I interpret teachers' responses to question 1: How does the decision-making process motivate teachers to adopt technology? The teachers suggested that they lacked a voice in the decision to adopt a particular technology. What tended to happen was that they would turn up to a meeting at which the TAL would propose a new technology for teaching, and then a discussion would ensue. However, Rosie, Veda and Macie had the feeling that the decision to adopt the technology was a fait accompli, despite their opinions.

> There was this sort of like pseudo consultation. But actually, the decisions had already been made behind closed doors. (Case 1, Veda, 9–10)

> We had a wide group discussion… (The decision) was based on the Head of School's experience, who saw it as a very innovative and exciting technology to use. (Case 1, Macie, 6–21)

The teachers felt that the decision had already been made for them, driven by the TAL who was in a senior leadership role in the university, that is, the head of department or the head of school.

When the TAL gave a presentation about the new technology to the workgroups, Macie and Tane perceived that they tended to leave out any potential negative aspects. They also felt unclear about why the decision to select that particular technology was made.

> I'm a little bit cynical about people who are really passionate about something new – without looking at the downside. (Case 1, Macie, 72–74)

> You get kind of suspicious. You look at people and think, why are you pushing this? Is it for your own benefit? Your own promotion prospects? (Case 1, Tane, 56–60)

Rosie and Veda constructed negative reasons for the decisions made by the TAL. They assumed that the reason for adoption must be economic rather than to improve teaching.

> My feeling is that the technology is being used to reduce the amount of contact time. (Case 1, Rosie, 44–45)

> It was driven more by economic reasons. It was dressed up in terms of 'wow, this new innovative technological advance'. That it was to make our classes as big as possible, to pare down our teaching. (Case 1, Veda, 36–41)

During the interview, Veda was particularly critical about being left out of the decision-making process. Her perception of the adoption process was that it should be about making them better teachers.

> I think sometimes admin and management forget that their job is to support the teachers, the learners and the researchers. They're actually the support crew. They let their needs become more important. Asking them what they'd like, and in a way that management actually listen, so teachers don't go into a conversation thinking that decisions have already been made. Some real consultation around how can we make you the best teacher you could possibly be. (Case 1, Veda, 564–568)

Veda perceived that teachers and TALs could potentially make decisions together. She sensed that the adoption process should focus on how to make them better teachers, rather than concentrating on the technology itself.

Tane's perception of the role of technology in the university was based on the institution's history as a polytechnic, as it retained the word 'technology' in its name.

> Because it's a university of technology, there's a feeling it… [should be] conducive to embracing technology. (Case 1, Tane, 596–597) Our vision and goals here are much more about preparing people for the workplace. So technology is part of it… (Case 1, Tane, 654–657)

Tane viewed the role of technology in the university as supporting students to prepare for employment. Yet not all of his colleagues agreed with him.

> That's the kind of distinction, my understanding. We have it in my department… teachers say 'we're not here to be a training institution, we are here to be academic'. So those guys are not the ones that are interested in new technology. [They] won't embrace Blackboard, they won't flip the classroom, they won't think about these new ideas. (Case 1, Tane, 660–666)

Tane perceived that his colleagues viewed the university as an academic learning environment rather than a vocational training environment. These philosophical differences caused conflict in the workgroup and Tane viewed it as a form of resistance to the adoption of technology.

Assertions

In these departmental workgroups, the adoption process began with an authoritative decision made by a senior leader, that is, the head of department or head of school. Teachers lacked clarity about the reasons for the selection of the technology and as a result they tended to construct their own motives for the decision. Teachers wanted to be properly involved in the decision-making process. There was a suggestion that the adoption process should not be about technology, but about making them better teachers. Despite a perception that TALs put their own needs before the needs of teachers, there was also a recognition that teachers and TALs had the potential to make decisions together.

Preparing to teach

In this section, I interpret teachers' responses to question 2, What pedagogical knowledge do teachers develop about teaching with technology and how do they develop it? Teachers attended workshops, presentations and demonstrations given by workgroup leaders or organised by workgroup leaders. However, teachers perceived that these practices did not adequately prepare them for teaching with the technology.

> We had a couple of sort of this is what it is, don't worry, it'll be fine. Just click this, click that. But then when we started using it, we found that was generally not the case. (Case 1, Veda, 87–89)

Veda described attending a demonstration of the technical aspects of the technology. The facilitator gave the impression that it would be easy to use in the classroom; therefore, teachers would not require hands-on training or practice. However, the demonstration left Veda feeling underprepared and so she asked a workgroup member to help her understand the technology.

> I remember sitting in a lecture theatre with [a colleague] and her kind of demonstrating what it would look like. But it was all a bit abstract and not really real, until you picked the thing up yourself and started using it. (Case 1, Veda, 99–102)

The inadequate training Veda received earlier in the workgroup is repeated in this collegial one-on-one situation. Veda perceived that being given a demonstration without an opportunity to practise was not effective for her.

Similarly, Macie struggled to learn how to use the technology, despite attending the workshop provided for teachers and a workshop for students. Macie found it extremely difficult to understand how the technology worked.

> We attended a couple of small workshops. The negative thing for me was that I couldn't get my head around how it worked. I just found it very difficult to get in, start using it and playing with it. It felt very alien to me. (Case 1, Macie, 70–71, 93, 103–104)

Macie used the word alien, which suggested that the technology was more than just unfamiliar to her. She perceived it to be so unlike any other technology that she had come across that even working out how to begin using it was unknown to her. This unsettling feeling made it difficult for her to ask questions about it.

> You don't know what you don't know. So in a way it was difficult to even ask questions, because it seemed so difficult. I wasn't even sure what the problems were in the end. But there were definitely problems in how I was relating to it. (Case 1, Macie, 143–148)

When Macie refers to having problems in relating to the technology, she is making the assumption that she is the one who has a problem. She does not conceive of the possibility that the functionality of the technology itself could be the problem. I asked Macie to describe when she had experienced success in learning to use a technology. With some relief, she described a recent instance when she made the decision to adopt an iPad to solve a specific pedagogical problem. Macie adopted the iPad as an individual, and not as a member of this departmental workgroup.

> I did find it easier, and I think for some reason I was more motivated as well with the iPad. Possibly because I use Apple at home anyway, so it was a more familiar medium for me. (Case 1, Macie, 106–109)

In this instance, Macie found the iPad easier to learn how to use because she was already using an Apple product. This familiarity provided her with some prior knowledge on which to base the learning of the iPad. However, the problem of learning the new technology remained, and the pressure to be ready to use it for assessment purposes pushed her to the point where she began to resist using it.

> The pressure of knowing that there was an expectation in terms of (assessing) students… created some real difficulty in terms of

> motivation. And a sense of, 'I don't get this'. I kind of got to the point where I really didn't want to go in and use it. (Case 1, Macie, 110–113)

Unable to determine how to get beyond her present capacity, Macie's growing anxiety and confusion led to resistance. Her self-image was affected and she began to develop a belief that she was not capable of learning technology. I asked Macie how she finally developed the knowledge required to use the technology. She explained that a colleague (not a member of the workgroup) who had experience with the technology worked alongside her during the semester.

> Sitting down with somebody, to actually look at the portfolios… as they were being developed by the students. I've actually done that since and that's how I've learned to feel more confident with it. (Case 1, Macie, 150–154)

Having a colleague to support Macie work through the process of using the technology was a replacement for her lack of prior knowledge. Additionally, the authentic, job-embedded process of observing and discussing the assessment of students' assignments with her colleague enabled Macie to check and confirm her thoughts, thus developing the knowledge and skills she required. However, at this late stage it was not enough as the overall experience had a negative impact on Macie's motivation to adopt other technologies.

Tane described professional development as regular catch-up meetings where he provided his workgroup with demonstrations. However, part-time teachers on the course team did not receive any development as it was thought too difficult to bring them together as a group. Instead, Tane explained that part-time teachers were advised to contact the IT support services help desk as required. Abandoning professional development because it was too difficult to bring teachers together signalled that it was not an important part of the process. Throughout these discussions with teachers, there appeared an attitude that professional development was an option – that technical skills could easily be picked up by individuals and thus any support provided to teachers was a bonus. This attitude may explain why teachers such as Macie were reluctant to question the quality of the professional development provided.

I asked the teachers what kind of pedagogical development they engaged in. Surprisingly, they could not provide any examples of pedagogical training.

> I don't remember really anything, particularly around pedagogy. We were basically flying by the seat of our pants, really. We were all learning on-the-go. (Case 1, Veda, 97–105).

> Yes we do and it should be something that's considered. It's often lost in the mix because people get bogged down in the detail of why are we using this. (Case 1, Tane, 88–91)

Here Tane expressed good intentions for discussing pedagogical strategies; however, he went on to explain that other details tended to get in the way and thus one can assume that it was not a priority. However, as Veda explains below, her workgroup required some help with pedagogical strategies.

> [We needed] some help around pedagogical strategies. The ability to lecture to 1,500 students simultaneously in four different venues is really cool. And yet it does require quite a shift in your pedagogy. (Case 1, Veda, 120–126)

Veda recognised that implementing a technology requires a shift in pedagogy, signalling the need for development that guides teachers to change their current thinking about teaching in order to effectively accommodate the new technology in their practice.

In the same vein as Veda and Macie, Tane provided another example of an ineffective outcome when teachers did not receive effective technical and pedagogical development.

> Some people fly with it and use it. Others plod along with the basics and don't explore. Then you'll... get to the end of the semester and there's this inconsistency in how they're using the technology. (Case 1, Tane, 110–114).

Tane's use of the term inconsistency alludes to the variations in how teachers conceive of technology for teaching. He perceived that teachers who understand the technology will be more effective and creative when implementing it, whereas teachers without any real understanding of it will be more likely to apply it within a traditional teaching approach. Tane also signalled that those who do not understand the technology continue to teach with it throughout the semester anyway. This raises questions about the impact on teachers' confidence, and the quality of students' learning when teachers are not well prepared to teach with the technology.

Because of inadequate and ineffective professional development methods, teachers found it difficult to gain access to and develop knowledge about the technology that they were required to implement in their teaching practice. One could assume that departmental workgroups would be a collegial environment in which to discuss these issues. I asked the teachers how the members in each of their workgroups supported each other throughout the process.

Within the departmental workgroups the support varied. Macie's workgroup could be described as dysfunctional, whereas Rosie and Veda received the support of group members. This first section focuses on Macie, who experienced difficulty in learning to use the technology. Macie explained that she felt relieved when she was told that she would be adopting the technology as part of a group.

> For me, the difference with working in a group is that it felt more secure, that there were people who knew more than I did, so could support me. (Case 1, Macie, 11–13)

Macie expected the workgroup to give her a sense of security as she would be able to rely on colleagues for support throughout the process. However, when Macie struggled to learn the technology, the support she was relying on did not materialise. Macie explained that they did not work as a group at all.

> There was never a sense that we all got together and really Coped with this as a group… There was a sense that some of us were trying to struggle individually. There was a sense, 'Oh no, it might just be me. I'm not really getting this'. (Case 1, Macie, 96–99)

Macie perceived that teachers did not feel that they were part of a group and instead they participated in the process as individuals. It would appear that those who thought 'it might just be me' as Macie expressed it, saw themselves as having some kind of learning problem. This supports the earlier finding that Macie could not conceive that the problem might be that the technology itself was difficult to use. Over time, teachers' participation in the process as individuals became the norm and contributed to a feeling that they had no way of coping with the technology.

> It made you feel really deskilled. It was a horrible feeling. One of the members of staff seemed to be getting on quite well with it. Whereas those of us who weren't, were just kind of keeping our heads down and hoping it would disappear. (Case 1, Macie, 127–131)

Here Macie began to (re)construct herself as a teacher who was becoming deskilled. She perceived that her teaching skills were becoming less relevant because of technology. Additionally, Macie came to the realisation that she might not be able to develop new skills to replace those that she perceived as becoming outdated. Macie also sensed that there was some embarrassment between those in the workgroup who did not understand the technology and the one teacher that did. Their coping response was to hide the problems that they were having. Interestingly, while Macie acknowledged that there were

others in a similar position to hers, they did not seek to support each other. I asked Macie what could have improved support within the group.

> I don't think we really talked about that. There were opportunities, but it always felt like it was an additional thing to your day-to-day teaching… for most of us it was the last thing on our list. There just wasn't the motivation. It was presented almost as, you have to do this because this because this is the way we're going. (Case 1, Macie, 164–174)

Macie described the problem of being unmotivated to work as a group as emanating from the decision-making process. Firstly, being directed to adopt a technology that appeared to have little relevance to their teaching once again illuminated the problem of being unclear about its purpose. Secondly, adding technology adoption activities to teaching loads suggests that management may be unaware of the time required to come to learn technology. Accordingly, teachers saw the adoption of the technology as a low priority and this attitude may have influenced the collegial formation of the workgroup.

On the other hand, Rosie and Veda had a very different experience from that of Macie. Rosie's group offered the support that Macie had hoped for.

> We had conversations in our group… It was more about managing [the technology] and how we felt about it. Being able to talk to somebody else within your group that felt the same way that you did… Because sometimes you think, 'it's just me being difficult [chuckles]', or 'me not Coping'. (Case 1, Rosie, 406–414)

In Rosie's workgroup, discussions provided teachers with an outlet for their frustrations and they were able to work through difficulties. It appeared that they had implicitly used the discussions to construct a perspective of what might be a fairly normal trajectory for learning a new technology. Therefore, Rosie emphasised the importance of engaging in conversation to determine whether the difficulties she experienced in learning the technology was normal or whether she was unusual in not Coping. It would be fair to assume that the support of this workgroup added to Veda and Rosie's capacity to ably manage the adoption process. If Macie's workgroup had participated in regular discussions, in all likelihood they would also have come to the realisation that the problems they were experiencing were a common occurrence.

Assertions

Teachers took advantage of the few professional development opportunities provided to them. However, they found the technical training inadequate and they did not receive

any pedagogical development. Yet teachers recognised the need for development in order to change the way they teach and to allow for the introduction of the new technology. The personal learning needs of teachers were overlooked as support varied between workgroups. Some workgroups could be collegial while others were dysfunctional. However, even a supportive workgroup experience could not overcome the inadequate professional development. The inadequate and ineffective professional development had implications for the use of the technology in the classroom. Some teachers were still learning to use it when they began teaching, while others used the technology to reinforce traditional teaching approaches. One teacher who struggled to learn the technology lost confidence in herself as a teacher and her ability to develop new skills, indicating that teachers' personal learning needs were not being taken into account.

Learning and teaching with technology

In this section, I interpret teachers' responses to question 3: What teachers' approaches to teaching with technology? The teachers shared their teaching beliefs, how they implemented technology for teaching and their perceptions of students' responses to their teaching. They taught in lecture theatres, classrooms and virtual environments.

The teachers began by discussing how they might modify their teaching in response to new technology. Both Rosie and Tane considered how technology had changed their relationship with students and this caused them to think about how they might modify their teaching in response to the Blackboard LMS.

> We use technology through Blackboard. That's a new pedagogy isn't it? It's about how we test and examine and record information and get students engaging using this medium. We can be more creative, thinking about other ways of students expressing their learning through journals, images or media. (Case 1, Rosie, 558–585)

> I now engage with Blackboard, thinking much more about how I'm going to get a message across to everyone whether they are there or not. (Case 1, Tane, 124–126)

Rose and Tane expressed two conceptions of teaching. In considering how students might represent new knowledge in a variety of virtual environments, Rosie expressed a learner-focused conception. In contrast, Tane focused on the technology as a communication problem, thus expressing a teacher-focused conception. A teacher with a learner-focused conception would have considered how students could communicate with each other in

order for them to achieve learning goals in a virtual environment, as well as reflecting on the changing role of the teacher. Nevertheless, in these examples, teachers were considering the development of a new skill set for teaching in virtual space.

Next, teachers discussed the kinds of teaching strategies they developed for technology. Rosie used technology in her lecture as a means to stimulate students' curiosity, whereas Tane adopted the flipped classroom model of learning and teaching.

> You can find a movie clip and embed it and the students actually see things which they can't normally see. It is to engage the student. You want them to go wow, I want to know more about this. It's about developing curiosity and understanding. I think technology can tap into it, then you can use it to motivate and stimulate students. (Case 1, Rosie, 482–494)

> I'm flipping the classroom and teaching differently. Flipping the classroom means that I am putting the stuff online in advance of the classroom. So I'm buying myself more time in class to do more applied work, more application of the theories. By making sure they've read something in advance. They've engaged with some online website, they've actually done an exercise. (Case 1, Tane, 128–139)

Both Rosie and Tane viewed technology as the agent of change (Kirkwood & Price, 2013). This occurs when teachers endow technology with the ability to motivate students and shape their learning. In these examples, Rose and Tane were focused on their own teaching activities and what the technology could do for students, rather than what students needed to do to learn or how they might go about it. Essentially, Tane had modified his teaching by posting homework activities online so that he could do more teaching in the classroom. These are examples of teachers thinking with a teacher-focused approach to teaching.

Teachers' reflections on students' responses to their teaching provided an indicator of students' perceptions of the teaching environment. Tane inferred that students' access to online information and resources had caused a change in the students' classroom behaviour and approaches to learning. He went on to explain that his students appeared to be unmotivated and less receptive to his lectures.

> [Technology has] definitely changed my thinking, because I can tell the students are not receptive to me talking so much in the classroom. (Case 1, Tane, 408–409) They are learning differently to how they did ten years ago. Many students come to my class with not a scrap of course or a pen, and I say, 'I think you should make a note of what I'm saying'. And there's no engagement at all. Just sitting, arms folded, just looking at you. (Case 1, Tane, 292–296)

Tane has assumed that students' behaviour meant that they were not interested in learning or engaging with him. He also perceived that students tended to disengage in class, safe in the knowledge that they could use the online resources to do the required learning later.

> I think they've got used to, I will just look on the computer for that answer. And they're not going to a lot of depth in terms of, can I understand why?. There's no need to know why. I just go on and I Google the answer and it's there. (Case 1, Tane, 297–302)

> Students think that because the resources are on Blackboard, 'I can read it later'. I'm just recording the lecture, I'll listen to it later. But actually later is too late because it's too late to ask me a question, it's too late to engage with that thinking time. They think it's easier and quicker to find information and that they don't need to understand why. That quality, critical engagement and thinking is still required in the classroom. (Case 1, Tane, 306–353)

Tane is thinking about critical thinking, discussion and questions, all of which develop students' deep approaches to learning. However, from his students' responses, it appears that to them, this classroom is about receiving information. Students appear to have recognised that the information Tane transmits in class is also reproduced in online materials and can be learned at any time and in any place. Perhaps one of the few opportunities students have to direct their own learning in class occurs when they are able search online for information. Yet while Tane is critical of how students search, he does not support them to develop effective search strategies. Instead, Tane is thinking about a classroom environment from a teacher-focused approach, which his students do not appear to be receptive to. Similarly to Tane, Rosie sensed that students' approaches to learning had changed.

> Perhaps our definition of a student is not what it used to be… I also think that definition of what learning is, is changing too. Do we have to change the way we look at how and what we expect people to learn? How do we mesh these concepts and ideas of learning and technology? (Case 1, Rosie, 723 -729)

In considering how technology has disrupted classroom teaching, Rosie suggests that the process of learning has changed. She perceives that the notion of learning could become a synthesis of learning processes and technology.

Having discussed face-to-face teaching, I asked teachers to examine their perceptions of mobile learning (m-learning). Macie acknowledged that m-learning would challenge her

role as a teacher; however, she viewed the idea of students taking a central role in their learning as a positive step.

> I think what it does is challenge the whole concept of the teacher as expert. It's very much a democratising kind of pedagogy, which again can be very good. I'm just trying to work out how it would work. I can't get my head around it completely. (Case 1, Macie, 303–307)

Although Macie was not sure what her role as teacher might be or how teaching might happen, she perceived that m-learning emphasised the role that students would play in their learning. Macie's and Rosie's prior experience of students and online learning influenced their perception that not all students would be motivated to self-direct their learning.

> Some students would be good at it, some students would not be so good. You would get the students who want to access it a lot, like they do with Blackboard, and some students who hardly go in. So if it's left to the students I'm not sure it would work that well. (Case 1, Macie, 308–312)

> I think the biggest problem is time management. How do you accommodate that? It takes time to learn. It's not something that just happens by osmosis. You have to put time and effort and energy into it irrespective of how you deliver the material. Somewhere, somehow you have to engage with that material to learn it, and you have to be able to use that material in some way. (Case 1, Rosie, 694–702)

Rosie and Macie perceived that m-learning would put students in control of their learning. Yet conversely, they suggested that students may have problems directing their learning, and that it might not encourage them to take deep approaches learning.

> How do we maintain that level of integrity in the depth of learning, when I can just go on my phone and find out something? I can do it right now in five seconds, and I might find a while lot of stuff lacking in critique… As a novice how do I know what's the good stuff and what's not? I don't know that we're teaching our students how to do that filtering and deciphering. (Case 1, Rosie, 765–779)

> What sort of learning is that? It's just recall – not particularly deep. We've got to ask what [students] are actually using mobile technology for. And from my perspective it's often just tweeting, sending Instagrams, a kind of social emptiness, superficiality. Can you really carry on an in-depth conversation with anyone? (Case 1, Veda, 303–313)

Rosie and Veda viewed learning as requiring intellectual effort. However, they perceived m-learning as looking up information on devices, that is, using the technology to

encourage a surface approach to learning. Therefore, they had constructed a view of m-learning that was at odds with their teaching beliefs. Rosie attempted to describe how m-learning might happen.

> To have this kind of thing work, it has to be snack-liked. Like little snippets, because that's the way we've gone. It's not good necessarily, but I think that if you had little snacks of learning, that you could get your head around and understand, then each snack could build on the next one. (Case 1, Rosie, 681–689)

Rosie has described a strategy similar to computer-aided learning, which is underpinned by behaviourist learning theory. While she recognised that it might not be an effective approach to learning, she was able to construct such a conception by relating to the affordances of mobile devices. In this case study, teachers identified that m-learning was changing the teaching and learning context, but were unsure about how to modify their teaching methods, thus highlighting their lack of pedagogical knowledge for new teaching environments.

Teachers had observed students engaging with social media such as messaging and Facebook during class time. Tane considered what kind of authority he had to direct the use of Facebook for teaching and came to the conclusion that Facebook was a private space for students' use.

> What they do on Facebook is kind of private. (Case 1, Tane, 401)

Tane explained that he preferred students to use the Blackboard LMS so that he could control the communication between students and the type of resources they accessed. Tane perceived social media as a learning space he could not control and therefore did not deem it appropriate for teaching. Macie viewed students' use of devices and Facebook in the classroom as a disruption. During the interview, she tried to determine whether they should be allowed to be used in the classroom.

> On a number of occasions I've made a comment to a student and they'll say 'well actually I've been looking something up' [on their device]. So it's made me reflect on my response. I've tried to tone it down and understand it a bit more from their perspective – that they're more capable than maybe I am. (Case 1, Macie, 272–277)

> Facebook is such a familiar platform for them. Is it right to say that in a classroom context, it shouldn't be allowed? I'm still struggling with that. I haven't really decided, but it can be quite problematic. (Case 1, Macie, 282–287)

Macie was in a quandary because she was not convinced that students could focus on what she was teaching them while they were using technology, yet she was beginning to question whether there were educational benefits. Macie was not confident that she could direct students to use their personal devices and social media spaces for learning. In this case, it would appear that Tane and Macie perceived that they lacked the pedagogy and authority to direct students to use personal devices and social media for classroom activities.

Finally, the teachers discussed their concerns about the digital capture of photos, video and audio recordings in the classroom.

> The photos are more worrying, especially if they're asking to take photos of my or other students. I wouldn't be happy with that. (Case 1, Macie, 327–328)

> I would just worry that it would go global if I made some silly statement, and it could end up on YouTube or something like that. (Case 1, Tane, 321–323)

Their concern stems from their inability to control what happens to the photos or recordings. Macie had concerns about protecting the privacy of students, whereas Tane worried that any mistake he made in the classroom had the potential to be posted online. Like Macie and Tane, Rosie was uneasy about the vulnerability that technology creates in allowing snippets of digital information to go viral.

> I don't think we've had enough discussions around those sorts of things… and how we as teachers are protected from things that could potentially… be taken out of context or misconstrued. Because I think we are quite vulnerable to things being taken out of context. (Case 1, Rosie, 820–825)

Without the opportunity to talk through these issues with other staff in the university, these teachers were unable to determine whether their reactions were normal or extreme.

Assertions

Teachers described both technology-focused and pedagogical-focused approaches to learning, suggesting that they lacked a pedagogical foundation on which to base their use of technology for teaching. They suggested that technology had caused students to underestimate the complexity of learning that is required, that students were learning differently from how they had in the past and that they were now less motivated in class. Teachers viewed m-learning as an approach that was in conflict with their teaching. They thought that while it could place students in control of their learning, not all students

would be motivated to self-direct that learning. They were concerned that students would use their devices to develop a surface approach to learning. The teachers felt uncertain about the authority they had to direct students to use personal devices and social media for classroom activities. In terms of digital recording capability, teachers were concerned that they lacked the ability to control what happened to the photos or recordings. They looked to the university for some kind of protection and procedure for these issues. These findings indicate that teachers lack a pedagogical foundation on which to base the use of technology for teaching and learning.

Rejection and discontinuance of technology

In this section, I interpret teachers' responses to question 4: Why do teachers reject or discontinue using a technology? Technologies could be rejected or discontinued at various stages throughout the process. Macie and her workgroup had a particularly difficult time adopting technology. So when the TAL organised a demonstration for another potential technology to adopt, Macie rejected it outright even though she thought it might be useful for teaching.

> After the smart board demonstration, I came away thinking I'm not going to use that and I don't think anyone has. And yet it looks like it could be really good for teaching. But I don't have to the confidence to go there. There's something about this. How do you become confident in these things without actually trying it out with students? And most of us don't what to do that I think. There's certainly… the sense that we want to feel very confident before we go in front of students. (Case 1, Macie 477–485)

Macie perceived that her lack of confidence in learning to use technology for teaching had caused her to reject the technology. In all likelihood, this stemmed from her recent difficult experience of adoption that did not instil her with any confidence that the next one would be different. That Macie continued to ask how to become confident with technology is a testimony to the inadequate support she received during the process.

On the other hand, Tane found that once a technology had been adopted it became difficult to sustain over time. Having been through a number of adoption processes, Tane perceived that workgroups developed a pattern of resistance to change, became familiar with the change and then accepted it as normal.

> So there's that constant kind of cycle which happens all the time. (Case 1, Tane, 256–261)

Tane also noticed times when the cycle of adoption was disrupted, for example, when a teaching team changed.

> I think it's the cost factor, the inconvenience of constantly retraining different times, because the teachers change on those teams. This team was passionate about it, the next team was not so passionate. This team's forgotten about it… The problem is… they don't have the time to actually sit down for hours, pondering 'how does this work?' I found myself doing a massive amount of work because the team wouldn't embrace it, they wouldn't… help with it. So it just reaches a point where it's not worth doing. (Case 1, Tane, 526–544)

Therefore, despite a technology working well, new team members were not necessarily enthusiastic about the technology. As a TAL, Tane found himself with the sole responsibility of keeping the technology running, as well as training and motivating the team. This caused him to become discouraged over time and so he discontinued using the technology.

Assertions

A poor technology adoption experience can discourage teachers from adopting another technology. When teachers have a negative experience of technology adoption, they can become discouraged and lack confidence in the process and themselves. So when they are presented with another technology, this lack of confidence may cause them to reject it despite their perception that it might be useful for teaching. Therefore, the negativity of the experience may not be enough to outweigh the potential of the technology. Once a technology has been implemented by a workgroup, it can be difficult to continue its use over time. This difficulty can occur because changes of teachers in the teaching workgroup can disrupt the cycle of adoption over semesters. When new team members are not enthusiastic about the technology, it can be difficult to keep them using it and can lead to an eventual rejection.

A summary of the adoption process

For the teachers in this case study, the process began with a departmental workgroup leader making an authoritative decision to adopt a technology and informing the workgroups of the decision. Lacking an understanding of the reason for the decision, teachers tended to form a negative attitude towards the technology. Teachers wanted to be involved in the decision-making; however, because they felt left out they began the process lacking motivation. It was suggested that the adoption process should not be about technology but, as Veda suggested, about making them better teachers. There was

also a recognition that teachers and workgroup leaders could potentially make decisions together. Hindered by inadequate professional development, teachers struggled to understand the technical and pedagogical aspects required for effective teaching with technology. Yet teachers recognised the need for development in order to change the way they teach and to allow for the introduction of the new technology. The personal learning needs of teachers were overlooked as support varied between workgroups. However, even a supportive workgroup experience could not overcome the inadequate professional development. The inadequate and ineffective professional development had implications for how teachers used the technology in the classroom. Accordingly, teachers described both technology-focused and pedagogical-focused approaches to learning, suggesting that they lacked a pedagogical foundation on which to base their use of technology for teaching. Teachers perceived that technology was causing students to learn differently from how they had in the past, and that they were now less motivated; however, they could not draw on any learning theories to understand why this was happening. Teachers viewed m-learning as an approach that was in conflict with their teaching. They perceived that not all students would be motivated to self-direct that learning and that it would encourage a surface approach to learning. The teachers felt uncertain about the authority they had to direct students to use personal devices and social media for classroom activities. In terms of digital recording capability, teachers were concerned that they lacked the ability to control what happened to the photos or recordings outside of the classroom. Yet, despite these issues, the teachers mostly remained positive about teaching with technology. A poor technology adoption experience caused teachers to lack confidence in themselves and the process, and become discouraged from adopting another technology. So when they are presented with another technology, this lack of confidence may cause them to reject it, despite their perception that it might be useful for teaching, indicating that the negativity of the experience may not be enough to outweigh the potential of a new technology. Once a technology has been implemented by a workgroup, it might be difficult to continue its use over time, because of changes in members of the workgroup. When new team members are not enthusiastic about the technology, it can be difficult to keep them using it and can lead to an eventual rejection. I conclude this case with Macie, who experienced extreme difficulties during the process and lost confidence in her abilities as a teacher.

> I think just an acknowledgement that it's not as easy as falling off a log. It's not as easy for everybody as I think it was possibly made out to be. (Case 1, Macie, 156–158)

As Macie suggests, it is not easy to adopt technology. A commitment to listening to teachers' voices and the provision of sufficient support by workgroup leaders would go a long way to making the process more effective and congenial. The next chapter presents a case study of teachers who adopted technology within CoPs.

Chapter 5: Case 2 – Communities of practice

This chapter describes and interprets how the adoption of technology occurred for teachers who adopted technology within a CoP. In 2011, CFLAT initiated CoPs in order to promote and support learning and teaching with mobile devices such as iPads and iPhones. Each of the CFLAT CoPs described in this case were led by a CFLAT advisor. How a new member might be inducted into a CFLAT CoP, and how it works was described by one of the CFLAT advisors as follows: "A [CFLAT] CoP is a mutual agreement to work together in order to achieve something, - such as exploring new technologies and their affordances for enhanced learning and teaching. Normally, the process is initiated by the practitioner and it could be as simple as - how do I use technology for teaching? We normally meet over a cup of coffee to explore this further and to understand each other and the context, issues etc. This is where we normally also ask the practitioner to invite any other person who might be interested in exploring something in relation to technology and learning and teaching. After our first meeting, if we have an agreement or a shared vision of what we want to achieve—every process—meetings, goals etc. are negotiated/derived together as a team. Course outline, graduate profiles etc. are important documents that drive this process and in formulating the agenda and shared goals. In a nutshell, the approach is very organic and resembles the way an organic CoP would run. Nothing is set in documents etc. — the approach is driven by people and what the group wants to achieve together" (Narayan, 2017).

Aside from the CoP workgroup, these teachers were employed as full-time academics and all worked in disciplinary departments in faculties that followed the same structure as for the teachers in case 1. Following the hierarchical structure of AUT faculties, each of these teachers had a line manager who was their head of department. The head of department reports to a head of school. The head of school sits under the umbrella of the dean of the faculty. None of the teachers in this case was a member of the senior leadership team as described. Nor did any of the senior leadership team have a role in these workgroups. The CFLAT advisors have full-time academic positions in the universities' ADU.

The Teachers: Gala, Albert, Tammy and Aroha

Four teachers who joined a CFLAT CoP were interviewed for this case study. Gala and Albert were senior teachers in the same school, in Faculty D. They both joined the school-based CoP initiated by CFLAT. Gala and Albert suggested that their discipline was

reliant on technology; therefore, joining a CoP was an opportunity to develop skills in this area.

> It is a highly technology dependent profession and academic discipline so… it influences highly how you do the teaching. (Case 2, Gala, 33–27)

> I was very excited to be involved and really looked forward to it as a chance to bring my own skills up a level. (Case 2, Albert, 15–16).

Soon after joining the school-based CoP, they each formed their own course-based community of practice (C-CoP) consisting of teachers who taught on the same paper. Gala's C-CoP consisted of herself, four teachers and a CFLAT advisor. Albert's C-CoP consisted of himself and a colleague, therefore Albert's C-CoP did not have a CFLAT advisor. However, he still belonged to the school-based CFLAT CoP. I asked Gala why she formed a smaller C-CoP.

> If you think community of practice in a narrow sense of the word, like one of these established, more formal and more structured communities of practices that CFLAT is running, then no. This is a small team, and because it is small, we have an ongoing daily conversation about what everyone is doing. (Case 2, Gala, 6–14)

Gala perceived that compared with a school-based CoP, the C-CoP was more focused and manageable because of its smaller size. For this interview, Gala and Albert mostly chose to discuss their experiences as members of their C-CoPs.

Aroha was also a senior teacher in Faculty D, although she taught in a different school. Aroha joined two school-based CFLAT CoPs situated within different schools in her faculty that offered members the technology she wanted to teach with. In this instance, the two CoPs that Aroha joined were experimenting with iPads and iPhones. Therefore they were issued to members as long as they remained in the CoP. She joined the first CoP because she wanted to teach with iPads, and then joined the second CoP to obtain an iPhone.

> I really wanted to get into iPads because of my specialty area. It just coincided with my interests. (Case 2, Aroha, 15–18)

Tammy was a senior teacher in Faculty H. Tammy formed a CoP consisting of herself, colleagues who taught on the same course and a CFLAT advisor. Therefore the CoP may be viewed as a C-CoP. She saw the C-CoP as an opportunity for teachers to develop their technological skills for learning and teaching.

> We're not as a department and myself included, savvy really, around using technology for teaching and learning. (Case 2, Tammy, 35–36)

All of the teachers joined or formed a CoP to improve learning and teaching with technology. A discussion of how the adoption process occurred for these teachers is provided next and each section concludes with a set of assertions relating to the research question.

The decision to adopt

In this section I interpret teachers' responses to question 1: How does the decision-making process motivate teachers to adopt technology? The four teachers in this case joined a CoP to experiment with or learn more about technology for teaching. Accordingly, they tended to be able to make their own decisions about what technology to adopt and they were not under any time pressure to adopt. Albert and his C-CoP colleague often chose to trial the same technology so that they could support each other throughout the process. They met to discuss the technology.

> We would discuss what we were doing, how we were doing it, where we were doing it and why we were doing it. (Case 2, Albert, 18–21)

Albert gave the impression that the CoP discussion was an important aspect of adopting technology for teaching. Despite belonging to a C-CoP, Gala described how she made decisions as an individual regarding what technology, teaching and assessment strategies to adopt. She made a point of stating that she got most of her teaching ideas from disciplinary and teaching websites.

> I do believe I belong to a community of practice, but it is me and my teaching throughout the years that has driven the way I design my courses. (Case 2, Gala, 29–32) Do I pick up ideas from other people? Of course, and other people from me. Do I do it on my own? Of course, because all of us are online all the time and there are sites for [my profession] and for teaching… Most of my ideas are [obtained] from how it is done around the world. (Case 2, Gala, 150–154)

There was a sense that although Gala thought the CoPs were beneficial for teachers, they had little impact on her teaching practice because of her considerable experience. Aroha joined two CoPs in order to access to the technology she wanted to trial. She explained that she did this because it was difficult to get the technology from her department.

> This is one of my issues… There's no way in this department that you can get an iPad or an iPhone unless you buy it personally. CFLAT has been fantastic in terms of its initiatives… but I wish that it would be

> taken up by the departments individually… because how can you get staff to use them in teaching if they can't get the equipment? (Case 2, Aroha, 68–73, 584–592)

To join the school-based CoP and obtain the technology she wanted to experiment with, Aroha needed to persuade a group of colleagues to join with her. Aroha explained that the CFLAT CoP requested that members who received an iPad or iPhone would benefit from attending lunchtime meetings to learn about them.

> Part of getting the iPad was that it was stipulated that the staff had to attend weekly meetings at lunchtime for the semester. (Case 2, Aroha, 114–117)

Yet Aroha found that while her colleagues were happy to take the iPads, they did not want to attend CoP meetings.

> Not many of the staff were as proactive and interested in learning. And some of them, it was hard to get them to come to the lunchtime meetings. But apart from that, a lot of them I think, just wanted the iPad… Not necessarily to use it in teaching, but because they really wanted it… I mean one or two didn't use the iPad, but they kept their iPads. (Case 2, Aroha, 140–147)

Both Aroha and Albert expressed dismay at the lack of interest some colleagues showed in attending the CoP meetings or teaching with the technology.

Tammy explained that it was her idea to form a CoP and made suggestions as to which technology to adopt. The teachers in Tammy's workgroup discussed the pedagogical benefits of the technology for teaching and were in agreement about adopting that technology. During the interview, Tammy explained that her CoP had attempted to adopt two technologies. The first technology, an ePortfolio, was chosen because it had relevance for graduates in the workplace. The second technology, an eBook, was to be developed and utilised as a teaching and learning resource.

Assertions

For the teachers in this case study, the decision to join a CoP was a decision to adopt technology. Teachers joined CoPs for two reasons: to learn more about teaching and technology and to gain access to technology for experimentation. Only one teacher gave an example of selecting a technology for pedagogical reasons; the others adopted technologies to experiment with. Having joined a CoP, teachers made individual and collective decisions to adopt a technology. Like in case 1, resistance to adopting a technology occurred in a workgroup where authoritative decision-making occurred.

Preparing to teach

In this section, I interpret teachers' responses to question 2: What pedagogical knowledge do teachers develop about teaching with technology and how do they develop it? The teachers discussed how they participated in all the professional development opportunities available to them. These included attending regular CoP meetings to share ideas with colleagues as well as reflecting on their use of technology in the classroom.

Aroha and Albert received some initial technical training sessions for the iPad, iPhone and social media from their CFLAT advisor.

> The CFLAT advisor was really good in sort of teaching us the basics. (Case 2, Aroha, 118–119)

> A bit of training around Google Docs and a little bit of training around the curation of Twitter stuff. But after that no. (Case 2, Albert, 281–282)

Aroha attended LATTE (Learning and Teaching Technology Enabler) sessions and found them helpful in providing just-in-time training.

> I went to the CFLAT LATTE sessions. They had some really good learning tutorials which were so fantastic. That is such an inspired and brilliant concept because if you ever got stuck… you go over and they solve it. (Case 2, Aroha, 121–122, 239–242)

Generally, teachers took individual responsibility for developing technical skills. They often asked colleagues for support.

> We learn individually I would say. We do ask each other, can you help? You know if we are stuck. (Case 2, Gala, 166–168)

> There is always some learning that I need to do, like blogging. I need to know how to edit a video on a cellphone, all of those things… I'll ask somebody who does it already and say, how do I do this? (Case 2, Albert, 319–327)

Despite the support of their CoP members, Aroha and Tammy both had difficulty in accessing the training they required. Tammy explained how her C-CoP wanted to use iPads that CFLAT were willing to provide them with. However, a senior leader disagreed with the use of Apple iPads and instead required them to use Windows-based tablets provided by the faculty. Tammy explained that they could not access any training for the tablets as the faculty did not offer any, and CFLAT and IT services did not support them.

> There are instructions interestingly, onsite for iPad users, but there aren't any for tablet users. (Case 2, Tammy, 19–21)

Aroha felt she needed more training than she received from the CFLAT advisor.

> And I joined in with a colleague and attended quite a few of his [classes] voluntarily. And I also sat in on the computer classes... So, I sort of piggybacked on any learning classes that were going on, even if they were the student ones, you know, which was good. (Case 2, Aroha, 124–129)

Unable to access any formal development opportunities, Aroha arranged to attend colleagues' classes when available. These formal and informal professional development activities centred on learning the technical aspects of the technology.

I asked the teachers what kind of pedagogical training they received. Common responses were that they did not receive any formal sessions. For Albert and Aroha, the CoP was a forum where they could share their teaching practice and receive support for issues that arose during teaching. They explained that they had discussions in their CoPs.

> For me it was about being very comfortable with the stuff we were using. And then bringing that into the tutorial or the lecture situation. And then taking it also to the community of practice to discuss or compare what we're doing. (Case 2, Albert, 28–31)

Albert made an important observation. These teachers were not under any pressure to adopt a technology in terms of time frames. Therefore they were able to become knowledgeable about and comfortable using a technology before implementation. Aroha described blogging about her pedagogical approach.

> In terms of pedagogical approach, no… One of the things the CFLAT advisor made us do was blog, which was great. Doing an academic blog was a new experience that we resisted, but I loved it in the end… So there was that pedagogical engagement, trying to record our findings of what we were doing with the iPads and teaching. You know, that was the forum for the pedagogical aspect of it. (Case 2, Aroha, 207–220)

Aroha enjoyed learning about blogs and blogging about teaching with the iPad, although others in her CoP resisted it. However, Aroha did not indicate what pedagogical approach she used when teaching with the iPad. Nor did she discuss gaining any new knowledge that may have encouraged her to develop or advance a learner-focused approach to teaching.

Tammy viewed the CoP discussion as a strategy for teachers to change their teaching approach.

> It's just discussing the potential possibilities. What are your key concepts that you want to flow with. So we're being moved out of our traditional way of approaching our course and thinking about it in a more IT-prepared way. (Case 2, Tammy, 69–70)

Tammy saw preparing for teaching as shifting their current traditional conception of teaching. However, she did not articulate a learner-focused conception of teaching; instead, she spoke of becoming IT prepared. This suggests a technologically determined view of teaching. Similarly, Gala described an incident that occurred during an online discussion with the CFLAT advisor and C-CoP members. Gala perceived that the advisor was pushing for a technology-driven approach towards teaching in their discipline.

> [The CFLAT advisor] was very technology driven… I feared that if we turn our discussion board mainly around the tools we are using, that it will hijack what we should be [discussing]. Because [the profession] is a story about curiosity, about creativity, about asking questions, about critical thinking. About tools yes, but about the meaning that you create in [that] public space. (Case 2, Gala, 200–211)

In attempting to keep the discussion focused on human learning rather than technology, Gala's conception of teaching directed her to think, firstly, about the discipline, which involved developing students' lifelong learning skills and, secondly, how technology might support that.

Assertions

Professional development activities mainly consisted of teachers learning from each other within their CoPs. Two of the teachers requested more access to professional development, for example, from their CFLAT advisor or any other source that might be available at AUT. Pedagogical development consisted of teachers sharing how they were teaching with the technology. Some teachers expressed a learner-focused conception of teaching. Yet the professional development they spoke of appeared to be balanced in favour of technical development. Additionally, their examples of pedagogical development appeared to encourage a technology-determined approach to teaching, rather than a pedagogically determined approach to teaching.

Learning and teaching with technology

In this section, I interpret teachers' responses to question 3: What are teachers' approaches to teaching with technology? The teachers shared their teaching beliefs, how they implemented technology for teaching and their perceptions of students' responses to their teaching. They taught in lecture theatres, classrooms and virtual environments.

Despite recognising that technology had changed the teaching environment, teachers perceived that technology was not always required or even useful in every learning context. This was demonstrated by their responses that face-to-face communication with their students was an essential part of their teaching process and of their students' learning process.

> Because my teaching philosophy is dialogue, has been dialogue and still is dialogue… Now that conversation happens not only within the physical space, which is a classroom, but it can happen within a virtual space as well. So it is an extension of dialogue. There are more forms of that dialogue now than before, but it is dialogue. (Case 2, Gala, 248–258).

As well as continuing to encourage conversation in the classroom, Gala had modified her dialogic teaching style to include conversations in virtual environments. Albert explained that technology could not be used in some aspects of his teaching.

> I can't teach writing group stuff with technology because that's about our relationship. No technology there except the pencil and our conversation. You're watching my response to your text… I use a pencil and I cross things out, or I tick them… we're talking about a use of a word or the way a sentence flows… I can't replace that with track changes. (Case 2, Albert, 633–646)

Albert perceived that he could not achieve his goal of teaching students to write using technology. He believed that it required a small group strategy and conversational communication. In this instance, he viewed his role as helping students to develop and extend their knowledge of writing. While Aroha was concerned that senior management was thinking of moving their teaching out of the studio environment and into an online massive open online course (MOOC).

> We're very keen to keep the studio culture going and not just go to the MOOC online type approach… That's what I don't like about teaching [with] technology. If it was replacing hands-on in the studio, then that would be a problem. (Case 2, Aroha, 261–288)

That technology might replace face-to-face teaching was a concern for Aroha, who felt that it would be detrimental to students' learning. Aroha viewed the studio culture as an opportunity to work one-on-one with students or in small groups.

Tammy discussed a teaching strategy that her CoP had developed. Tammy explained that teachers in her CoP had to repetitively demonstrate skills to classes of students. She spoke of students complaining that techniques varied between the teachers and that in a large class of 120-some students, they could not see the demonstration clearly. The teachers decided to make instructional videos of demonstrations for students.

> This notion of being able to use your tablet to video a demonstration of skills that is at the same time being projected up onto a screen for the students to see all at once. Oh wow, this is what we need to do. (Case 2, Tammy, 118–121)

> It's about reducing the repetitiveness of things. It's about everybody being able to see the same thing and then being able to view it repeatedly (Case 2, Tammy, 135–137).

Despite her enthusiasm, Tammy was concerned that students were not using the videos to prepare for class.

> So that means that students really need to come prepared, in order to do the work. I don't know what's happening around the student concept of being a student, because they don't prepare beforehand. And I guess that is the downside of technology. You use it for them to be doing the work themselves prior to a workshop situation, but that doesn't happen yet. (Case 2, Tammy, 298–304)

Tammy's reflection on students' responses to the videos provided an indicator of their perceptions of the teaching environment. Creating the video was about students' accessing the demonstration of a technique, not a pedagogical strategy. A pedagogical strategy is to have students view the video to analyse the techniques, practice the procedure and discuss the outcomes online. However, instead of reflecting on students' interactions with the technology from a pedagogical viewpoint, Tammy questioned students' commitment to learning.

Having discussed face-to-face teaching, I asked the teachers to examine their perceptions of mobile learning (m-learning). Tammy spoke of learning with podcasts.

> I'm just discovering podcast radio and things like that and really enjoying it. So, I'm thinking, actually, yeah. It does work, I love to listen. And I love to listen when I'm not expecting to have, when I'm not in a classroom, having to listen. So I'm being freed up into thinking,

> actually, I do understand that anywhere, anytime, when it suits me kind of notion of accessing learning, and therefore, yeah, maybe students do want to do it that way [chuckles]. (Case 2, Tammy, 88–95)

This experience suggested to her that students may also prefer to learn in such a manner; thus, the replication of a teacher-focused approach was negated as she was able to listen in a time and place when she was ready to learn. In this instance, Tammy recognised and utilised the affordances of the technology. This works because the technological medium is an ideal environment for an individual activity such as listening to information, although, as in the video example above, posting a podcast on its own will not necessarily motivate students to listen to it. What Tammy has explained here is her experience and perception of mobile learning (m-learning). However, Tammy was in two minds about the use of podcasts for students' learning.

> The notion of five minute podcasts. Where's the depth of learning that's going to occur in that sort of thing? So I guess that might be… to the detriment of developing thinking, and that would be a tragedy. (Case 2, Tammy, 275–280) Having said that, lectures aren't necessarily a great stimulus for thinking either, if they're poorly done. (Case 2, Tammy, 281–282)

In viewing podcasts as a replication of lectures, Tammy was concerned that the technology might not engage students in deep learning. She acknowledged that lectures did not necessarily encourage deep learning either. Although Tammy had expressed concern that technology such as podcasts would not encourage a deep approach to learning, she thought they might be useful for m-learning. Tammy may hold these contrasting views because she does not have a pedagogical basis on which to devise teaching activities and judge their effectiveness.

Aroha explained that currently she did not have the technology to encourage m-learning. She was keen to have students using devices in class and elaborated on her perception of m-learning.

> I would try to get an Apple TV and have them in class, so those students could interact with their mobiles and things in responding. (Case 2, Aroha, 399–402)

Aroha's perception of m-learning seemed to be classroom based, using specialised technology, and having students communicate with "their mobiles" and each other through mobile devices in the classroom.

Albert and Gala also viewed m-learning as classroom based. During lectures, they required students to use their devices for the social networking tool Twitter. Gala asked students to answer questions during the lecture and send their responses via Twitter. Gala explained that at points throughout the lesson she scrolled through the tweets and selected some for further discussion or clarification.

> [I ask them to] tweet their response. Then we have that on a screen and we go through the tweets that are there. (Case 2, Gala, 243–244)

Here Gala has used Twitter to provide a safe space for students to ask questions and have them discussed in the classroom. Another option would be to have students to engage with the Twitter questions to self-direct their own learning. A pedagogically determined strategy would have students selecting and discussing tweets in groups, generating multiple responses for multiple questions in a short period of time. Meanwhile, Albert required students to summarise the lecture into a tweet at the end of the class, to develop the skill of being concise.

> So that is teaching them how to basically boil down texts and put it into 140 characters, and then it becomes a very powerful teaching tool, because you really need to know your work. (Case 2, Albert, 209–213)

Albert perceived that summarising and reducing ideas to a tweet required students to engage in deep learning. On other occasions, Albert asked students to tweet an image that summed up the lecture and then to defend the selection of that image to their peers.

> Well they have to defend the image… The image has to stand on its own, so that's where it's quite difficult as a task… The questions [students ask each other] are quite probing, and that's where I think the learning happens. That thinking is really deep in my humble opinion. (Case 2, Albert, 468–480)

In contrast to the tweeting strategy above, Albert has developed a pedagogically determined strategy that is free from the limitations of the technology. First, students use Twitter as a conduit for image (resource) sharing to achieve the learning goal. Second, students collaboratively engage in critical thinking, which encourages them to learn for understanding.

Gala and Albert observed that students became distracted by mobile devices in the classroom.

> I let them do what they want (using devices in class). I do expect them to engage in a dialogue when we're discussing. If they can manage that by doing five things at a time, fine. But I don't think that is possible

> 100%. But they know that part of their learning is to learn how to manage their time and attention. (Case 2, Gala, 287–297)

> Now I don't care. But if you're on Facebook during my tutorial, the lecture, a couple of things are happening. A – it's a bit boring or it's not engaging you, or B – what's happening on Facebook is more important to you at the moment. I just need to recognise that and not use that as something that irritates me. (Case 2, Albert, 233–238)

Gala and Albert noted that students used their devices for social activities during lectures or tutorials. Yet they did not set rules to limit mobile devices. Instead, Gala maintained her expectation that students would participate in class as required and saw it as an opportunity for students to learn how to manage their attention. Albert reflected on the possibility that it was his inability to motivate students that caused them to be distracted.

Finally, the teachers discussed their views about the digital capture of photos and video and audio recordings in the classroom. Gala and Aroha set rules in response to students' digital capture.

> There are occasions when we have a guest speaker, and we say, please, this is off the record. (Case 2, Gala, 274–277)

> I tend to try not to have an image presence on the web, so I don't really want visually recorded lectures. I don't mind the audio. (Case 2, Aroha, 383–384)

While both Aroha and Tammy were concerned about the personal impact of digital capture, Albert was not uneasy at all.

> Record away, I don't care… If you're going to mash it up and do something funny and make me look stupid, well that's fine. (Case 2, Albert, 258–261)

> At an institutional level, I think we should have a policy and an approach to it. (Case 2, Tammy, 247–248)

Tammy suggested that a university policy might provide teachers with guidance about how to approach the issue of digital capture on students' devices. Devices that allow students to capture video, audio and images appeared to be shaping teachers' approach to how they viewed students' use of them in the classroom.

Assertions

Three of the teachers perceived that technology may not be useful in every teaching context, with some describing how they preferred a face-to-face, dialogical approach to

achieve some specific learning goals. Additionally some teachers were unsure whether technology engaged students in deep learning. Despite thinking in a learner-focused way, some of the teachers developed both technologically deterministic and pedagogically deterministic strategies for teaching with technology. The teachers viewed m-learning as something that students did with their devices in the classroom, for example, students interacting with each other through their mobile devices. The idea that technology itself motivates learning was dispelled when teachers provided examples of students being distracted by devices in class and not using it to prepare for classes. Some of the teachers were concerned about the personal impact of digital capture and set rules in response to students' digital capture of information. A university policy was suggested as a way of providing teachers with guidance about how to approach the issue of digital capture on students' devices.

Discontinuance of technology

In this section, I interpret teachers' responses to question 4: Why do teachers reject or discontinue using a technology? Two of the teachers in this case found that technology could be discontinued by a course coordinator, a head of department or head of school who did not have a role in the CoP at various stages throughout the process. Tammy discussed two technologies that were discontinued by the head of school who did not have a role in the CoP. She described how the CoP adopted a technology that graduates could use in the workplace.

> We got good momentum going and then we had a change of management and [it was] disbanded. That was stopped. (Case 2, Tammy, 12–15)

Despite teachers viewing the adoption of the technology as successful and demonstrating a willingness to use it, the head of school discontinued the project. Tammy became upset when she spoke about the discontinuance and asked for the recording to be stopped, whereupon she talked more about how the decision made her feel. Once the recording resumed, Tammy went on to explain that, later, the CoP made the decision to adopt another technology. Yet once again the head of school prevented them from continuing with it. While the recording was stopped, Tammy hazarded a guess for the reason the head of school halted the projects; however, she did not want it included in the interview.

> We were really keen to do [it]. Because we've got a number of ESL students who would really benefit from it. But because we are being

> blocked from doing [it] formally. We are doing it in segments and putting it into Blackboard, so that the material will all be ready [for later]. (Case 2, Tammy, 42–54)

In this instance, the teachers were so committed to teaching with the technology that they covertly continued with the project. They continued to develop teaching resources so that later they could utilise the technology for teaching as planned.

Aroha spoke about the difficulties of innovating her teaching when she was overruled by the course coordinator. She explained that she liked to use her iPhone to record lectures and then post them in Blackboard for students to review.

> I have always used my iPhone to record, visually record, lectures and things and then put them up on AUT online… But [the course coordinator] doesn't want me to put them up after the lecture because he thinks that will discourage people from coming. (Case 2, Aroha, 300–308)

Another barrier occurred because her new head of department, who had taken up the position after she had joined the two CoPs, wanted to standardise teaching between classes. This meant that all the teachers on a specific course had to follow the same lesson plan prepared by the course coordinator, and it did not include a technology component.

> It's hampered in a strange way by having all six classes doing the same thing set by the course leader… I think it's our new HoD's philosophy, trying to get in line with overseas universities. I'm feeling that I've got less autonomy now than I had when I was a junior teacher. What you are teaching in that tutorial is dictated with a sheet of things that you have got to cover. (Case 2, Aroha, 402–442)

In this instance, Aroha found her beliefs about teaching and technology in conflict with the course coordinator and head of department. I asked Aroha what she could do about this situation. She responded that she would need the authority to make the decisions about teaching and technology.

> How would I change my teaching? I would first of all have to get them to put me on as a course leader [chuckles]. It's really a matter of having the authority or the power to dictate what happens. (Case 2, Aroha, 393–395)

Despite being recently promoted to senior teacher, Aroha felt that she lacked the authority to teach according to her beliefs.

Technology was also rejected by students. Despite Albert's concerns of students becoming distracted by social media in the classroom, he was keen to have students learning in new social networking spaces such as Facebook and discussed the possibility with them.

> Some students were keen, but one student said, it's a private space for her family… she didn't want her academic work to be part of Facebook. (Case 2, Albert, 55–57)

Although Albert had been prepared to modify his teaching to adopt Facebook technology, it was student resistance that caused the technology to be rejected at the outset because they could not all be persuaded to use it. Despite teachers being willing to adopt technology, student resistance was a barrier to technology adoption.

Assertions

Teachers' adoption of technologies were disrupted by both senior leaders and students. However, it was the senior leaders who played the biggest part in discontinuing teachers' use of technology. Senior leaders prevented CoPs from adopting technology at two points in the adoption process: before it was implemented and after it had been implemented. Other ways adoption was blocked was when a senior leader standardised the teaching between classes and did not include technology, thus impeding the consideration of adopting technology for teaching. In this case study, teachers' beliefs about technology and teaching conflicted with those of senior leaders. Despite belonging to a CoP, teachers felt that they lacked the autonomy and authority to make their own decisions about using technology for teaching within their departmental roles. Additionally, teachers who were willing to adopt social media found that students' resistance impeded adoption.

A summary of the adoption process

For the teachers in this case study, the decision to join a CoP was a decision to adopt technology. Only one teacher gave an example of selecting a technology for pedagogical reasons; the others adopted technologies to experiment with. Having joined a CoP, teachers made individual and collective decisions to adopt a technology. In contrast to case 1, teachers were under no time pressure to adopt, which helped them to form a positive attitude towards the technology. Professional development activities mainly consisted of teachers learning from each other within their CoPs. However, some teachers requested more access to professional development opportunities in the university, as well as from their CFLAT advisor. While some teachers expressed a learner-

focused conception of teaching with technology in a face-to-face environment, the professional development they spoke of appeared to be balanced in favour of a technology-determined approach. Despite thinking in a learner-focused way, these teachers often demonstrated a technology-determined approach to teaching as they explored ways to utilise the affordances of technology. Some teachers had difficulty in understanding how technology might encourage a deep approach to learning, and it appeared that teachers did not have the pedagogical understanding to consistently create pedagogically determined strategies. The teachers viewed m-learning as something that students did with their devices in the classroom. They also used social media for teaching; however, some teachers met with resistance from students. Some of the teachers were concerned about the personal impact of digital capture of information in the classroom, and it was suggested that a university policy would be helpful. In this case, teachers' adoption of technologies was often disrupted by senior leadership. Senior leaders discontinued workgroup projects and standardised traditional teaching methods among classes. Despite belonging to a CoP, some teachers felt that they lacked the autonomy to make their own decisions about using technology for teaching. I conclude this case with Tammy, who provided another example of a senior leader interfering with a successful adoption project.

> The decision (made by the head of school) for us to be using a device that is not supported by the university is kind of problematic. It would be a great thing to be part of a university-wide technology base, rather than outside it. (Case 2, Tammy, 340–342)

In this case study, the greatest threat to teachers' adoption of technologies was the views and actions of senior leadership who were not directly involved in any of the projects undertaken by the CoPs. The next chapter presents a case study of teachers who adopted technology within funded workgroups.

Chapter 6: Case 3 – Funded projects

This chapter describes and interprets how the adoption of technology occurred for teachers who applied for, and received, an LTDF project. These university-wide projects have been administered and supported by CFLAT since 2011. Funding consisted of a combination of resources, but not necessarily all at the same time: CFLAT advisors, support staff, monetary funds, iPhones and iPads. While the time frame for the projects was one year (two semesters), ongoing projects could apply for further funding in subsequent years. According to the application form, "The overall purpose of the Learning and Teaching Development Fund (LTDF) is to support the goals of the AUT strategic plan, by increasing student engagement and enhancing innovation in learning, and exploring ways of managing the overall costs of learning and teaching. The fund is also designed to develop overall capacity in the scholarship of learning and teaching and increase research outputs in this area (CFLAT, 2014). Two priority areas relevant to LTDF projects are the "development of digital learning resources to enhance the student experience" and "uses of social and digital media to enhance specific learning outcomes" (CFLAT, 2014, p. 1). In 2014, two requirements were stated on the application forms. Firstly, that a line manager's approval was required for teachers participate in a project, and for time release if needed (CFLAT, 2014). Secondly, that the project participants would "work in partnership with CFLAT and engage with staff across the university in appropriate activities that support the project outcomes" (CFLAT, 2014, p. 1).

The teachers involved in the LTDF workgroups were employed as full-time academics and all worked in disciplinary departments in faculties that followed the same structure as for the teachers in case 1 and case 2. Following the hierarchical structure of AUT faculties, each of these teachers had a line manager who was their head of department. The head of department reports to a head of school. The head of school sits under the umbrella of the dean of the faculty. None of the teachers in this case was a member of the senior leadership team as described. Nor did any of the senior leadership team have a role in these workgroups. The CFLAT advisors have full-time academic positions in the universities' ADU. Support staff situated in CFLAT who lead Blackboard and Mahara training were employed in full time, professional positions. Other support staff, such as IT Services tend to be employed in professional positions in the university. IT Services staff are not part of the ADU.

The Teachers: Heidi, Jack, Akela and Jane

Four teachers who had adopted technology because they had received an LTDF project were interviewed for this case study. According to the LTDF application form, each of these teachers would have gained their head of department's approval to undertake the project. Heidi was a teacher in Faculty C and applied as an individual for funding to develop her own website. Jack was a teacher in Faculty H and applied as an individual for funding to design a fully online course. Jane was also a teacher in Faculty H, although she worked in a different school from Jack. Jane taught a course with a team of colleagues, and as a team, they applied for funding to redesign the course. Akela taught in Faculty D with colleagues on a specific course. Akela's course coordinator applied for funding to redesign the course. A course coordinator is not considered a part of the university's senior leadership team. A discussion of how the adoption process occurred for these teachers is provided next; each section concludes with a set of assertions relating to that sub-research question.

The decision to adopt

In this section, I interpret teachers' responses to question 1: How does the decision-making process motivate teachers to adopt technology? Within these funded projects, the decision to adopt was made in differing ways. Heidi and Jack each made their own decision about what type of technology to adopt. Jane's workgroup made a collective decision about what to adopt, whereas Akela's workgroup had the decision made for them by the course coordinator.

Heidi explained that she made the decision to design a website because the university-wide Blackboard LMS was not satisfactory for teaching her subject.

> I just didn't find [Blackboard] satisfactory for what I wanted, I didn't find it visually effective enough. I didn't find that the students really liked it. At that stage I decided to make my own website for learning. I got funding to do that. (Case 3, Heidi, 9–19)

In determining whether she should create an in-house website, Heidi perceived that it would be more beneficial for students' learning than what she was currently using and therefore made the decision to create a website. Jack explained that he selected technology based on how well it would support the learning and teaching process.

> I have this mantra called fit for purpose. I look at what it is that I'm actually trying to achieve as part of the teaching and learning process,

> then I say, what could support that learning process, rather than just using technology per se. (Case 3, Jack, 4–10)

Jack has explained how his 'fit for purpose' mantra is a teaching belief that he used to guide his pedagogical thinking and use of technology in the classroom. To help him decide what technology to adopt he drew on feedback from students and advice from colleagues.

Jane's workgroup was the only one that that made a collective decision to adopt a technology. They received funding to develop a project in which students used iPads to educate clients in a workplace setting.

> We decided that as a group. (Case 3, Jane, 32)

To make the decision, the team focused on their educational aim, which was to have students engage with and educate clients. Then they determined what kind of technology would work best in that context. However, the funding only provided for iPads.

> We could only get funding for iPads at the time, so we were restricted to that. (Case 3, Jane, 14–15)

Akela was part of a workgroup that received funding to develop an alternative technology strategy for the course she taught on. Yet the decision to develop the technology strategy and the choice of technology was not made by the team; it was an authoritative decision made by the course coordinator.

> It wasn't our decision. (Case 3, Akela, 34–35)

> It was more of an authoritative position and that suggestion came from the course coordinator, that we should be looking at introducing other technologies. (Case 3, Akela, 10–13)

While Heidi, Jack and Jane expressed a sense of enthusiasm about adopting technology, Akela and her workgroup started out the process feeling somewhat intimidated. She elaborated why.

> As far as the decision-making process went, the suggestion came from the course coordinator, but I and the other teachers had little experience with the technology so we were really following suggestions, which was a bit scary for us because we didn't know what we were getting into and whether we could deal with it. (Case 3, Akela, 13–21)

Akela suggested that their lack of technological knowledge was due to their being digital immigrants – those who grew up without the Internet being part of their lives.

> Initial motivation was quite low, because the other teachers and I describe ourselves as digital immigrants. (Case 3, Akela, 45–46)

Lacking experience and knowledge about the new technology and the adoption process they were about to embark on meant that teachers were not persuaded that it would result in a positive outcome for them. As a result, their motivation to adopt at this point in the process was low.

Assertions

Teachers received funding for individual and group projects. Individual teachers made their own decisions about what technology to adopt and based their decision on pedagogical factors and relative advantage. One group made a collective decision to adopt a technology also based on pedagogical factors. Another group had an authoritative decision made for them, but the reason for the decision was not clear to the teachers and they lacked the confidence and motivation to adopt the technology.

Preparing to teach

In this section, I interpret teachers' responses to question 2: What pedagogical knowledge do teachers develop about teaching with technology and how do they develop it? I asked the teachers how they learned technical and pedagogical aspects of technology.

Jack explained that he depended on Google, YouTube videos and colleagues to learn the technical aspects of technology. He relied on the advice of colleagues who understood the learning and teaching process for pedagogical information. Heidi did not need any specific training to use her website. However, she developed her pedagogical knowledge from the literature and past experiences.

> It's always been research-led I suppose. My use of technology is the classroom and the pedagogy. Because then you're reading the literature all the time, so I've got a huge background in technology and learning I suppose. (Case 3, Heidi, 207–210)

Interestingly, CFLAT provided Akela's workgroup with iPads to use during the duration of the project despite the fact that they were not used in the project. She explained that they were provided with iPads so that they could become more familiar with new technologies.

> There was some instruction through the LTDF process. The basic instruction of how to use (the iPad), how to load apps and emails. That was really useful. The iPad wasn't specifically used in the project, but that was some of the technology that we were given to get familiar with the new things coming out. (Case 3, Akela, 86–91)

Akela suggested that she liked using the iPad and was grateful to receive it. However, this was not the technology she was required to learn to use for the funded project. When I asked Akela what kind of pedagogical training her team underwent, she was unable to answer the question. Without technical training and pedagogical development, Akela's workgroup struggled to learn the technology and, later, teach with it.

Jane's workgroup received some initial technical and pedagogical instruction from their CFLAT advisor.

> We did go over a little bit about the pedagogy with our CFLAT person. He did some teaching around the pedagogy of mobile learning and flicked us some articles to read. (Case 3, Jane, 145–148)

Jane explained that she took ultimate responsibility for training the teachers in her workgroup. All the teachers expressed a need for better access to effective training and ongoing support. Jane and Heidi discussed just-in-time learning.

> I think there is a real place for that, just-in-time learning, we require that. (Case 3, Jack, 548–552)

> I go to IT and say, 'I really need to upskill in Photoshop', and they say, 'Go to linda.com, there's tutorials on everything'. There is, but I only want to know two or three key things, and I have to sit through hours of tutorial, and I don't have that sort of time. I often know what I want to know, and so I want instant answers from somebody. (Case 3, Heidi, 570–579)

In terms of technical training, Jack and Heidi observed that online learning could be time consuming, whereas discussion was more likely to fulfil their requirements in a timely fashion. Teachers pointed out that workshops would be useful because:

> Staff don't have a clue what's out there, and they just don't have the time to look. (Case 3, Jane, 652–653)

> There are lots of things I don't know that would be easy to do. And sometimes it frustrates me because it's not doing what I want it to do, and I'm not sure how. (Case 3, Heidi, 171–174)

> If I want to stay abreast of things, I've got to learn it myself, so I need help from people (Case 3, Akela 615–616).

> There are still some things I don't know what I don't know. I'm probably not alone in that. It's about having the confidence to use it. As educationalists we still need to be passionate, we need to be knowledgeable, we need to be creative. (Case 3, Jack, 652–662)

Here, the teachers have described the frustration they felt when they did not have enough knowledge about the technology to use it effectively. For Akela, accessing effective training and ongoing support was not her only problem. She also had difficulty remembering how to use the technology.

> You can't just expect them [teachers] off their own back to get their own devices and teach themselves. (Case 3, Akela, 503–504)

> If you're not naturally inclined to the technology, you don't always remember, or you don't always work it out for yourself. Over time we have learned those things, but it might have been less scary if we had notes to refer to. (Case 3, Akela, 152–159)

Akela felt that she was left to learn the technology herself. Akela and her workgroup found it difficult to understand how the technology worked and this had a major impact on their ability to teach with it and support students' learning in the classroom.

> It was a rush introducing the technology. It was sort of scary for us, so looking back it would have been probably much better for us to have a better understanding ourselves of the technology and how to use it. (Case 3, Akela, 142–147)

This lack of attention to teachers' development meant that they were underprepared to teach with the technology. They told their students they did not know how to use it and that they would have to work it out themselves.

> We were quite terrified about it because we actually started off telling our students this is the stuff to use. We're not sure how to use it, that's for you to work out. (Case 3, Akela, 50–56)

As Akela continued talking of her experiences, it became clear that the teachers were relying on the CFLAT advisor to be available during class time to help students with any technical issues. Yet when the CFLAT advisor was not available, the teachers could not help the students.

> It's the more complicated things and that's where I say if we had a resource book that [lists the] steps, we can practice ourselves and show the students. But we've got nothing, and therefore if the learning advisor is not available, the [students] can't do it. (Case 3, Akela, 514–519)

Akela explained that after two years of the project they might not receive further funding so would lose their CFLAT advisor.

> We will have to make more of an effort to be more knowledgeable ourselves. (Case 3, Akela, 513)

She explained that even though the workgroup had become more familiar with the technology, she felt that they still required support, particularly to deal with questions from the students.

> I don't like being in a situation teaching with technology when I don't know how to use it. (Case 3, Akela, 201–202)

Although there was an initial lack of training at the beginning of the CFLAT project, two years later Akela's workgroup appears to be in a similar position. Their technical skill is so lacking that they cannot help students with some aspects of their learning. Akela acknowledged that the workgroup should have tried to learn the technology; however, this has not happened and she is nervous at the thought of having to support students without the help of the CFLAT advisor. Perhaps the willingness of the advisor to step in and support students has had a long-term impact on teachers' decisions to avoid learning the technical aspects of the technology.

Assertions

To prepare to teach with technology, teachers utilised online resources and received some professional development through CFLAT advisors. Teachers suggested that they lacked access to adequate technical and pedagogical development. Some found that they lacked pedagogical knowledge about the technology to use it effectively for teaching. The lack of attention towards teachers' personal learning needs has had long-term negative implications for one workgroup's ability to teach with technology. Teachers' personal learning needs may have been overlooked even though they adopted technology within a workgroup context.

Learning and teaching with technology

In this section, I interpret teachers' responses to question 3: What are teachers' approaches to teaching with technology? The teachers shared their teaching beliefs, how they implemented technology for teaching and their perceptions of students' responses to their teaching. They taught in lecture theatres, classrooms and virtual environments.

The teachers discussed how they modified their teaching in response to new technology. I start with Akela, who described how incorporating technology into her teaching practice had challenged her conceptions about how university teaching occurred.

> The approach to teaching with the technology is more of an informal approach. It's less teaching to the students but more engaging with them, and I think that's probably more satisfying. (Case 3, Akela, 209–212)

> Coming from old school and believing that in university you stood in front of the class, you gave a lecture and then you went away. Students might write an essay, then you'd mark it. So definitely technology has changed my personal beliefs, but I've actually had to accept it myself and go with it. (Case 3, Akela, 234–238)

Akela indicated that she was thinking about a learner-focused approach to teaching. Jack and Heidi explained how they had developed teaching strategies with technology in mind.

> Access to technology gives students access to material, so it has enabled us as educators to challenge students more, knowing that somewhere they will find the information, or come back with another discussion. I think it develops confidence in students if things are put up online as a discussion topic. Then they're used to sort of free flow conversations, and I think that enhances their thought processes and their learning processes. (Case 3, Jack, 307–315)

Jack had modified his face-to-face teaching by using the technology as a conduit to facilitate discussion online. Free flow conversations are an indication that students lead much of the discussion, which demonstrates a learner-focused approach to teaching. Heidi explained that because many of her students were from passive learning cultures, she provided them with a model of learning to help them adjust to more participatory methods.

> [They didn't] really have an understanding of how to learn well. But if you have the model and follow them up and have peer checking and marking, it tends to work quite well. (Case 3, Heidi, 344–347)

> I've completely embraced the idea of scaffolding and socio-collaborative learning. Students learning together and coming to decisions… It took me a long time to come to that, and it took a lot of technology to push me into that because [my subject] is traditionally taught. Technology started to pull me out of that. (Case 3, Heidi, 319–330)

Here Heidi is thinking with a learner-focused conception. She has utilised a technology (her website) as a learning resource and modified her teaching to develop strategies that were pedagogically determined. Students collaborated to answer questions and engage in peer review, indicating higher order thinking. These examples show that teachers are thinking about or implementing strategies that are most likely to encourage students to take a deep approach to learning.

Not all strategies were pedagogically determined, however. Jane was concerned with adapting her teaching approach to meet the 'immediacy needs' of students. She suggested that younger teachers like herself were more likely to recognise these needs.

> I think that's the difference between younger teachers and older teachers, in that older teachers don't necessarily adapt their teaching to the immediacy needs of the students. They try and change the students to be less immediate, but society makes students more immediate. (Case 3, Jane, 239–244)

Jane perceived that technology provided the student with immediate answers; therefore, this is a concept teachers have to understand and include in their teaching. Jane described an example of how she meets the immediacy needs of her students.

> You can Google a picture, and bring it up and show them. So I think that's something I'm really good at actually. Adapting what's happening in the moment, and finding the resources to actually show students, and I think that's where we're going. (Case 3, Jane, 387–391)

Jane's example of searching for and displaying an image in class is an example of the concept of immediacy she explained. In this instance, the technology is the focus of the teaching strategy, and students would have remained passive as Jane searched for and displayed an image, perhaps in an answer to a question. However, attempting to meet the immediacy needs of students did not encourage deep learning. To encourage deep learning, Jane could have assigned this 'search, display and explain' task to her students. They could easily have utilised their devices to complete it. Yet Jane perceived this as something that she is good at and described it as the future of teaching with technology. Jane has indicated a teacher-focused conception of teaching. It appeared that Jane had no basis for her pedagogical decisions.

Teachers' reflections on students' responses to their teaching provided an indicator of students' perceptions of the teaching environment. Heidi and Jane discussed how technology had changed the way students approached their learning. I start with Jane, who had problems with how students searched the Internet. She observed that students

would move ahead of her during the lecture and often found the wrong information when searching the Internet.

> The only problem is, there is such a wide plethora of information out there, it's actually directing them to the right information. Often you'll find they'll go on their own and it's in American units, and I'm going, 'no that's wrong'. (Case 3, Jane, 219–224)

This suggests that students do want to be involved in the lesson as they are searching for information as Jane lectures. However, students are engaged in fact finding rather than higher order thinking. Once again, Jane is so involved in using technology for teaching that she does not consider what the students are doing to construct knowledge in her classroom.

Heidi suggested that the Internet provides so much information that students became overwhelmed and unable to prioritise a process for learning. She observed that it was easy for teachers to post materials online and in doing so they were overloading students with work, unaware of the time it required for students to complete assignments.

> So many of my students get major anxiety because the work is hard and challenging, and they don't know where to start, and they've got too much stuff. (They have) every choice in the world, (it's) too much and (they) can't cope, and just don't know where to start and don't know how to prioritise. And teachers are asking them to do too much because it's all so accessible and so easy to give the assignments, but not easy to recognise what it takes to actually do the work. (Case 3, Heidi, 255–264)

Here, Heidi drew attention to a student-focused approach in which teachers are focused on their teaching activities, that is, posting resources and assignments online for students, rather than thinking about how they will engage students in meaningful learning. Heidi also observed that students used their phones during learning activities to repetitively look up information.

> I see my students using their smartphones to look up the same thing about 20 times over a period of time. Because it's right there, they don't actually think, 'I have to remember that because I will need it again in the future'. It's either my problem in that I still expect the memory to be used, and I think it's very important for future learning, because they have to recall (the information) to work in a business. Students are not good learners anymore because of these technologies. (Case 3, Heidi 285–294)

Heidi is questioning whether she has a problem with her current notion of learning, questioning whether she should still require students to memorise information. Heidi was

also concerned that students were not able to discern the type of information that they should be able to recall and she blamed technology for this. Yet like Jane in this case and Tane in case 1, she did not speak of supporting students to develop effective search strategies.

Having discussed face-to-face teaching, I asked the teachers to examine their perceptions of mobile learning (m-learning). The teachers grappled with similar issues when discussing conceptions of m-learning. I begin with Jack, who was unable to conceptualise m-learning.

> Why I'm pausing is that I'm finding it hard to actually visualise what that actually may be like, and again I keep coming back to, how might (learning) be enhanced? (Case 3, Jack, 399–402)

Instead, he asked what m-learning might look like and how it might improve learning. Akela explained that m-learning had changed the way she interacted with students, yet she also observed that it disrupted face-to-face teaching, as was found in case 2.

> With the technology, they didn't always have to sit in class and do it. That's changed the way that you teach and the way that you interact with students. (Case 3, Akela, 185–193)

> I think that mobile devices depends on the course you're teaching. It was not so much for students' learning, but for them to create a movie with the mobile devices, and actually going outside the classroom. (Case 3, Akela, 258–261)

> They're missing out on important information. We like students to at least attend class, ask questions, discuss things, and when they want to go away and film, they can sign out. But what's been happening is, five minutes before the computer labs, we get an email saying, 'won't be in class today, out filming'. (Case 3, Akela, 274–282)

Akela perceived that m-learning had not changed her approach to teaching, although it had lessened her interactions with students. She continued to view learning as something that happens when students attend class – to gain information, to ask questions and discuss – yet she is annoyed that m-learning interferes with this process. Akela explained that the students have used the permission she gave them to film a movie outside of the classroom as an opportunity to miss classes. Like teachers in case 1, Akela perceived that real learning happens in the classroom, where she is in control of teaching activities, rather than outside of the classroom, where students are directing their learning.

Heidi explained that she wants students to learn outside of class and interact with her via mobile technology.

> Generally we have 50% of students saying we need more face-to-face. I'm saying to them, but I don't want you to come to class at 8.00 am in the morning and sleep through my class. I want you to be able to access (me) anytime. You can chat with me on the email in that time where you're not having face-to-face and you can do it when you want. (Case 3, Heidi, 423–430)

Heidi's conception of m-learning was that it would be beneficial for students because they could learn at a time that suited them. If they needed support, they could contact her anytime. She may have developed the conclusion that m-learning could be beneficial because in stating that she does not want students to sleep through her class, she is implying that they were not paying attention – not participating. Yet instead of reflecting on why students were not participating and looking for pedagogical improvement, Heidi was seeking a technological fix, one that would support her teaching practice. Conversely, she perceived that her students preferred face-to-face teaching.

> Students don't like it at all. The better students are saying no, it's hopeless. There in the computer room, half of them are just playing games, looking on Facebook. The rest of them have gone home. They need someone to tell them what to do and how to do it. (Case 3, Heidi, 440–450)

Like teachers in case 1, Heidi has perceived m-learning as self-directed learning and that students are not particularly good at it. She has not understood the concept well enough to develop strategies that would encourage students to take a deep approach to learning. She is thinking about m-learning in terms of planning teaching activities rather than encouraging learning for understanding.

Teachers were interested in using new technology such as social media and gaming for teaching. Heidi and Akela trialled Facebook, blogs and games in their teaching; however, they found it difficult to know which of these spaces students preferred for learning. Heidi felt encouraged by the literature to develop a learning game for students.

> The literature says that gaming is absolutely wonderful and should be used. I'm a more serious learner type. I just don't want to say, yeah just do your Facebook, do games in class and find they're not really gaining anything. That's just us thinking that we should be moving into the students' world, when actually they should be moving more into our serious world. I had a lot of conflict over that. My conflict was about whether we give the students what they want. Students didn't use the game because it only targeted one area of learning. I found that the

> students have got so much to learn that they use only the tools that are absolutely the most efficient for them. The ones that work really well. (Case 3, Heidi, 358–376)

Heidi found that students did not find the game all that useful for learning. She was conflicted about the new learning spaces that technology such as gaming and Facebook created and questioned whether they could facilitate students' approaches to learning at a university level. Similarly, Akela found herself in a difficult position when students demonstrated their dislike of working in the blog she had directed them to use.

> A lot of the students hated using the Word Press blog. They much preferred Facebook. Some would take screenshots of their Facebook conversations and put it in the Word Press blog so that we could see it, because they're not going to ask us to join their Facebook page. Facebook contact was more engaging for them to use than the Word Press blog. (Case 3, Akela, 382–391)

In this instance, Akela had noticed that students had preferences for the social media that they felt most comfortable using. As in cases 1 and 2, students were contradictory in their choice of social media for learning and teachers were in a quandary over what to use for educational purposes. Similarly, Heidi observed that students preferred not to use Facebook for learning.

> They hate Facebook because it's their private thing. These are huge questions, these are not pedagogical, these are philosophical questions aren't they? It's getting into a bigger sphere of what is teaching and what is playing, and what is private and outside school, and what is inside school. (Case 3, Heidi, 390–395)

Heidi suggested that teaching in virtual space was a philosophical question that needed discussion. Throughout the interview, she had questioned how technology was changing what it means to teach, when technology might be considered playing rather than learning, what kinds of virtual space should be used for education, and what should remain as private virtual space for students.

Finally, the teachers discussed their views about the digital capture of photos, video and audio recordings in the classroom. Jack and Jane explained their concerns over students' use of mobile devices to capture audio and video in the classroom. They questioned how much control they had over the media and what students might do with it.

> For what purpose is it going to be used? There is always the fear that it may be used for the wrong reasons. And how much control do you actually have over what it's then going to be used for? (Case 3, Jack, 405–409)

> I don't mind my lectures being videoed and put online, but I want to know who owns the [recording], and what they're going to do with it. I don't want them sticking a video of me up on Facebook without me knowing. So that's a conflict there. (Case 3, Jane, 329–335)

They were concerned that the digital media might be manipulated by students, taken out of context and posted on line. Their main concern, however, was that the discussion of confidential information in the classroom may be digitally captured.

> We've got to be careful that we don't open ourselves to all sorts of risks around confidentiality. There needs to be more thinking about protection. As soon as you take the conversation out of that time and place and context, then it could be interpreted as a completely different context, or a different place in time, and I think that's where the danger lies for us as educators. (Case 3, Jack, 442–466)

> Students learn a lot from storytelling, and often we tell stories of clients we've looked after – no names, nothing like that. Often I think I don't want to tell a story when they're videoing me, because if this ends up anywhere it shouldn't then it's giving client information. (Case 3, Jane, 342–347)

Jack and Jane suggested that they needed protection from risks associated with students' digital capture.

Assertions

Three of the teachers indicated that they were thinking with a learner-focused conception of teaching and developed pedagogically determined strategies. Conversely, one teacher indicated that younger teachers such as herself recognised that they had to adapt their teaching approach to meet the 'immediacy needs' of students – which ties into teachers' perceptions that students are using their phones to look up information repetitively in the classroom. This teacher espoused a teacher-focused conception of teaching and a technology determined approach to teaching. The teachers perceived that technology had changed the way students approached their learning, but that it was not improving their learning. However, the teachers did not have any strategies for changing this situation because they were questioning the notion of 'learning' themselves. Additionally, teachers were conflicted by students' use of personal devices and social media, which made it difficult for them to modify their teaching approaches and plan strategies that encouraged students' deep approaches to learning in new environments. Some of the teachers were unable to conceptualise m-learning, and two others thought of m-learning as self-directed learning. There was also a notion that m-learning disrupted face-to-face teaching, lessening interactions with students and interfering with the learning process.

Finally, teachers were concerned that discussion of confidential information in the classroom may be digitally captured, and that it could be manipulated and posted online. They suggested that they needed protection from risks associated with students' digital capture of classroom discussion.

Discontinuance of technology

In this section, I interpret teachers' responses to question 4: Why do teachers reject or discontinue using a technology? Two of the teachers described difficulties in continuing with their projects. Jane described how her group implemented the iPads into their teaching practice and were achieving good results from the project.

> We were getting some very good results actually. We showed that client knowledge increased afterwards. The iPads were the most used and valued resource by the students. We did a student survey and a client survey. (Case 3, Jane, 56–63)

However, a head of school within Jane's faculty (who did not approve the LTDF application and did not have a role in the LTDF project) prevented the group from continuing with what they perceived to be a successful project. The head of school insisted that the group stop using the Apple iPads that were given to them by CFLAT for the project and use Windows tablets instead.

. However, the CFLAT funding was only for iPads, not tablets; therefore, the project came to an end.

> The current manager doesn't like Apple, so because she wasn't a fan of Apple, we weren't allowed to continue. The manager wanted teachers to focus on teaching students content, rather than developing better ways of teaching. (Case 3, Jane 51–54, 536–537)

Jane's view was that the senior leader discontinued the project because of a bias against Apple products and a conflict of teaching beliefs. Jane described how the senior leader's decision caused her workgroup to lose motivation.

> Being told not to use Apple, we actually lost a lot of motivation as a team. I feel that our department is very prescribed, and any new ideas are, 'oh we can't do that', so I kind of feel prescribed to. (Case 3, Jane, 93–94, 103–106)

Throughout the interview, Jane was very enthusiastic about improving teaching and using technology to support students' learning. She sounded dejected when she expressed concern that she now had less authority to implement new ideas for teaching and was

increasingly being told how to teach. Heidi described the difficulties in gaining funding to maintain her in-house technological development.

> It's very hard to get funding for technology. All universities tend to have this traditional idea about writing journal articles and funding for publications of that sort, but it's quite hard to get funding for technology projects. My other big issue is there is absolutely no funding for maintaining those projects. Once you've got the start-up funding that's fine, but no one seems to have any understanding that websites and such things take a lot of updating and changing, and that all takes money. (Case 3, Heidi, 19–26)

Heidi too expressed enthusiasm for her website during the interview. However, she was finding it a challenge to stay enthusiastic as the funding required was difficult to acquire, particularly when she compared it with obtaining funding for research. Like Heidi, Jane and Jack thought that the university should invest in staff and technology as they do for research.

> If the university is prepared to invest in staff undertaking PhD studies, they should also put that same investment into ensuring staff are familiar with, and can see the learning possibilities in technology. (Case 3, Jack, 558–561)

> We need to value the staff who have the knowledge, [by asking] what do you need to be able to do your job? So I think valuing us, and our opinion, and our needs, rather than just going 'you can have this', helps. (Case 3, Jane, 658, 601–605)

Teachers linked the improvement of teaching practice to technology adoption. Therefore, they perceived that senior leaders should support the process.

Assertions

A conflict of teaching and technological beliefs resulted in a senior leader stopping a workgroup from continuing with what they perceived to be a successful project. This caused the workgroup to lose motivation to adopt further. As in case 1, teachers connected the improvement of teaching practice to technology adoption. They perceived that senior leaders should support the process. A teacher who had to maintain an in-house technological development found it challenging to maintain motivation because of the time and difficulties involved in acquiring ongoing funding.

A summary of the adoption process

Heidi, Jack, Akela and Jane received funding for individual and group projects. Within these projects, individual, collective and authoritative decision-making occurred. The workgroup in which the authoritative decision-making occurred was the least motivated to teach with the technology. Teachers suggested that they lacked access to adequate technical skill and pedagogical development. Despite adopting technology within a small workgroup, some teachers' personal learning needs were overlooked and this negatively affected their ability to teach effectively with the technology. Most of the teachers espoused a learner-focused conception of teaching with technology in a face-to-face environment. However, as was established in cases 1 and 2, teachers found it difficult to conceptualise teaching with m-learning and to understand students' use of technology for learning. In this case study, only one teacher continued to develop technologically-deterministic strategies for teaching with technology. Additionally, teachers were concerned with potential negative effects of digital capture of confidential information in the classroom. As was established in case 2, senior leaders were an obstacle to teachers' adoption of technology, discontinuing what teachers perceived to be a successful project, which resulted in the workgroup being reluctant to adopt again. Like case 1, teachers viewed the improvement of teaching practice as part of the technology adoption process, and perceived that they required support from senior leaders. I conclude this case with Jane, who suggested that more pedagogical development for teachers was needed to improve teaching practice.

> So I mean enabling people to actually have the time to develop things, to pursue different methods of teaching, to improve themselves. Maybe AUT could write a course… on what technology is out there, and how to use it for staff… Staff don't have a clue what's out there, and they just don't have the time to look. (Case 3, Jane, 645–653)

Teachers in this case study were dedicated to improving their students' learning experiences and all but one espoused a learner-focused conception of teaching. However, it became apparent that a lack of pedagogical understanding inhibited their ability to develop effective teaching strategies for virtual environments. The next chapter presents a case study of teachers who implemented the Blackboard LMS in 2004 and can provide a long-term perspective on the adoption of technology for teaching.

Chapter 7: Case 4 – Long-view teachers

This chapter describes and interprets an atypical case; teachers with a long-term view of adopting technology for teaching. In 2000, John Hedberg, Professor and Associate Dean, Faculty of Education, University of Wollongong was employed as a consultant to make recommendations for flexible learning at AUT. Relevant to this research, are Hedberg's (2000) recommendations for a pedagogical focus when developing technology-enhanced learning using the Blackboard LMS. The report suggests that "values espoused by staff should be employed in developing a strategy and unique pedagogy for AUT technology-supported learning initiatives" (Hedberg, 2000, p. 2). Hedberg (2000) spoke informally with teachers and described them as "aware and interested in a technology-based delivery of AUT programs, although they were seeking information and a coherent rationale for moving into new technology and forms of course delivery" (Hedberg, 2000, p. 2). The reported teachers views are consistent with the views of the teachers in case 1 when discussing their perspectives on the decision making process. Hedberg also recommended the need for development priorities, and pilot projects that focused on new models of pedagogy. For example, "create new pedagogies for level 5 students to develop their independent study skills and to link their AUT experience as an integrated one with all subject information and links online" (Hedberg, 2000, p. 3).

As a result of Hedberg's (2000) recommendations, AUT implemented the institutional use of the Blackboard LMS in 2003. Each of the teachers in this case attended a series of four workshops designed to develop technical skills and pedagogical strategies for teaching in the then, new virtual learning environment. The data for this study were collected in 2014; therefore, 10 years had passed since these teachers implemented the Blackboard LMS in their teaching. Compared with cases 1–3, this case is unique as the participants can provide a long-term view of technology adoption for university teaching. This case is unlike the others because these teachers did not adopt technology in a workgroup setting. The focus of this case is the teachers' perspectives of adopting technology as individuals in the university.

The Teachers: Omar, Moana, Dale and Poppy

Four teachers interviewed for this case study were employed on a full-time basis and all worked in faculties that followed the same structure as for cases 1, 2, and 3. Omar is an Associate Professor in Faculty B, while Moana and Dale held Head of School positions in Faculty H. Despite their administrative duties, each of them continued to engage in some

teaching. Omar, Moana and Dale were all interested in technology and saw its value in teaching. However, Omar perceived that he now used technology less than when he started because his faculty changed its teaching approach from blended learning to a traditional lecture and tutorial approach. Moana perceived that in her faculty, teachers' attitudes towards technology were not as positive as her own. Poppy continued to be a teacher in Faculty D. Throughout the interview, she appeared blasé about using technology for teaching because, as she said, technology was part of the degree in which she taught, and she viewed it as a teacher tool. These teachers were enthusiastic about using technology for teaching.

The decision to adopt

In this section, I interpret teachers' responses to question 1: How does the decision-making process motivate teachers to adopt technology? Each of the teachers recognised that technology was part of life and beneficial for teaching.

> It's all around us. I cannot teach any other way. It's part of life. You cannot separate it… everything is technology. You cannot view it in any other way. (Case 4, Poppy, 47–52)

> I don't have any deep-seated views of particular teaching styles. I've just seen the technology as a benefit, right at the start. Before it was all about flexible delivery, whereas it's just part of the mix now. (Case 4, Omar, 278–285)

They had come to perceive teaching with technology as a natural and positive part of their teaching practice. They spoke of actively seeking out events such as conferences, teaching showcases and faculty presentations where like-minded individuals provided examples of technology being utilised in their disciplinary area.

> I was recently at a conference and had a demonstration of an interactive website. I thought I could use it rather than give my standard PowerPoint lecture. That would give students a tool that they could use immediately afterwards. (Case 4, Dale, 10–13)

> It's really picking up on what other people do. (Case 4, Omar, 103)

> My ideas mostly come through reading research articles or from what I hear at a conference… It is good to know if it is successful or not because you don't want to experiment all the time. (Case 4, Poppy, 19–30)

The teachers perceived that observing colleagues using technology helped them to see its potential and made them more positive about using it themselves. As Poppy elaborated, she could draw on the experience of a colleague who had already implemented it. Teachers could also be persuaded by a presentation to investigate technology further.

> I think 'oh that could work for me', and then I go in and investigate how to use it. (Case 4, Dale, 8–9)

> The last stage is to make a decision, but before that you need to know what technology is. For me the first stage is to get informed about what's available, which happens through reading, talking. Then evaluate it, to see if it is actually suitable or not for what I want, is it available or not. How much effort would it cost me, and also considering the students. These are all factors in the decision process. (Case 4, Poppy, 4–16)

> I ask how the technology enables, rather than disables. How this is better than what we have? (Case 4, Moana, 13–14)

Once the teachers had decided to investigate the technology further, they tended to have specific questions that they asked themselves to make the final decision.

Assertions

After 10 years, these teachers had continued to adopt technology because they viewed it as a natural part of teaching. All the teachers made individual decisions about what technology to adopt. Teachers were drawing on their colleagues' experiences of technology to decide what to use for their own teaching practice. Once they became interested in a technology, they investigated it further to help ensure a successful learning outcome.

Preparing to teach

In this section, I interpret teachers' responses to question 2: What pedagogical knowledge do teachers develop about teaching with technology and how do they develop it? I asked the teachers how they learned technical and pedagogical aspects of technology. Omar observed that in the past CFLAT had run workshops on technology. However, this changed in 2010, when it took a new direction and workshops were replaced with a situated learning approach.

> CFLAT used to have courses… but a lot of technology now is more intuitive, I suppose. (Case 4, Omar, 156–158)

> If there is a class… I'll generally go to it. That saves me having to learn up myself. I get it explained to me and I can ask questions. If I've got problems, I can ask someone later. (Case 4, Omar, 121–125)

> My own learning is, I need to see it being done, and then go and do it – experiential type learning. I'm not good following a two-page print out… I'd rather watch someone do it, then do it. (Case 4, Dale, 41–45)

These teachers acknowledged the difficulty they faced in learning technology when they no longer had access to institutional training opportunities. Omar preferred the speed of a short course. This also provided him with a contact for ongoing support for the technology. Dale preferred a live demonstration and then practice, both of which are supported in a workshop environment.

Without formal training opportunities, these teachers looked for alternative ways to develop technical knowledge. They explained that they would use Google and YouTube to access knowledge from online training resources.

> If there is some sort of guidance or instruction on it. (Case 4, Omar, 160–161)

> There is a tremendous body of knowledge online, so I look for help and somebody will have an answer to my problem. (Case 4, Poppy, 87–89)

Although some teachers took advantage of the online option, it did not always suit their personal learning preferences. Teachers had specific learning preferences that were not catered for within the institution.

> It doesn't suit my personal style. I found it (lynda.com) boring and I cannot concentrate enough. (Case 4, Poppy, 78–80)

> I need someone to sit down with me and say, this is what you need to do. But I am getting there by myself, it's trial and error. (Case 4, Dale, 371–375)

> I think a lot of the social media, you don't take courses. There's no one to give you a course on them. You're supposed to just know how to use it. But sometimes it doesn't always work out that way does it? It's very hard to know where to go. (Case 4, Omar, 474–478)

Poppy found online training boring, and Dale suggested that learning how to use a technology through trial and error is ineffective and time consuming. Omar acknowledged the perception that social media should be easy to learn; however, this

was not his experience and he suggested that the university could provide more learning opportunities for teachers.

Along with a lack of technical training, opportunities for pedagogical development were non-existent for these teachers. Omar described how he had been upgrading his teaching resources from paper to a digital format. He wanted to learn how to record explanations onto PowerPoint slides and post them online for students. IT services support showed him how to record a sound file; however, they were unable to help him with the pedagogical issues that arose as he began recording.

> I realised as I was going through the PowerPoints that I needed to explain some details a bit more. Whereas in the classroom you can compensate by explaining things further down the line… in this situation, each slide needed to be self-explanatory, and that made me pay more attention to the explanation. (Case 4, Omar, 194–201)

While recording the explanations, Omar recognised that he needed to develop new teaching skills. For these audio explanations to make sense to students, he had to plan speaking points, introductions and summaries. Therefore, the use of this technology required more than understanding the functionality of an audio file: it required an understanding of the pedagogy that underpins spoken explanations in a digital format.

Omar suggested that more professional development opportunities for teachers should be provided.

> With the use of technology, I don't think they make as much of it as they could. They could do a bit more. (Case 4, Omar, 427–428) To get the best out of the technology investment [the university could provide more] opportunities for professional development, learning about new technologies, and making a commitment that is actually worthwhile. (Case 4, Omar, 410–412)

Omar perceived that the university could make better use of their investment in technology if they committed to its use and considered how it could be used in more worthwhile ways for learning and teaching.

Assertions

Teachers found it difficult to access institutional support for the technical and pedagogical development they required to learn about new technologies. Instead, they utilised online resources and undertook a self-directed process of trial and error, but found this approach unsatisfactory as it did not meet their personal learning needs. They requested more opportunities for professional development within the institution. As

these teachers were not part of a departmental or CFLAT-supported workgroup, the lack of institutional workshops left them feeling that they lacked the opportunities to obtain specific training or ongoing support for technologies they had implemented.

Learning and teaching with technology

In this section, I interpret teachers' responses to question 3: What are teachers' approaches to teaching with technology? The teachers shared their teaching beliefs, how they implemented technology for teaching and their perceptions of students' responses to their teaching. They taught in lecture theatres, classrooms and virtual environments.

The teachers described how technology had changed their approach to teaching over time. Poppy described how she had stopped teaching and encouraged students to self-direct their learning by engaging with the online materials.

> I actually gave up teaching as it happened before where you had to have everything around you and go through the material in class because there was no other way. Now they have all the materials online. I can ask them to read in their own time and discuss with them offline or off-class if they have problems. Now I do it in a more free format. (Case 4, Poppy, 19–22)

Poppy noticed that while students can self-direct their learning online, they were still likely to have difficulty with some concepts. She explained these difficult concepts during class time.

> Sometimes there are difficult things in the material which do need to be covered in class. I spend enough time on them. I can allow myself the luxury to spend more time on these things, rather than go through everything. I don't feel the need for that. That's the change in my old teaching style. (Case 4, Poppy, 78–82)

Dale too noticed that he should be more aware of what students know before beginning to teach.

> I don't think we take enough time to learn or to understand what the students already know. (Case 4, Dale, 110–111)

Here, Poppy and Dale are thinking about students' prior knowledge indicating a learner-focused approach to teaching. Once a teacher has determined what students already know, they can focus students' attention more easily on what they have yet to learn, what they can learn themselves and what they need help with. In practical terms, this understanding frees up class time to focus on students' needs, which are often the most

difficult concepts. Poppy and Dale could focus on students' developing understanding rather than their own teaching activities.

Moana explained that she had changed her philosophical stance to teaching and technology over time.

> When I first did it, I was still pedagogically attached in that what I saw engaged students with teaching. At the time I actually thought of it more as a magical moment than as something linked to a theoretical stance… What has happened in the interim is that my philosophy on teaching and my theoretical stance about how I do that teaching has become stronger. (Case 4, Moana, 3–9)

Initially, Moana had focused on the technology – how she used it to support her teaching activities and to motivate students – thus espousing a teacher-focused approach. She continued to explain what she had come to understand about engaging students in learning.

> It's not necessarily that they engage with me, but that they engage with others, or with knowledge. And there has to be structure… but it's got to be that it might move someone out of their current comfort zone to learn more. (Case 4, Moana, 805–810)

Here, Moana described engagement with learning from a learner-focused teaching perspective. Such a perspective encourages students to develop and expand their knowledge in response to teaching. These strategies have indicated that the teachers articulated a learner-focused conception of teaching. They discussed examples of how they used technology to facilitate students' learning rather than to facilitate their own teaching activities.

Teachers' reflections on students' responses to their teaching provided an indicator of students' perceptions of the teaching environment. The teachers encouraged students to use their personal devices during lessons.

> I like the smartphones, and when I've done surveys in the classroom, I would say typically it's 99% of people have their smartphone with them… And so I like the ability to have them with [their phones] right in front of them, and so they can make use of it in the (teaching) space. (Case 4, Moana, 508–520)

> Students were requested to bring in their laptops or digital equipment so that they could engage in tutorials live. (Case 4, Dale, 74–75)

> [with the interactive website, students] can look up things as we're talking, to find out the differences and make comparisons between

> New Zealand, Australia and the rest of the world. It's a visualisation, it's quite a neat thing. (Case 4, Dale, 301–305)

These examples demonstrated how students could direct their own use of technology in the classroom. Dale noticed that students were engaged in the tutorial because they were leading it themselves.

> While using their technology, the students were so engaged, they were doing it themselves, they basically led the tutorial. People posed different things and they'd go away and look at different things. It was a completely unstructured tutorial. (Case 4, Dale, 93–95)

When students lead a session, they can collaborate to ask their own questions, while carrying out problem solving to determine answers and solutions. Students are engaged in a deep learning approach to develop and extend their knowledge. Dale also changed his teaching direction according to students' needs.

> I was able to say (to students) that's probably not a good site, look a little deeper than that. Who are these people and what is this site about? It doesn't necessarily have the best information for you. (Case 4, Dale, 117–120)

In perceiving his role as a facilitator, Dale was freed from standing at the front of the room and was able to move around the classroom. This allowed him to notice when students used technology to gather the most easily accessible information, and to challenge them to think more deeply about what they had found and the relevance to their learning. Omar encouraged students to use technology to reflect on their learning.

> What the technology does is allow you to create something outside of the classroom and get students to reflect. (Case 4, Omar, 295–297)

Encouraging students to engage in reflection activities deepens knowledge construction. This is further evidence of a learner-focused approach to teaching.

Teachers also described how they modified their teaching strategies in response to changing teaching and learning environments. Omar had come to recognise how technology may be approached from a teacher or student perspective. He perceived that teachers sometimes used technology as entertainment to engage or motivate students, although he did not agree with this approach himself.

> I don't really know how it (smartphone polls) helps learning. I think a lot of people approach this entertainment side of education. They see it as something a little bit different to engage the students. Sometimes I think with those bells and whistles… people work out pretty quickly

> what they do and what they don't do, and they just become like (every other technology) don't they? Students soon work out that this is not going to get them any marks. (Case 4, Omar, 450–453)

Omar perceived that such teachers are focused on using technology for their own teaching activities. He suggested that students recognise that these kinds of activities will not help them to develop the deep understanding they require for assessment purposes. Omar has recognised that how one conceives of technology can lead to a teacher-focused approach to teaching and the development of technology-determined activities. However, Omar and Moana were able to utilise the affordances of technology while keeping students' needs in mind.

> I change my teaching for the very big classes, so part of the joy of being in a big lecture theatre is that it's a bit like a movie, at least on the big screen. (Case 4, Moana, 470–473) The classroom, the shape of it, the hard architecture is a technology in its own right, so I'll change what I do to suit the technology of the moment as well. (Case 4, Moana, 496–499)

> You've got to change your technology, the way you approach it, to make sure your material is useful in a smartphone environment. (Case 4, Omar, 289–291)

Here, Moana used the technology of the large screen in a lecture theatre to bring cinematic drama to her teaching. Omar concluded that teaching resources should be formatted correctly for a smartphone environment so that they may be easily read or listened to by students. Although what they described are not pedagogical activities, Moana and Omar realised this, and were working with the affordances of the technology rather than ignoring them, and continuing with a traditional teaching approach.

Having discussed face-to-face teaching, I asked the teachers to examine their perceptions of mobile learning (m-learning). These teachers indicated that they had little experience with m-learning and social media. Dale and Omar did not see m-learning as something they would engage with. However, similarly to cases 1, 2 and 3, Moana and Poppy perceived that m-learning was about students directing their own learning.

> Oh I really hate saying this. I'm going to sound bad. That level of freedom of anywhere, anytime learning, also becomes nowhere, and no time learning. (Case 4, Moana, 792–793)

Moana's past teaching experience told her that students find it difficult to direct their own learning. She also questioned how students went about learning with technology.

> We let people loose on the Internet and they just find the knowledge that confirms their own belief systems. It's cherry picking and it's not actually extending them. It's just keeping them more entrapped in a limited way of seeing. (Case 4, Moana, 826–830)

Moana perceived that students tended to use technology to find information rather than extend their learning. Both Moana and Poppy perceived that face-to-face teaching provided opportunities for students to participate in learning.

> [classroom teaching] traps [students] in a model of engagement. (Case 4, Moana, 798–790)

> That's why face-to-face teaching and learning is still valuable, because that provides opportunity to participate. If it was left to technology-supported learning, it would be much more difficult to participate. (Case 4, Poppy, 177–182)

The teachers perceived that m-learning would not provide the participation that students required and received from attending face-to-face classes. Even when determining how m-learning might work, Moana and Poppy remained pedagogically focused, viewing discussion as key for learning.

The teachers in this case study did not utilise social media such as Facebook for teaching, yet they were aware that students used it for their own learning purposes. Moana elaborated on an example in which cohorts of students carried out a summative assessment staggered at various times over the week. Some students who took the assessment at the beginning of the week posted the answers on Facebook for those who were undertaking it later in the week.

> Students don't understand that Facebook is not as private as they think it is and they're actually doing themselves huge damage by posting answers to tests. (Case 4, Moana, 602–604)

> I think students are sometimes a little naive in how they make use of it, and I think they need some lessons sometimes in keeping themselves safe in doing that. (Case 4, Moana, 621–623)

Given students' misuse of Facebook, Moana perceived students' use of virtual space as naive and questioned whether students should be given guidance for its use in educational contexts. Over time, these teachers had developed a learner-focused approach to teaching and pedagogical-determined strategies. Yet while they held positive beliefs about the benefits of technology in a face-to-face teaching context, they had little

experience of new teaching approaches such as m-learning or teaching with social media.

Finally, the teachers discussed their views about the digital capture of photos, video and audio recordings in the classroom. Poppy and Moana observed that students took photos and made recordings in class.

> Given the abuse of photography, that may be a valid concern, because these photos can be manipulated. On the other hand, you cannot prevent it. (Case 4, Poppy, 216–219)

> So I have minor reservations, but I tend to think we're in such a connected world, that anything I did or said, whether it was on a technology-enhanced platform or not could be recorded and sent anywhere in the world in a moment. (Case 4, Moana, 551–555)

However, while they had concerns that digitally captured material could be manipulated and posted online, their view was that it could not be prevented.

Assertions

These teachers had developed a learner-focused conception of teaching with technology. They sought out opportunities to utilise the affordances of technologies to enhance the student experience. Yet they always balanced the use of technology by creating pedagogically determined strategies. These teachers had little experience of, or exposure to, m-learning or social media for teaching. One teacher viewed m-learning as students directing their own learning, yet suggested that they would find it difficult because they perceived that students did not know how to use technology for deep learning. They also held the perception that face-to-face teaching provided students with better opportunities for participation than m-learning. These teachers did not utilise social media for teaching, although they were aware that students used it for their own learning purposes and suggested that students could be naive in their use of social media for educational purposes. Additionally, teachers were concerned that students could use their devices to capture images and audio in classrooms and that this could be manipulated and posted online.

Discontinuance of technology

In this section, I interpret teachers' responses to question 4: Why do teachers reject or discontinue using a technology? Omar explained that in recent years his faculty had changed from encouraging teachers to develop blended learning opportunities to

removing it from the teaching format. This occurred with a change of senior leadership in 2010. The previous faculty dean and associate dean had championed blended learning and the Blackboard LMS in the faculty, whereas it appeared that the new faculty dean and associate dean did not view technology as a priority for teaching. For example, in 2004 the teaching format was a lecture and then an online session, and by 2011 it had changed to a lecture and then a tutorial.

> It used to be that we had the lecture and then an online session. Now all we've got is the lecture and the tutorial… If anything's changed, I'm not doing as much with technology. I'm still using Blackboard LMS for my course, but I'm using the same basic tools that I started with. I've used the technology – the things that seem to suit the lecture format. (Case 4, Omar, 3–21)

> As the faculty changed its approach, it didn't make it practical to go further with Blackboard LMS. In fact I think I've made more use of things on the web generally, rather than the technology provided by the university. (Case 4, Omar, 400–403)

As this change had removed the online teaching session, Omar had reduced his use of the Blackboard LMS and curbed his enthusiasm to adopt newer Blackboard functionality. Despite teachers being interested in new technologies, Moana perceived that they may not be willing to trial new technologies unless they could be persuaded that the process would be more successful than past adoption projects had been.

> So it's getting staff who are willing to trial things, who have recovered enough from past historical experience other (technologies) that… weren't very successful, or which went so much against their own beliefs about what is good teaching. We're not totally risk averse to trialling new things, but we want a better persuasion that we never had historically. Now we're a little burnt. (Case 4, Moana, 260–270)

Moana has indicated that teachers who are thinking about adopting technologies do not want to be part of further unsuccessful adoption processes. Nor do they want to implement a technology using an approach that conflicts with their teaching beliefs. She indicated that an unsuccessful adoption experience had left teachers more cautious about new technologies and as a result they now required better information about the benefits, and the impact on teaching than they had had in the past. These negative experiences were likely to make the teachers resistant or cautious about adopting further technologies.

Assertions

In this case study, one teacher perceived that their faculty appeared to discourage the use of technology and so became less inclined to continue to develop new related skills.

Additionally, negative adoption experiences are likely to increase teachers' resistance to adoptions. Therefore, decision makers may find that teachers will be more difficult to motivate unless they can clearly demonstrate an adoption process that acknowledges teachers' concerns.

A summary of the adoption process

Over a 10-year period, Omar, Moana, Dale and Poppy have continued to adopt technologies for teaching, now viewing them as a natural part of teaching. Not belonging to a departmental or CFLAT-supported workgroup, these teachers made individual decisions about what technology to adopt, drawing on their colleagues' experiences to guide their selections. Teachers described difficulties in accessing institutional support for the technical and pedagogical development they required to learn about new technologies. Therefore, they turned to online learning or self-directed trial and error, which did not suit their personal learning needs. Yet over time, the teachers had developed a learner-focused conception of teaching with technology. They utilised the affordances of technologies to enhance students' learning experiences while developing pedagogically determined strategies. These teachers had little experience of, or exposure to, m-learning or social media for teaching, suggesting that face-to-face teaching provided better learning opportunities. Additionally, teachers were concerned that students could use their devices to capture images and audio in classrooms and that these could be manipulated and posted online. In this case study it was suggested that if a teacher perceives their faculty as discouraging technology adoption, then they may be less inclined to integrate it into their teaching practice. When teachers experience a negative adoption process, they are more likely to resist further adoptions. Thus, decision makers may find that teachers will be more difficult to motivate unless they can clearly demonstrate an adoption process that acknowledges teachers' concerns. I conclude with Omar, who observed that he would have liked to build on his accumulated skill, but lacked opportunities to learn about new technologies and related teaching methods.

> Much of the time we're using our accumulated skill from the past, say with a PC. But there's new stuff, that unless people point it out to you, you just go on using the same technology. (Case 4, Omar, 139–144)

In contrast to cases 1–3, these teachers did not belong to a departmental or CFLAT-supported workgroup. Therefore, they found it difficult to access professional development and resources that would assist them in acquiring new knowledge and support for teaching with technology.

This concludes the findings chapters. In the next chapter, I discuss the cross-case assertions derived from these case studies and the conceptualisation of my Pressure Point Framework.

Chapter 8: Discussion

The impetus for this research was to investigate two recurring issues in the extant literature that impact on my practice as a teaching and learning advisor in the university's ADU: first, that teachers are viewed as reluctant to adopt technology and, second, that technology-related professional development has been ineffective in changing teachers' approaches to teaching. Teachers' perspectives on these issues have been under-reported in the literature and there are few technology adoption studies that have focused on the meso or workgroup level of analysis. Therefore, I designed a qualitative, multiple case study of inquiry to surface the voices of teachers through focus groups and individual interviews. Through a social constructionist interpretation of the qualitative data, I developed four case studies that provided rich descriptions of teachers' perspectives for each of the research questions. The scope and findings of this research are particularised to teachers' workgroup settings at AUT and may not apply in other contexts, for example, macro or micro studies on technology adoption. Nevertheless, the findings make a significant contribution to the scant literature on technology adoption in higher education at the meso or workgroup level of analysis.

This thesis has investigated factors that impede teachers from adopting and implementing technology-enabled learning when engaging in socially situated learning approaches to professional development. Relevant to this discussion is my definition of technology-enabled learning, which I described in chapter 1 as the effective adoption of technology for university teaching practice. The research question was: What factors impede teachers in workgroup settings from adopting and implementing technology-enabled learning?

My research identified four pressure points that reduced teachers' motivations to adopt technology and impeded their abilities to develop the pedagogical knowledge necessary for the implementation of technology-enabled learning in workgroup settings. The pressure points represent the findings for my research and are pedagogical development, authoritative decision-making, virtual space and senior leadership. I argue that a situated learning approach to professional development is unlikely to have a significant impact on encouraging teachers' implementation of technology-enabled learning if the pressure points that impede adoption projects are not identified and addressed.

Two original and significant outcomes of my research are the conceptualisation of the four pressure points and the Pressure Point Framework. The Pressure Point Framework is my contribution to the theoretical literature on technology adoption in higher education.

The metaphor of pressure points is used in this research to describe areas of difficulty where problems are likely to occur for teachers who adopt technology in workgroup settings at AUT. A search of Google Scholar returned few literature sources that have used the term pressure points. The term tends to be used in journal articles as a common-sense metaphor to describe issues that have been identified in the findings of a study. For this research then, the term pressure point describes a "source of difficulty" or an area "where problems or difficulties are likely to occur" (The Free Dictionary, n.d.). The four pressure points were conceptualised from the cross-case assertions. Table 6 illustrates which case studies the pressure points were derived from.

Table 6. Four pressure points conceptualised from the cross-case assertions

Pressure points: (a) in workgroup settings				**(b) in non-workgroup settings**
Pressure points	Case 1 Departmental workgroups	Case 2 CoPs	Case 3 LTDF projects	Case 4 Long-view teachers
Authoritative decision-making	✓	✓	✓	×
Pedagogical development	✓	×	✓	✓
Virtual space	✓	✓	✓	✓
Senior leaders	×	✓	✓	✓

The pressure points were derived from teachers adopting technology in workgroup settings (cases 1, 2, 3), as well as teachers who adopted technology as individuals (case 4). Although teachers tended to experience more than one pressure point, they did not experience all of them.

In subsequent sections of this chapter, I provide an overview of the Pressure Point Framework. Each pressure point is discussed in turn, drawing on evidence from the case studies and cross-case assertions, and finishing with a recommendation for a social constructionist dialogic practice to address the challenge. Finally, I discuss the implications for approaches to professional development, and conclude with a discussion on technology adoption in workgroup settings from a technology as system perspective.

The Pressure Point Framework

The Pressure Point Framework was developed through a synthesis of relationships between three sources. The sources are the pressure points conceptualised from the cross-case assertions in my research, Rogers's (2003) innovation-decision process and social constructionist dialogic practice (Gergen, 2015). The Framework is significant as it places a much-needed focus on identifying and addressing pressure points, that is, areas of difficulty that occur for teachers who adopt technology in workgroup settings. I posit that the Pressure Point Framework can assist TALs to develop strategies that support teachers' workgroups to progress through the stages to implement technology-enabled learning.

Table 7. Pressure Point Framework

A framework for identifying and addressing pressure points that impede teachers in workgroup settings from implementing technology-enabled learning		
Stages of the innovation-decision (Rogers, 2003)	**Identification of pressure points**	**Implementation of social constructionist dialogic practices** (Gergen, 2015)
1. Knowledge	Pedagogical development	Engaged relationships
2. Persuasion	Authoritative decision-making	Transformative dialogue
3. Decision	Authoritative decision-making	Transformative dialogue
4. Implementation	Virtual space	Relational education
5. Confirmation	Senior leadership	Collective intelligence

The case studies identified that each of the four pressure points occur at different stages of the innovation-decision process. They have been aligned in Table 7. The framework also demonstrates the alignment between the pressure point and the recommended dialogic practice. As the case studies have demonstrated, many of the teachers in this research experienced tension when adopting technology in workgroup settings. The aim of social constructionist dialogic practices is to transform relationships, and as I discuss in this chapter, they are one avenue for managing the pressure points. Despite each pressure point aligning with a specific dialogic practice, it does not preclude the implementation of more than one dialogic practice as an option for overcoming pressure points. In the next three sections, I discuss the Pressure Point Framework in more detail. I focus the discussion on the characteristics of the pressure points, their relationship to Rogers's

innovation-decision process and relevant concepts from social constructionist dialogic practice.

Focus on the pressure points

The characteristics of each of the four pressure points that have been derived from the cross-case assertions and the significance for teachers' implementation of technology-enabled learning are summarised in the following paragraphs. How each pressure point was conceptualised from the case studies is discussed in detail in subsequent sections.

Authoritative decision-making: This research identified that it was the type of decision-making that occurred within a workgroup that influenced teachers' motivations to adopt technology rather than the situated learning context itself. Cross-case assertions demonstrated that teachers who engaged in authoritative decision-making were less motivated to adopt technology than those who engaged in collective and optional decision-making. On the other hand, teachers who engaged in collective and optional decision-making were very motivated to adopt technology, demonstrating that TALs should involve teachers in the decision-making process. The pressure point authoritative decision-making occurred when teachers felt left out of the decision-making process, leaving them feeling less motivated to continue with the project. The evidence will be discussed to demonstrate that conflict in the decision-making process can cause teachers to lose the motivation to adopt technology during the project, and to become reluctant to adopt technology in the future

Pedagogical development: This research identified that despite adopting technology in situated learning contexts, teachers were not provided with satisfactory pedagogical development opportunities required to support their implementation of technology-enabled learning. Cross-case assertions demonstrated that the development of pedagogical knowledge and technical skills in workgroup settings was insufficient to meet teachers' expectations. Additionally, some workgroups were unsupportive; therefore, the collegiality that might assist members to achieve their personal learning needs did not eventuate. This evidence will be discussed to demonstrate that as teachers did not engage with pedagogically related professional development, they did not change their approaches to teaching required for technology-enabled learning; instead, they continued to apply their current approaches to teaching with technology. This lack of pedagogical development had implications for teachers when they implemented the technology in the classroom, as they had not changed their approaches to teaching, which led to the development of the next pressure point: virtual space.

Virtual space: This research found that teachers who adopted technology in situated learning contexts did not change their approaches to teaching required for technology-enabled learning; instead, they continued applying their current approaches to teaching with technology. The case studies provided examples of teaching strategies that demonstrate that teachers who held teacher-focused approaches to teaching continued to develop teacher-focused strategies for virtual space. Furthermore, teachers who held learner-focused approaches to teaching did not consistently develop pedagogically determined learning strategies for virtual space. Consequently, the pressure point virtual space occurred because teachers did not consistently change their teaching approaches to account for learner-focused, pedagogically determined strategies that would support students to construct knowledge in virtual space. The difficulty in developing pedagogically determined strategies led to the cross-case assertions, which identified that teachers were unsure of conceiving teaching in virtual space, that they had difficulty understanding how their students used technology for learning and that they lacked the confidence to regulate students' use of social media and digital capture of audio and images in the classroom. This evidence will be discussed to demonstrate that teachers who did not change their teaching approaches to facilitate technology-enabled learning hindered students' opportunities to engage in deep learning through the collaborative construction of knowledge in virtual space. Moreover, the lack of pedagogical knowledge required for virtual space left teachers unconfident about teaching with technology and uncertain of their authority to direct students to use social media in the classroom.

Senior leadership: This research demonstrated that despite teachers adopting technology in situated learning contexts, the actions of senior leadership impeded their goals to adopt or continue teaching with technology. It is important to note that the senior leaders involved in this pressure point were not the same leaders as those involved in the pressure point authoritative decision-making. The senior leaders identified in this pressure point did not have an allocated role in teachers' workgroup projects, yet their positions gave them authority over the teachers. Cross-case assertions demonstrated that senior leadership hindered technology adoption by making the decision to discontinue teachers' adoption projects and standardising teaching across papers so that teachers could not include technology in lessons, and by removing technology from a faculty's strategic teaching direction. The pressure point senior leadership occurred for teachers when their goals for adopting or continuing to teach with technology were rejected or discontinued by senior leaders' decisions. This evidence will be discussed to demonstrate that teachers became disappointed and occasionally resentful when they felt that their perspectives and rationales for teaching with technology were not valued or listened to by senior

leaders. Subsequently, teachers became despondent about working on innovative teaching projects because of the uncertainty of senior leaders' future decisions, and they became less motivated to learn more about the technology they were currently using and reluctant to adopt technology in the future. Consequently, senior leaders' actions of discontinuing teachers' innovative goals kept them restricted to a traditional lecture model of teaching, which as the case studies identified, had negative implications for student engagement; a concept signalled as important in the current AUT strategic plan.

Focus on the innovation-decision process

A key theory in my research is Rogers's (2003) innovation-decision process, which was discussed in chapter 2, part 2. The innovation-decision process posits that individuals or groups progress through five stages when making choices to adopt or reject technology. The five stages are knowledge, persuasion, decision, implementation and confirmation. Rogers suggests that further studies are required to confirm whether the stages exist in educational contexts. My Pressure Point Framework demonstrates that some but not all teachers in workgroups engaged with each of the five stages in the innovation-decision process. As a detailed analysis of the innovation-decision process was not the purpose of this research, I was not able to identify whether teachers engaged with elements that correspond to each of the five major stages. Instead, my research advances the notion that pressure points impede teachers in workgroups from successfully completing a stage or becoming confident with the elements in that stage before moving onto the next.

The case study narratives demonstrated that workgroups that engaged in authoritative decision-making processes did not begin at the knowledge stage (stage 1) of the innovation-decision process. Instead, the persuasion and decision stages (stages 2 and 3) were combined for these workgroups. The process tended to begin with the decision (stage 3) to adopt, during a presentation when teachers were informed by the decision maker of the technology selected. The decision maker then attempted to persuade (stage 2) teachers that it was a beneficial decision. Because of the pressure point authoritative decision-making, many of these teachers felt left out of the decision-making process and so did not accept the decision makers' message that the selected technology would be beneficial for their teaching practice.

This research aligns with that of Rogers, who suggests that each stage is not sharply distinctive. The case study narratives identified that teachers do not work through each stage in a linear fashion, completing one stage before moving onto the next. Because of the pressure point pedagogical development, many teachers were still grappling with the

development of technical skills and pedagogical development at the knowledge stage (stage 1) when they implemented the technology in the classroom at the implementation stage (stage 4). Because of the pressure point virtual space, most of the teachers found it difficult to conceptualise teaching in virtual space. This caused stress for some teachers who had a limited time frame of a few weeks in which to adopt technology. These teachers became overwhelmed with the change required to accommodate technology in their teaching practice. Conversely, it was noticeable that CoP workgroups (case 2) were not under any pressure to adopt technology within a specified time frame and this added to their confidence to achieve their project goals. This finding suggests that it would be beneficial to extend the adoption time frame, allowing teachers a minimum of one semester to prepare for implementation. Although it would mean that progress is slower, teachers would have time to move confidently through the stages and therefore have a better chance of implementing technology-enabled learning in their teaching practice.

Rogers suggests that individuals or groups are likely to discontinue or reject technology at the decision stage (stage 3). However, this research found that because of the pressure point senior leaders, discontinuance occurred at the confirmation stage (stage 5). At the confirmation stage, some workgroups had data demonstrating the benefits of the technology for students' learning and had determined to continue with it. However, instead of reinforcing teachers' decisions to continue using the technology for teaching, some senior leaders discontinued teachers' projects and this prevented them from teaching with the technology. Being unable to control the outcomes of their projects, teachers become disillusioned about instigating further adoption projects.

Focus on social constructionist dialogic practice

As discussed in the preceding section, teachers in workgroup contexts experienced tension, which resulted in pressure points as they progressed through the innovation-decision process. Conflict may be managed between professionals to seek a more positive outcome through the social constructionist notion of dialogic practice (Gergen, 2015). Dialogic practices, as explained in chapter 3, can support technology adoption stakeholders to focus on understanding and acknowledging differing interpretations of problems that lead to pressure points during the innovation-decision process.

The following dialogic practices have been aligned with each pressure point. First, the notion of transformative dialogue is underpinned by the concepts of co-action and welcoming differences, and may be considered as an approach to overcoming the pressure point authoritative decision-making. The notion of engaged relationships is

underpinned by the concepts knowledge, reasoning and motivation, and is suggested to address the pressure point pedagogical development. The pressure point virtual space may be addressed by the notion of relational education and is supported by the concepts Web 2.0 technology, teacher as facilitator and collaborative learning. Finally, the notion of collective intelligence in organisations may have the potential to address the pressure point senior leadership.

In the following sections, I begin by discussing the cross-case assertions that led to the conceptualisation of each pressure point. Then I explain the potential for dialogic practice to overcome that pressure point. I begin with the pressure point authoritative decision-making.

Pressure point: Authoritative decision-making

The pressure point authoritative decision-making occurred when teachers felt left out of the decision-making process, leaving them feeling less motivated to continue with the project. The evidence will be discussed to demonstrate that teachers who engaged in authoritative decision-making were less motivated to adopt technology than those who engaged in collective and optional decision-making.

Optional and collective decision-making

The cross-case assertions demonstrate that teachers who were involved in the decision-making process were motivated to adopt technology. Teachers (cases 2, 3, 4) were motivated to adopt a technology when they engaged in optional and collective decision-making. Rogers (2003) describes optional decision-making as a decision made by individuals and collective decision-making as a decision made by group consensus. These teachers were positive about their decision to select a specific technology and excited about the process they were embarking on. The long-view teachers (case 4) engaged in optional decision-making and they were also motivated to adopt technology.

Teachers (cases 1, 2, 3) selected technology either for pedagogical reasons or to experiment with technology. Teachers in cases 3 and 4 believed that technology had a role in improving the learning process for students. Therefore, they tended to select technology to solve a pedagogical problem and to improve their teaching practice. Similarly, the long-view teachers (case 4) had come to view technology as integral to their beliefs and a natural part of their teaching practice. These findings add to the research that indicates teachers tend to adopt technology for pedagogical reasons (Bennett, 2014; Kregor et al., 2012), to accommodate their teaching beliefs (Lei &

Morrow, 2010; Porter & Graham, 2015) and because they are passionate about it (Ng'ambi, 2013).

Authoritative decision-making

Teachers (cases 1, 2, 3) who engaged in authoritative decision-making lacked the motivation to adopt technology. Rogers (2003) describes authoritative decision-making as a decision made by individuals who have the authority in an institution to do so. The evidence demonstrates that the lack of motivation occurred for two reasons. First, teachers said that they were unclear about the reasons given by the decision makers for the selection of the technology, and second, teachers felt left out of the decision-making process. Consequently, teachers found themselves at odds with the workgroup's decision maker.

Teachers wanted to understand the reasons why they should be invested in making the adoption process work. However, teachers (cases 1, 2, 3) were unclear about the reasons given by decision makers for their selection of technology. This lack of clarity around decision-making left teachers to construct their own reasons for the decision maker's selection of technology. None of the reasons teachers constructed were to do with pedagogy or improving teaching. Instead, teachers tended to construct pessimistic reasons for the decisions, such as financial reasons, to make classes larger or, as Macie (case 1) suggested, because it was a favourite technology of the decision maker. However, teachers expected the reasons for adoption to be based on pedagogy or improving teaching and learning. When this expectation was not realised, they were not able to align the idea of using technology for teaching with their current teaching beliefs. Instead, there was a perception that management put their own needs before teachers and they tended to dwell on these negative aspects throughout the adoption process.

Teachers wanted to be involved in the decision-making process to adopt a technology. Teachers (cases 1, 2, 3) perceived that not being involved in the thinking around making the decision created a need for more discussion on how to implement the technology for teaching. Teachers viewed the need for discussion as a necessary part of understanding how to implement the technology effectively for teaching and learning. Although teachers wanted to be properly involved in decision-making, they indicated that they did not necessarily want to take control of the adoption process. For example, Veda (case 1) indicated that there was the potential for teachers and decision makers to work together to make decisions. Therefore, they wanted the decision maker to acknowledge that their experiences and ideas could add value to the decision-making process. These teachers

perceived that when they made everyday decisions about teaching, they contributed to the way the university is viewed in terms of its learning and teaching strategy. This suggests that teachers saw the decision-making stage as an important opportunity for them to contribute to teaching innovations in the university.

Teachers (cases 1, 2, 3) who engaged in authoritative decision-making workgroups were unable to reconcile the conflict that occurred between themselves and the decision makers, and this led to their reluctance to adopt the mandated technology. This evidence confirms institutional studies that found top-down, authoritative decision-making negatively affects teachers' beliefs and motivations, and can result in teachers becoming reluctant to adopt technology (Sadaf, Newby, & Ertmer, 2012; Straub, 2009). The section below discusses the notion of transformative dialogue as having the potential for addressing this pressure point.

Transformative dialogue

One option for addressing the pressure point authoritative decision-making is the social constructionist dialogic practice of transformative dialogue. Underpinned by the concepts of co-action and welcoming difference, transformative dialogue offers the potential to open up a space for teachers and decision makers to go beyond their differences and co-create new and mutually shared constructions of the decision-making process. The purpose of transformative dialogue is to "enable participants to generate new and more mutually congenial realities" (Gergen, 2015, p. 135). Therefore, if one person's perspective is one interpretation of a problem, then multiple interpretations will give us a more complete understanding of the problem at hand (Burr, 2003; Foss & Foss, 2012; Gergen, 2015). Without the specificity of the concepts co-action and welcoming difference, discussion may be a superficial process. Therefore, these underpinning social processes provide transformative dialogue with significant potential for addressing this pressure point. Transformative dialogue is characterised by the following principles:

- Participants agree to listen to each other with openness, and an intent to understand.
- Participants are viewed as equals as they explore each other's viewpoints.
- Participants instigate a power-with rather than a traditional power-over stance.
- Participants are aware that change only occurs when one makes the decision to change oneself.
- Participants enter the dialogue willing to be changed.

- The process "creates a more respectful, appreciative world in which to live", particularly in situations when participants encounter difference (Foss & Foss, 2012, p. 19).

Transformative dialogue is constructed through the social processes of co-action and welcoming differences. These processes are discussed in the following two sections.

Co-action

Transformative dialogue is the process of clarifying meaning when involved in co-action. Co-action is a social constructionist view of meaning making. Gergen (2015) argues that meaning is not made in an individual's mind; rather, it is the outcome of the relational process of co-action. Co-action is the process that underpins conversation. It occurs when people exchange words and coordinate physical movements, for example, a frown or a nod (Gergen, 2015). When people engage in conversation they make meaning by perceiving what the other has said, and then offering a response to clarify that meaning (Gergen, 2015). Because the meaning behind conversations or actions is rarely clear, attempts to clarify meaning are an opportunity to construct new possibilities (Gergen, 2015). For teachers, then, effective transformative dialogue relies on them understanding how the conversation they are engaging in is unfolding and when to act to ensure that they are truly considering other participants' perspectives. For teachers who are impeded by this pressure point, transformative dialogue is an opportunity for their views to be heard by the decision maker.

For teachers in this research, overcoming this pressure point requires an intention to understand each other's viewpoints and to reflect on responses to differing perspectives. Transformative dialogue provides teachers with the opportunity to understand reasons for the selection of a technology and to reconcile conflicting attitudes during the process of co-action with the decision maker. Through transformative dialogue, teachers are included in the decision-making process and are encouraged to express their viewpoints. When teachers and decision makers develop a better understanding of each other's viewpoints, teachers are more likely to feel part of the decision-making process and be able to move forward in a constructive manner rather than focusing on negative aspects of the decision-making process. Participants engaged in transformative dialogue come to understand the ideas and attitudes of the other; considering and contributing to the thinking about the issue at hand and, in doing so, developing a deeper, richer understanding of the complexity of the issue (Foss & Foss, 2012).

Welcoming differences

When responding to differences, people often try to change others, only tolerating their ideas in the hope that they will eventually come around to their own viewpoint (Foss & Foss, 2012). This is likely to occur because people interpret the world through their lens of self, which allows them to focus on what they want, and to fade out what they are not interested in (Foss & Foss, 2012). Therefore, despite engaging in co-action to bring about transformative dialogue, there will be times when decision makers and teachers are not able to reconcile their differences. Fortunately, the notion of welcoming difference provides an avenue for drawing on others' perspectives without necessarily embracing them (Foss & Foss, 2012). For the workgroup settings in this research, welcoming difference involves recognising that teachers and decision makers might not be able to fully embrace each other's perspectives or decisions. Therefore, the intention to welcome differences during co-action is an opportunity to learn from others' perspectives, and reconsider and clarify ideas while developing a comprehensive understanding of the issue at hand. An assumption of transformative dialogue is that authoritative decision makers will have to view themselves and the teachers in workgroups as equals in the process. Welcoming differences requires one to consider others' voices as beneficial to one's thinking, rather than asserting one's authority over the other (Foss & Foss, 2012). The next section presents the evidence for the pressure point pedagogical development.

Pressure point: Pedagogical development

The pressure point pedagogical development occurred because many of the teachers were not provided with opportunities to discuss their approaches to teaching with technology, instead there was a focus on technical skills development. This evidence will be discussed to demonstrate that the development of pedagogical knowledge and technical skills in workgroup settings was insufficient to meet teachers' expectations, and for some, personal learning needs were not met..

Pedagogical development

The pressure point pedagogical development occurred because many of the teachers were not provided with opportunities to discuss their approaches to teaching with technology, instead there was a focus on technical skills development. This occurred because teachers across all workgroup contexts indicated that there were few pedagogical development opportunities. The case studies illustrated that most of the teachers (cases 1, 2, 3, 4) did not engage in any pedagogical development opportunities, while for others the opportunities were minimal. Few of the teachers (cases 1, 3) spoke of

engaging in any pedagogical development and few teachers (cases 1, 2, 3, 4) could provide examples of learning about pedagogical knowledge in their workgroups. Similarly, the long-view teachers (case 4) who adopted technology as individuals found it difficult to access pedagogical development and cited a lack of formal institutional workshops delivered by the ADU.

Pedagogical development was not a priority in workgroups. Instead, workgroups tended to focus on technical training. As Tane (case 1) suggested, pedagogy often got pushed to the side or was forgotten. Yet teachers' perceptions indicate that pedagogical development was not considered at all in many of the workgroups. This finding echoes several studies that highlight the imbalance between technical training and pedagogical development (Kirkwood & Price, 2013; Teräs & Herrington, 2014).

Yet teachers did recognise the need to engage in pedagogical development. Teachers (cases 1, 4) wanted to develop pedagogical understanding in order to change the way they teach to accommodate technology. For example, Veda (case 1) explained that the workgroup needed specific help with teaching and learning strategies as they recognised that new technology required a shift in teaching approaches. Omar (case 4) articulated a learner-focused conception of teaching; yet he recognised that he lacked specific pedagogical information to implement technology effectively for teaching. Recognising that he needed further knowledge is an indication of the pedagogical complexity that the addition of technology brings to teaching, even for experienced teachers. The lack of pedagogical development is a concern, because as de la Harpe and Peterson (2009) argue, teachers require a deep understanding of the theories of learning that underpin effective student learning.

Two teachers perceived that they engaged in pedagogical development activities. These teachers were Albert and Aroha (case 2), who indicated that informal conversation was a way of sharing practice with colleagues in CoPs. They each provided an example of how this occurred for them. The first example was from Albert (case 2), who described conversations as groups of teachers discussing how they were using technology in the classroom. The second example was provided by Aroha (case 2), who explained that the TAL requested the community to write blog posts about their practice. According to Aroha, the TAL viewed the blog posts as a way of sharing pedagogical practice with community members. The discussion and sharing of information on how teachers use technology is a characteristic of developing practice in learning communities (Buckley & Du Toit, 2010). However, the case study identified that the conversations tended to be

based on the development of technical skills, rather than having a pedagogical focus. This finding aligns with studies that have critiqued learning communities for elevating practice knowledge above theoretical knowledge (Denscombe, 2008; Krause, 2012).

Technical skills training

The evidence demonstrates that despite the focus on technical training in workgroups, many teachers requested further opportunities. Some teachers perceived that the training was inadequate or ineffective and there was a lack of access to technical training in general. Teachers (cases 1, 2, 3) were reliant on TALs to provide training. There was no consistency across the workgroups regarding technical training. For example, training was provided for workgroups by TALs (cases 2, 3), IT services technicians (case 1) or a single workgroup member who had a good understanding of the functionality of the technology (cases 1, 2, 3). For Macie's (case 1) workgroup, training comprised the PowerPoint demonstration that the head of school gave when informing them that they would be adopting that technology. Most of the teachers requested more training and different types of training to meet their needs. This evidence demonstrates that the provision of technical training was fragmented and in some instances inadequate. This finding resonates with the work of Birch and Bennet (2009), who found that technology-related development is not effective or customised for teachers. The teachers (case 2) in the CoP received technical skills training from their CFLAT advisor. Despite Aroha (case 2) requesting additional training, these teachers learned technical aspects from their workgroup members and they were satisfied with this process. This may be because the teachers in case 2 did not have a time limit in which to adopt a technology. Albert's (case 2) goal of learning how to post an image in Twitter over the course of a semester could easily be achieved and with a minimum of stress. Other workgroups had deadlines for implementing the technology. Teachers (cases 1, 3) had a limited time frame in which to learn how to teach with and implement a technology, and this added to their difficulties. This evidence suggests that CoPs had fewer time restrictions than the other workgroups.

It is not unreasonable to suggest that teachers should take control of their own technical skills development rather than rely on others. However, despite seeking other opportunities, teachers found it difficult to access the development they required beyond what was offered to them in their workgroups. The long-view teachers (case 4) found it difficult to access any technical skills training or to learn about new technology, and cited the lack of an institutional programme of learning. Many of the teachers accessed online resources and videos; however, some teachers (case 4) found that self-learning technical skills was a slow process of trial and error – an approach that they found unsatisfactory

and that did not meet their personal learning style. The lack of institutional workshops also had implications for part-time teachers. Tane (case 1) described a situation in which they received no training at all, because part-time teachers could not attend the workgroup meetings during the day. Instead, they were advised to phone IT services technicians for help as required. Not surprisingly, this unsystematic and inadequate approach to technical training meant that some teachers found the technology difficult to learn, and those who provided the training did not identify teachers who were having difficulties. Case 4 teachers and other teachers (cases 1, 2, 3) who were looking for more instances of professional development have highlighted the absence of formal opportunities for teachers in the university.

Lack of support in workgroups

The evidence demonstrates that despite adopting technology in workgroups, teachers' personal learning needs were not being met. The evidence suggests this occurred for two reasons. Firstly, support varied between workgroups. During the interviews, many of the teachers did not mention their workgroups; instead, they seemed to work as individuals within the groups, for example, Gala (case 2). Macie (case 1) perceived that members of her workgroups behaved as if they were in competition with each other. It appeared that no one in the workgroups noticed individual teachers struggling. The case studies demonstrated that the TALs paid little, if any, attention to the knowledge and skills teachers were, or were not, developing. For some teachers (cases 1, 3), the training was so inadequate that they were still learning to use the technology after it had been implemented in the classroom. Support between colleagues in workgroups varied, and some members of Macie's (case 1) workgroup were competitive rather than supportive. For Macie, the extreme difficulties she experienced in understanding technology resulted in a loss of confidence as a teacher and her ability to develop new skills. Because of a lack of confidence, Macie had been relieved that she would be adopting technology as part of a workgroup, yet she found her colleagues were non-supportive. Macie's self-image was affected as she developed the belief that she was not capable of implementing technology, and her growing anxiety and confusion led to resistance.

Examples from the case studies demonstrated that TALs deemed an initial demonstration of the technology or the provision of one training session as sufficient.

Secondly it seemed that some TALs did not take teachers' professional development needs seriously, for example, deeming the demonstration of a technology or one training session as sufficient. Jane (case 3) identified that their TAL had "flicked them" some

articles on m-learning. The TAL had emailed the teachers some articles; however, Jane's use of the phrase "flicked them" indicates that she perceived the TAL did not view pedagogical development as a priority. Additionally, Akela (case 3) described instances of inadequate and ineffective professional development that had long-term negative implications for her workgroup and their ability to teach with technology. Two years after their LTDF project had begun, Akela and her team lacked technical skills and were anxious about having to support their students without the help of their TAL. In the next section, I discuss the notion of engaged relationships as a potential avenue for addressing this pressure point.

Engaged relationships

One option for addressing the pressure point: pedagogical development, is the social constructionist dialogic notion of engaged relationships. Gergen (2015) argues that the co-construction of knowledge is more effective when people develop engaged relationships. The potential for the notion of engaged relationships to address this pressure point, lies in the specific actions that elevate the process of sharing practice or conversation in workgroup settings. These specific actions are developing knowledge, reasoning with that knowledge, and being motivated to support group members (Gergen, 2015).

Knowledge and reasoning

Learning communities have been critiqued for the way in which teachers acquire knowledge, suggesting that sharing of practice is not sufficient to develop the theoretical base required for effective teaching (Denscombe, 2008). Gergen (2015) argues that engaged relationships develop as workgroup members collaborate to co-construct new knowledge during an adoption project. Therefore, having workgroup members focus on the development of new knowledge, as well as sharing practice, is key. The cross-case assertions support the development of a curriculum for technology-enabled learning as one avenue for focusing on pedagogical development in workgroups. A curriculum is a structured programme of study designed to support learners to achieve specific learning outcomes (Debowski, 2016).

Educational literature highlights a multitude of theories and principles for teaching and learning; however, few of these apply specifically to adult learning and university teaching. In making a comparison of course content for higher education programmes, Beaton and Gilbert (2012) identified five prominent concepts that appeared in 46 higher education certificate courses across NZ, Australia and the UK. They are reflective

practice, scholarship of teaching, constructive alignment, students' approaches to learning and assessment-driven learning. Additionally, Bates and Sangra (2011) argue that the following theories, concepts and skills are the minimum required for educators to teach effectively in higher education. They describe them as:

1. understanding different kinds of epistemological knowledge, for example, objectivism, the social construction of knowledge, and networked knowledge;
2. learning theories that are linked to epistemology, for example, behaviourism, cognitivism and the social construction of knowledge;
3. the biological basis of learning, which examines how the brain works in terms of memory, cognition and emotions;
4. the design of teaching, which includes assessing students' needs, learning outcomes, teaching strategies, application of theory to practice, assessment and course evaluation methods;
5. an examination of the relationships between learning technology, knowledge representation and theories of learning; and
6. strategies for technology selection, the functionality of learning management systems, Web 2.0 tools and other devices.

Concepts identified by Beaton and Gilbert (2012) may be integrated with those recommended by Bates and Sangra (2011) and emphasised during professional development activities because of their prominence in higher education certificates. The theories, concepts and skills described here can form the basis of a comprehensive curriculum for technology-enabled learning in ADUs.

Gergen (2015) argues that there is no universal knowledge to master; therefore, it is better to reason among many forms of knowledge that will support people to act more effectively. Teachers' conceptions of and approaches to teaching may be challenged by reasoning with knowledges to develop one's own personal perspective (Bain, 2004; Entwistle, 2009). Working with this idea, opposing epistemologies and learning theories described in the previous section offer teachers in workgroup settings opportunities to explore and reason through multiple perspectives of knowledge. A social constructionist perspective posits that teachers will develop differing personal philosophies for technology-enabled learning.

Motivation

Supportive workgroups provide the motivation for teachers to reason with new theories and strategies, testing and evaluating their developing ideas about technology-enabled learning. A social constructivist learning approach focuses teachers on learning how to learn, to reflect and judge their own thinking and skills development (Bain, 2004). Workgroups that have developed engaged relationships are more likely to become aware of teachers who are having difficulty coping with the adoption process and be motivated to support them to ensure their learning needs are met. As discussed in the preceding sections, some teachers experienced extreme difficulties in developing technical skills and pedagogical knowledge for technology implementation. A traditional psychological approach will locate the difficulty within the mind of learners, looking inside them, at their motivation, attitudes and cognition as an explanation for their problems, and holding them responsible (Burr, 2003). Yet social constructionism challenges this approach, "as the proper focus of [our] enquiry [is] the social practices engaged in by people, and their interactions with each other" (Burr, 2003, p. 9). From a social constructionist perspective, these teachers' issues are not a problem of mindset; instead, they occur because of the constructions that have emerged from the ongoing interactions between themselves, other workgroup members and TALs as they interacted during the innovation-decision process. Teachers' learning needs may be better supported when workgroup members develop engaged relationships.

Educational development or the process of improving university teaching practice should support academic teachers to "imaginatively acquire knowledge about learning and teaching" (Ramsden, 1993, p. 87). Ramsden (1993) suggests that all those involved in education, for example, teachers and policy makers draw on both formal and informal theories to guide their work. New university teachers are likely to hold various informal theories and if they undertake some form of professional learning, such as a post-graduate certificate or accreditation process, then this learning may expose them to a deeper understanding of formal learning theories. However, this is not a given, and in my research I found that there was quite a variation in terms of the extent to which teachers had been exposed to formal theories. Therefore, Ramsden (2003) argues that educational developers should "understand how university teachers think, and why they use the theories that they do" (p. 95). One way of doing this when adopting technology is through discussion in workgroup settings. Ramsden (2003) offers a different way to think about informal and formal theories when he suggests that although informal theories in education "work at individual and group level" (p. 91) they are problematic, and that formal learning theories "are simply different from, not better than, vernacular ones" (p.

94). However, while Ramsden argues that teachers should develop a knowledge of student learning theory, he warns that teachers are likely to be conflicted about their informal theories in relation to such a formal theory. This was certainly the case in my research, where teachers were motivated to adopt technology to engage students better in their learning, yet found that students did not always engage as expected. Every professional learning opportunity is different (Debowski, 2017) however drawing on the wider literature to discuss and create strategies for learning and teaching with technology (Dalgarno, Bennett, Henderson, & Kennedy, 2014) is one method for teachers in workgroup settings. For example, teachers may engage in discussion of the learning benefits of twitter feeds in lectures by drawing on the wider literature about the value of peer feedback (Dalgarno et al., 2014) and importantly their own experiences. In this example, both informal and formal theories of learning and teaching will be examined by teachers. My research has shown that learning takes time, and teachers need this time to reflect on their informal theories of learning in order to become comfortable with new ways of teaching.

This concludes the discussion on the pressure point pedagogical development. The next section presents the evidence for the pressure point virtual space.

Pressure Point: Virtual space

The pressure point virtual space occurred because teachers did not consistently change their teaching approaches to account for learner-focused, pedagogically determined strategies that would support students to construct knowledge in virtual space. This evidence will be discussed to demonstrate that teachers were unable to conceive of teaching in virtual space, had difficulty understanding how their students learned with technology, and lacked the confidence to regulate students' use of social media and digital capture of audio and images in the classroom.

The nature of students' learning

The following evidence indicates that teachers required an understanding of how learners construct knowledge in virtual space. Teachers (cases 1, 3) found it difficult to understand the nature of students' learning processes. They suggested that technology had changed the way students approached learning for the following three reasons. First, students used their mobile phones to repetitively search for information rather than remembering information. Second, they disengaged from classroom discussion, knowing they could read online material later or could record the lecture to listen to later. Finally, the personal apps on mobile devices distracted students from learning in class. For example,

Macie (case 1) was increasingly concerned over her inability to gauge whether students were using technology in the classroom for learning or for personal use. This evidence confirms research on teachers' perspectives of mobile learning by Handal et al. (2013), who found similar factors.

Some teachers tried to engage students by suggesting social media for learning activities. However, teachers (cases 1, 2, 3) experienced resistance from some students who viewed social media as their private space. For example, Albert (case 2) rejected social media as a teaching strategy when one student resisted. This correlates with other studies that found students do not want to use their personal social media spaces for learning (M. G. Jones & Harmon, 2011; Selwyn, 2009). As teachers could not persuade some students to use social media for learning, it may indicate that the teachers lacked the knowledge to persuade students of the benefits of social media for learning, or to suggest alternatives to students' private social media spaces, such as a class blog or wiki. Additionally, teachers and students may view social media differently from the Blackboard LMS because they do not see it as a formal learning environment. These teachers (cases 1, 2, 3) did not know what authority they had to direct students to undertake learning in social media spaces. Similarly to other teachers, Rosie (case 1) found students' decisions to use or not use technology confusing.

Approaches to teaching with technology

The following evidence suggests that teachers did not change their approaches to teaching for technology. Teachers' approaches to teaching and learning are representative of the strategies teachers adopt for their teaching practice (Englund et al., 2017). Like several other studies investigating teachers' approaches to teaching with technology (Englund et al., 2017; Kirkwood & Price, 2013), this research identified that teachers did not change their approaches to develop pedagogically determined strategies for teaching with technology. For example, teachers (cases 1, 2, 3) with teacher-focused approaches continued to develop corresponding teaching strategies. For example, Jane (case 3) thought that she could meet students immediate learning needs by showing them diagrams on her iPad as she moved around the classroom. Additionally, other teachers were inconsistent with the strategies they developed, indicating that they did not understand how to construct a pedagogically determined strategy. For example, although teachers (cases 1, 2, 3) demonstrated that they were thinking about learner-focused approaches to teaching, they fluctuated between developing pedagogically determined and technologically determined strategies. For example, Akela's (case 3) workgroup developed video demonstrations of techniques for students to watch before class, but

were disappointed when students did not view them. This workgroup had relied on video technology to motivate students' learning. As discussed in chapter 2, part 4, this finding aligns with Clark's (1983) argument that technology does not affect student achievement; instead, it is the pedagogical strategy that makes learning with technology effective.

Over time, the long-view teachers (case 4) had developed a learner-focused approach to teaching with technology. This contrasts with the research of Englund et al. (2017), who found that experienced teachers were less likely to change their conceptions of teaching than novice teachers. These teachers (case 4) had changed their teaching role from teacher to facilitator, one that is encompassed in a social constructivist approach to learning (Gergen, 2015; Selwyn, 2011). By taking a facilitator role, they were more focused on what the students were doing to learn rather than on their own teaching plans (Trigwell, 2011), and this focus enabled them to develop learning strategies in class according to students' needs. By taking a facilitator role, these teachers (case 4) who held learner-focused conceptions of and approaches to teaching aligned with Trigwell's (2011) model of university teaching.

Conceptualising teaching and learning in virtual space

The following evidence indicates that teachers were not sure how to conceptualise m-learning for teaching. Mobile learning or m-learning requires students to use personal mobile devices that enable learning in virtual space. Most of the teachers (cases 1, 2, 3) were unable to conceptualise m-learning in terms of a teaching approach and they had difficulty understanding how to use mobile devices and social media for teaching and learning. The long-view teachers (case 4) also had little experience of m-learning and did not view it as an approach they would use for teaching. This finding is similar to those of other studies that argue teachers lack an understanding of social media and mobile learning (Kukulska-Hulme, 2012). Many of the teachers (cases 1, 2, 3, 4) were concerned that m-learning would encourage students to take surface approaches to learning, whereas other teachers (cases 2, 3) suggested that social media could encourage students to take deep approaches to learning. What these teachers had in common was that they could not conceptualise how they would encourage students to take deep approaches to learning with technology.

Teachers (cases 1, 2, 3, 4) perceived m-learning as students directing their own learning, but they were concerned that students would not be motivated to self-direct their learning. Knowles (1972) argues that adults need to be perceived by others as self-directed. When students cannot direct their learning, a tension arises between the teacher

and their self-concept as an adult, and they may react with resentment and resistance that interferes with their learning (Knowles, 1972). Akela (case 3) provided an example of students not attending classes to complete assignments that were being created on their mobile phones. Additionally, many of the teachers (cases 1, 2, 3, 4) perceived that face-to-face learning would provide better opportunities for student participation than m-learning. Similar to the findings of a study on teachers' perspectives of m-learning undertaken by Rambe and Nel (2015), these findings indicate that teachers were uncertain about the usefulness of m-learning for teaching and learning. Indeed, Ramsay and Terras (2015) argue that teachers need to understand students' behaviour across educational contexts, including how students learn with mobile devices, and how to manage and structure that learning across multiple learning environments.

Authority to regulate digital capture of audio and images

The evidence demonstrated that teachers were ill at ease about students' digital capture of audio and images in the classroom. Teachers in all case studies were perturbed that they lacked the ability to control images or recordings digitally captured in the classroom by students with mobile devices. This finding resonates with research by Ibrahim and Howarth (2014), who found that few UK universities are ready to respond to the challenge of lecture capture in classrooms. Teachers (cases 1, 2, 3) were also concerned that students could record them in the classroom and then post the files online. These teachers' fears are confirmed by Ibrahim and Howarth (2014), who reported incidents of unauthorised, subversive and offensive videos (edited or reproduced) of teachers being uploaded to social network sites in the UK. A notable example in an NZ context is of a university lecturer who sued his employer for failing to deal with students who cyber bullied him (Dougan, 2015). The teachers in this research suggested that a university policy could support them to approach the issue of controlling students' ability to record in the classroom. These teachers were unaware that earlier, in January 2014, AUT had developed a recording of lectures and seminars policy (AUT, 2014). This policy lays out the conditions under which students can record lectures and seminars. In these learning environments, AUT permits students to make audio recordings without seeking permission to do so. The conditions are that the recording is for that student's use only, and it must not be altered or published online. The ownership of the information contained within the recording belongs to the teacher, and the recording must be deleted by the student once its purpose has been met. Failure to comply with these conditions is regarded as a disciplinary matter. The conditions in this policy account for most of the concerns teachers expressed in this research. This policy demonstrates that AUT can be forward-looking in their support of teachers, unlike the institutions in Ibrahim and

Howarth's (2014) research, whose policy documents remain focused on intellectual property and data protection. In the next section, I discuss the notion of relational education as a potential avenue for addressing this pressure point.

Relational education

One option for addressing the pressure point virtual space is the social constructionist dialogic practice of relational education. As an alternative to the traditional lecture method of teaching, Gergen (2015) proposes the notion of education as a relational process, that is, teachers and students collaborating to co-construct knowledge. Social cultural theory suggests that learning in social situations matches today's society that has "a need for collaboration, teamwork, networks, and negotiation" (Gergen, 2015, p. 149). The primary focus of relational education is building relationships between students and teachers, and students and students. The secondary focus is on teachers' actions, that is, the development and facilitation of learning and teaching strategies. In discussing this pressure point, teachers' actions are focused on the development of pedagogically determined strategies for virtual space.

Of primary importance to TALs is knowing when teachers have changed their approaches to teaching with technology. Torrisi-Steel and Drew (2013) argue that evidence of teachers' transformed pedagogy are effective practices that engage the student in the active construction of knowledge. Relational education is underpinned by the social processes of Web 2.0 technologies, teacher as facilitator and collaborative learning. The concept of meaning making, social constructivist learning theory and principles for adult learning align with relational education. As they were explained in detail in chapter 2, part 3, this section will focus on facilitating collaborative learning in virtual space and the construction of pedagogically determined strategies.

Virtual space

The collaborative nature of virtual space aligns with the social constructionist notion of relational education. The affordances of social media emphasise personal and collaborative learning (McLoughlin & Lee, 2010), encouraging people to construct knowledge rather than passively view information. The cross-case assertions identified that teachers found it difficult to conceptualise teaching in virtual space. Moreover, the case studies demonstrated that teachers tended to think about each new technology as another one to be learned and each requiring a new pedagogy. In addition to taking account of the benefits and drawbacks of technology, I suggest that teachers conceptualise each new technology as a virtual space. Therefore, in light of its

affordances they can construct and facilitate pedagogically determined strategies for that virtual space.

Teacher as facilitator

The primary aim of teachers as facilitators is the development of relationships between themselves and students, and students and students (Bain, 2004; Gergen, 2015). The goal of teachers as facilitators is to support the process of learning, and involves creating the conditions for students to learn (Bain, 2004; Gergen, 2015). In a facilitator role, teachers' knowledge becomes a resource, and students are encouraged to direct their learning. Gergen (2015) argues that the teacher as facilitator should be conscious of the relational process, for example, being aware of relationships between students, similarities and differences in discussion, unspoken tensions, conversation that is stalling and whether pertinent, new questions are being raised. The aim of teacher as facilitator is to assist and deepen the learning process (Gergen, 2015).

Teachers who deliver a lecture in the morning may find themselves teaching in a virtual space such as the Blackboard LMS in the afternoon. What was not clear for teachers in this research was how students learned with technology. It is likely that students' ability to construct knowledge is enabled or constrained by teachers' approach to teaching, the affordances of the learning environment and how they perceive that environment. McLuhan's (2013) premise that the message is the medium is useful for understanding the nature of students' behaviours in multiple learning environments, in particular, the notion that it is the learning process that is key to meaning making rather than the content.

In their personal lives, students understand that social media has been designed for knowledge construction using a variety of multimedia. Students are in control of their social media, constantly sharing life experiences while constructing knowledge based on their perceptions of the world. Conversely, traditional lecture theatres and classrooms, with their desks facing the front of the room, inform students that they are there to listen to a teacher who holds the knowledge. Students are rarely able to share their experiences and self-direct their learning as they would with social media in their personal lives. When teachers approach teaching with technology in teacher-focused ways, students lose the ability to collaborate with peers to construct knowledge that is meaningful to them. In this research, such teacher actions were exemplified in the way they perceived students as being disengaged in the classroom and repetitively searching for information on their phones.

Released from lecturing at the front of the classroom, the facilitator role provides multiple opportunities for teachers to develop relationships with students. When students are constructing knowledge, the teacher does not have to deliver knowledge. Teachers are free, for example, to engage in discussion with students, support them to develop metacognitive processes and provide feedback before assessments (Bain, 2004). These facilitator actions also apply in virtual space. How to encourage students to take deep approaches to learning in virtual space is discussed in the next section.

Collaborative learning in virtual space

The social process of collaboration places emphasis on the development of relationships between students and students, as well as sharing of knowledge among students (Gergen, 2015). Key to collaboration in virtual space is teachers' learner-focused approaches to teaching that encourage students to interact with each other (Garrison & Vaughan, 2008). The findings demonstrated that though teachers in workgroups espoused learner-focused approaches to teaching, the examples they provided revealed that they developed both teacher-focused and learner-focused learning strategies. This inconsistency suggests that teachers did not understand the elements of pedagogically determined strategies.

I have drawn on concepts from various sources to highlight three elements that can support teachers to construct pedagogically determined strategies for virtual space. These concepts and sources are learner-focused conceptions of and approaches to teaching (Bain, 2004; Entwistle, 2009), pedagogically determined strategies (Kirkwood & Price, 2013) and interactive online learning strategies (Lynch, 2002). Pedagogically determined strategies are described by Kirkwood and Price (2013) as the active use of technology and the concepts of knowledge building and sharing; however, they do not provide an example of how to construct strategies for virtual space. Practically, Lynch (2002) argued that students' interaction could be encouraged by designing learning activities that include two elements: communication and thinking processes. By focusing on higher order thinking processes, teachers can support students to engage with knowledge to change their mental models through reasoning and reflection (Bain, 2004; Entwistle, 2009). These concepts are synthesised in the following section to demonstrate the construction and facilitation of pedagogically determined strategies for technology-enabled learning.

Building on the work of Lynch (2002), pedagogically determined strategies for virtual space should be designed to include each of the following elements:

- higher order thinking skills, for example, analyse, interpret, evaluate, critique, create and propose;
- communication, for example, speaking, questioning, listening, writing, giving feedback, commenting and reading; and

Drawing on these elements, teachers can design pedagogically determined strategies that encourage students to develop reasoning skills as they engage with higher order thinking and communication skills. Each of these elements should be included in the construction of pedagogically determined strategies. Next, I analyse two of the teaching strategies developed by teachers in this research to demonstrate how they were constructed as pedagogically determined or technologically determined strategies using the criteria above.

Pedagogically determined strategy: Albert (case 2) utilises Twitter as a catalyst for engaging students in the development of critical thinking skills. At the end of a lecture, Albert requires students to send via Twitter an image that sums up their view of the lecture to all students in the class. In the next session, he asks students to defend their image while peers ask questions. Here, students are developing higher order thinking skills, they are interacting through presenting and questioning, and they have used their mobile devices authentically to share images and to create a record of learning that can be viewed for reflection purposes at another time. This strategy could also be facilitated in a virtual space, such as a wiki (Mason & Rennie, 2008).

Technologically determined strategy: Akela (case 2) utilises the affordances of video to produce demonstrations for students to view before class. However, Akela was disappointed when students were not motivated to view the videos her workgroup had created before classes. I suggest this is because watching a video will not engage students in higher order thinking, or provide the opportunity for peers to interact or give them an opportunity to communicate or construct knowledge with a device.

Pedagogically determined strategy: Pedagogically determined strategy: I will explain how Akela's video can become effectively integrated with Kirkwood & Price's (2013) notion of a pedagogically determined strategy, as described in their model that demonstrates relationships between conceptions of teaching, approaches to teaching and approaches to teaching and learning with technology, as discussed in chapter 2. Akela could ask students to view the video and analyse the elements of the demonstration. Or they could critique the demonstration according to a set of criteria, which could have been developed by groups of students. Akela could ask students to discuss their analysis and

judgements in each group's wiki. Another possibility would be to share each group's thinking in the class wiki. Alternatively, Akela could ask students to practise the techniques demonstrated on the video. Next, the students make a video of themselves carrying out a similar demonstration. Each student's video would be posted in the group wiki and group members could critique each peer's demonstrations using the criteria they had previously developed. The wiki provides a record of each of the groups collaborative learning processes. In their own time, students can view peers' thinking and reflect on their own learning in relation to others. Having completed one of these learning strategies, students would be well prepared to discuss the demonstration when attending the upcoming class.

This ends the discussion on the pressure point virtual space. The next section presents the evidence for the pressure point senior leadership.

Pressure point: Senior leadership

The pressure point senior leadership occurred for teachers when their goals for adopting or continuing to teach with technology were rejected or discontinued by senior leaders' decisions. Furthermore, teachers became disappointed and occasionally resentful when they felt that their perspectives and rationales for teaching with technology were not valued or listened to by senior leaders. This evidence will be discussed to demonstrate that adoption was hindered when senior leadership discontinued workgroups' projects, standardised teaching plans that excluded technology and excluded technology from a faculty learning and teaching strategy.

It is important to note that decisions made by senior leadership were not a focus of this study; therefore, I cannot identify why they made the decisions that they did. I can only interpret the perceptions of teachers as told to me. The senior leaders referred to within this pressure point were not the same people as the decision makers (case 1) discussed earlier in the section on authoritative decision-making. The senior leaders discussed in this section were faculty senior leadership, a head of school and a head of department. That senior leadership could be a pressure point in the technology adoption process was an unexpected finding of this study. Despite not having an allocated role in any of the teachers' adoption projects, senior leaderships' actions disrupted the process for three teachers across cases 2 and 3 who adopted technology in workgroups, and one teacher in case 4 who adopted technology as an individuals. Teachers became frustrated when they saw their efforts discontinued and some lost the motivation to adopt further technology.

Adoption projects were discontinued

Teachers (cases 2, 3) described instances when a senior leader stepped in to stop them from continuing their technology adoption projects. Tammy (case 2) explained how a senior leader discontinued two technology adoption projects undertaken by her workgroup. The teachers viewed both projects as successful and beneficial to students; therefore, they felt despondent when they were issued directives to discontinue the projects, one after the other. However, senior leaders' decisions to discontinue these projects meant that students were unable to benefit from technology-enhanced learning.

Jane (case 3) explained her perception that a senior leader disliked the technology her workgroup was teaching with and so issued a directive to stop using it. Jane's workgroup had surveyed the students using the technology, and the results showed that the students were benefiting from the using the technology for learning. Therefore, the senior leader's decision to discontinue the adoption project was not constructive for students. During the interview, Jane had expressed her enthusiasm for implementing technology for teaching; however, she explained that the discontinuance decision had caused her workgroup to lose motivation to adopt further. The notion of 'invisible success' (Whitworth, 2012) describes a situation in which, depending on their perspectives, some stakeholders will deem an adoption project successful and others will not. These teachers viewed their projects as successful pedagogically and beneficial to students, yet it appeared that the senior leader who discontinued them did not hold the same views as the teachers. Consequently, despite teachers' adoption projects being assessed as successful, they suffered from 'invisible success', which meant that their efforts may not have been highlighted in research on adoption projects.

Three teachers (cases 2, 3) expressed their disappointment, and occasionally resentment, that a senior leader would not listen to their rationales for using technology in their teaching. Some felt that it was affecting their professional sense of self as they were less able to determine how teaching occurred in their classrooms. During the interviews, three of the teachers asked for the recording to be stopped, and they went on to express their views off the record. These private views have not been included in this study. My sense is that these teachers spoke off the record because they wanted to alleviate the feeling of injustice from being unable to assert their autonomy in the classroom.

Traditional teaching is standardised

The evidence illustrated that senior leadership could stop teachers from implementing technology for teaching. A senior leader mandated that teaching between classes be standardised, so that teachers were no longer able to prepare their own lessons. Aroha

(case 2) described how the paper coordinator would write the lesson plan for the teachers, thus dictating the content and method, and ensuring that technology was not included. Moreover, Aroha was directed by a senior leader to stop posting recordings of her lectures on the Blackboard LMS because he felt that it would discourage students from attending her classes. These are two examples of a senior leader's beliefs about teaching and technology interfering with a teacher's efforts to adopt technology. Importantly, Aroha felt that despite her seniority as a senior lecturer, she had lacked the authority to teach according to her beliefs. These examples highlight that a senior leader's teaching beliefs can have precedence over a teacher's beliefs and how they can stop teachers from even considering the use of technology for teaching.

In the case study university, senior leadership are responsible for the teaching workload allocation in the university. Yet it appears from the evidence that they perceive they have the authority to dictate how a teacher conducts learning and teaching in the classroom. Aroha (case 2) indicated that she could do nothing about the situation, and that she could only adopt technology for teaching if she had more power than a senior leader. Consequently, it appears that teachers may see themselves in a power play with senior leadership, not only over their agency to adopt technology for teaching, but also to have professional autonomy in the classroom.

The faculty teaching and learning strategy

Another way in which senior leadership can hinder or motivate teachers' adoption of technology is through the faculty teaching and learning strategy.

Omar (case 4), a long-view teacher, provided a unique opportunity to understand why some teachers continue to use technology without upgrading or adopting newer ones. Omar explained that in 2004, Faculty B had encouraged teachers to adopt the Blackboard LMS for teaching. This included the teaching format being restructured throughout the faculty, so that it followed a blended learning format, with each class timetabled for a lecture session and then an online Blackboard LMS session. However, in 2010, senior leadership changed. The new senior leadership reversed the blended learning format and teaching was returned to a traditional lecture, then a tutorial session. By removing the online learning session, Omar now had fewer opportunities to use Blackboard in his teaching, and so he decided that he did not need to upgrade to the new functionality it offers today. Instead, Omar explained that now he mostly used Internet websites in his lectures. Omar had observed that many of his colleagues no longer taught online because of the change of faculty teaching and learning strategy. Why teachers

discontinue or reject technology was highlighted in chapter 2 as an area for further examination. This research has identified that the lack of opportunity to teach with technology provides one reason why teachers do not upgrade or adopt new technology.

When a faculty learning and teaching strategy does not provide the space for technology in its teaching format, it makes it difficult for teachers to be innovative with technology or to implement it to any substantial degree. This evidence does not provide an answer to the question raised by Gunn and Herrick (2012) regarding how long a technology should be expected to be relevant in teaching, yet it does go some way to explaining why teachers may not upgrade technology or adopt newer technology. The literature has identified a lack of institutional strategic direction or vision for technology adoption as a barrier for teachers (Birch & Burnett, 2009; King & Boyatt, 2015; Singh & Hardaker, 2014). In this research, teachers were not aware of any institutional adoption strategy or vision for teaching with technology at AUT. Perhaps an institutional vision for technology-enabled learning could provide teachers at AUT with the support they need to overcome senior leaders' decisions. However, Trowler (2008) suggests that developing a single institutional vision is likely to be fraught with difficulties as faculties tend to follow individual paths. On the other hand, the findings from this study suggest that for these teachers, an institutional or faculty strategy may give them more autonomy to adopt technology and would support them with continuity of teaching practice. Based on the perspectives of these teachers, it appears that the senior leaders identified in this research followed their own beliefs regarding technology and teaching. Therefore, finding a balance for a strategic or faculty vision of technology is important for teachers who have experienced the reality that their project efforts can be overturned because of the beliefs of a single person.

The evidence presented here correlates with other studies that argue that stakeholders who have the power to accept or reject an innovation comprise a barrier to technology adoption (Gunn & Herrick, 2012; Whitworth, 2012). In this research, teachers spoke of their adoption projects being disrupted by senior leadership who directed them to discontinue the use of a technology or reject the idea of using a technology altogether. This study found that despite senior leadership not having an allocated role in the process, they had the authority to influence the outcomes of technology adoption projects, as well as guide the direction of technology use in teachers' classrooms. All the teachers who experienced disruption to the technology adoption process by senior leadership became less motivated to adopt again. The overall consequence of such interference was that teachers lost the motivation to adopt other technology. The

knowledge that they could be hindered by senior leadership at any point during the adoption process made teachers question whether it was worth the effort they were giving to the projects, particularly as they increased their workload. Singh and Hardaker (2014) suggest that higher education management have a role to play in encouraging e-learning adoption: providing support for resources, acting as role models, enhancing morale and creating a culture that promotes technology. However, as this research showed, senior leadership cannot be role models if their beliefs do not extend to the idea of technology-enabled teaching. Such a disconnect between senior leadership and teachers has implications for staff engagement in and out of the classroom, and may lead to the development of a university teaching culture that is demotivated towards technology adoption.

In the next section, I discuss the notion of collective intelligence as a potential avenue for addressing this pressure point.

Collective intelligence

The social constructionist dialogic practice of collective intelligence is one potential avenue for addressing the pressure point senior leaders. Collective intelligence describes the intelligence of an organisation as a whole and is predicated on how well subgroups coordinate their actions to achieve success for that organisation (Gergen, 2015). Drawing on Gergen's (2015) notion, the collective intelligence of AUT is dependent on how well subgroups such as faculties and departments coordinate their actions to achieve success for the organisation as a whole. The pressure point senior leadership demonstrated that for technology adoption, AUT could be viewed as functioning collectively unintelligently.

The notion that "knowledge and social action go together" suggests that "our constructions of the world are therefore bound up with power relations because they have implications for what is permissible for different people to do, and for how they may treat others" (Burr, 2003, p. 5). In this research, senior leaders were able to discontinue adoption projects and reject teachers' plans for adoption because of their positions of authority, leaving teachers feeling that they lacked autonomy in their teaching practice. Thus, the relationships between senior leadership and teachers were poor. Senior leaderships' realities did not reflect those embedded in the daily work of teachers (Gergen, 2015). The case studies demonstrated that senior leaderships' decisions to discontinue projects and standardise teaching were incomprehensible to teachers. The kind of relationships senior leadership created when they interacted with teachers left the teachers feeling discouraged and undervalued. By impeding workgroups' adoption

projects, senior leadership kept both teachers and students limited to a traditional lecture model of university teaching. Significantly, this pressure point left teachers feeling that they lacked autonomy in their teaching. Thus, the notion of collective intelligence relies on the development of practices for good coordination across faculties and departments to address this pressure point that impedes the implementation of technology-enabled learning at AUT.

Collective intelligence may be implemented at AUT by focusing on the relationships between teachers and senior leaders. Gergen (2015) suggests this may be supported through the notion of "human boundary-spanners" (p. 215). For this research, a boundary-spanner would be a member of a workgroup who takes on the task of communicating with a senior leader about the adoption project on a regular basis. To create a positive way forward, senior leaders should be cognisant of the potential bias of their views towards teaching and technology.

This concludes the discussion on the pressure point senior leadership. The next section discusses the implications of the cross-case assertions for approaches to professional development at AUT.

Implications for approaches to professional development

The purpose of this research was to investigate factors that impede teachers from adopting and implementing technology-enabled learning when engaging in socially situated learning approaches to professional development. This purpose arose from the restructure of CFLAT in 2010, which saw the replacement of the institutional workshop programme with socially situated learning approaches to professional development. This research examined the implications of that change and they are discussed next.

The cross-case assertions and pressure point finding suggests two key implications for approaches to professional development: firstly, that multiple approaches to professional development are required and, secondly, that TALs should plan for reflection and evaluation strategies in order to anticipate and diminish the impact of pressure points in workgroup settings.

Multiple approaches to professional development

The evidence demonstrated that socially situated learning approaches to professional development did not adequately overcome pressure points that impede teachers from adopting technology for teaching and learning. The identification of pressure points in

workgroup settings was an unexpected finding of this research. As discussed in chapter 2, part 4, there is a growing academic development body of literature on situated learning contexts in higher education. Professional learning workgroups are viewed as a method of driving changes in teachers' practice (Clavert et al., 2015; Cox, 2013). Therefore, I anticipated that this research would provide evidence of a change in teachers' approaches to teaching. However, although teachers adopted technologies, there was no evidence of change to their approaches to teaching. That they had difficulty conceptualising teaching and learning in virtual space demonstrates that teachers did not develop the pedagogical knowledge required.

Another unexpected finding of changing the professional development approach was that teachers who adopted technology as individuals did not have access to institutional professional development. Case study 4, the long-view teachers, was an atypical case as they were representative of teachers who did not adopt technology in workgroup contexts at AUT. The interview data demonstrated that changing from a workshop programme to a situated learning approach left a void in terms of institutional and formal professional development opportunities for teachers who are not part of workgroup settings at AUT. It should be noted, however, that CFLAT responds to teachers and groups requesting teaching and learning support. The long-view teachers lacked access to the ADUs professional development opportunities to extend their knowledge about implementing technology-enabled learning; instead they relied on faculty or school professional development days, internet information and videos, and discussion with colleagues. However, some found that self-directed learning of technical skills was too difficult or that it took too long; therefore, they requested access to institutional professional development. Additionally, across each of the case studies 1–3, teachers in workgroups requested more options for professional development. A common request was for more technical skills development; others identified the need for pedagogical development to cope with new teaching and learning environments.

The cross-case assertions and pressure point finding suggests that options for professional development be opened up to provide variety and choice for teachers undertaking technology adoption projects in workgroups settings and as individuals. This suggests that CFLAT should offer both workshop and situated learning approaches to professional development to meet teachers' diverse needs. Yet, TALs cannot be responsible for all of the teacher-related development required at the university. However, the influence of the pressure point senior leadership demonstrated that senior leaders' perspectives on technology adoption can hinder any approach to professional development. This

demonstrates that the responsibility for change in university teaching and the teacher education activities that underpin this process rests with AUT as an institution.

Reflection and evaluation strategies

Through the development of reflection and evaluation strategies, TALs can plan to anticipate and diminish the impact of pressure points in workgroup settings. Workshops are designed around structured learning activities that "encourage learning, reflection, practice and action planning" (Debowski, 2016, p. 72). However, Debowski (2016) argues that more time is required to consolidate teachers' current self-efficacy, attitudes and capabilities and for them to build new capabilities than workshops allow. Therefore, Debowksi suggests that teachers explore their practice, share problems and build strategies in professional learning communities that offer informal, supportive and socialised learning settings. While this has been widely supported, this research demonstrated that the potential for professional learning communities to change teachers' approaches to teaching in virtual space has not been realised. Having argued for a multiple approach to professional development, I reiterate the importance of TALs anticipating and addressing pressure points during the innovation-decision process.

Next I discuss how critical and reflexive practice (Debowski, 2016) supports teachers to adopt technology-enabled learning, as well as the TALs who support them. The planning of reflection and evaluation strategies can support TALs to anticipate pressure points in workgroup settings. Undertaking critical, reflexive practice has been shown to ensure regular evaluation of academic developers' practice (Debowski, 2016). In this section, I intend to focus on teachers' reflections of learning as one source of evidence for TALs' reflexive practice.

From a three-year study of technology adoption in NZ schools, Walker (2002) developed the "reflective cycle" (p. 126), a metacognitive strategy designed to challenge teachers' thinking and behaviours during technology-related professional development. The questions can support a cyclical process of change and improvement for teachers progressing through the innovation-decision process. Teachers are encouraged to reflect on their development of pedagogical knowledge, identify conceptual change, consider implications for their own teaching contexts, and focus on their next set of professional development goals. Significantly, the reflective cycle is a reflection and evaluation strategy TALs can implement to anticipate and attend to pressure points during the innovation-decision process. In the following section, I have adapted Walker's questions for technology adoption in workgroup settings.

Table 8. Questions to guide reflection in the reflective cycle

Trigger questions for reflection	Relevance to the reflective cycle
1. What do teachers think about the new knowledge?	New knowledge provides a stimulus for thinking about new things as well as current knowledge.
2. What do teachers think about how their thinking is changing?	Metacognition provides self-evaluation and information for emotional support.
3. What are teachers doing in teaching and learning environments that relate to the workgroup project?	Links to teaching and learning environments give a grounding in practice.
4. What are teachers learning in terms of their personal skills?	Personal skill learning gives task information about what the teachers are learning.
5. What are teachers intending to do next?	Goal setting provides a link to action and what teachers intend doing next.

Reproduced from Walker (2002, p. 126)

Walker's reflective questions have benefits for teachers in workgroups as well as TALs. A focus on reflection and evaluation strategies can assist the development of effective teaching (Debowski, 2016); therefore, teachers are more likely to understand the nature, quality and progress of their learning (Bain, 2004) when they engage in reflection about technology-related development (Walker, 2002). The data these questions will yield can support teachers in this research to identify where they are experiencing difficulties with the technology, gaps in their learning, factors that hinder their adoption of technologies and issues they have with implementing technology-enabled learning.

Teachers' self-reflective questions are important sources of feedback for TALs; therefore, the questions will be equally beneficial for them. Within workgroup settings, teachers' reflections will generate substantial data for TALs to reflect on and to evaluate their own practice. The data can inform TALs how teachers are thinking and what, if any, theories they are using (Ramsden, 1993), the knowledge that they are developing, how they are reasoning (Bain, 2004) and whether their personal learning needs are being met. The activities involved in utilising Walker's reflective cycle could contribute a useful strategy for TALs to address pressure points as teachers progress through stages of the innovation-decision process.

Social construction of technology adoption at AUT

To conclude this chapter, I revisit the premise that technology adoption is a social construction. I discussed the "technological systems approach to technology" (Dusek,

2006, p. 204) in chapter 1, which posits that the SCOT is shaped by the multiple perspectives of people, as well as the objects within that system. Thus, the effective functioning or "working" of technology is socially constructed (Dusek, 2006, p. 205). The technological system is the complex of objects, for example, hardware and software, and perspectives of stakeholders, for example, teachers, students, TALs, IT services, senior leadership and others. As every stakeholder is within the system, they each have some relationship to the others (Dusek, 2006).

The technological systems approach demonstrates how teachers' technology adoption projects are influenced by the perspectives of stakeholders who socially construct technology at AUT. The social relations between stakeholders explain why the pressure point senior leadership occurred despite senior leaders not having a role in teachers' workgroup adoption projects. At AUT, senior leadership have differing priorities to teachers; for example, they may have to balance technology purchases with management of annual finances, whereas teachers' technological priorities may be pedagogically focused. As senior leadership have authority over teachers in workgroup settings, their views are more likely to frame the environment for technological innovations at the university. Therefore, senior leaders' perspectives on technology and teaching may inhibit the opportunity for teachers to transform the student experience.

I have examined teachers' adoption and implementation of technology in workgroup settings through the lens of a social constructionist paradigm. Teachers' perspectives on the factors that hindered them from implementing technology were gathered from individual interviews and interpreted to develop the case study narratives. Significantly, four pressure points that impede teachers from implementing technology in workgroup settings were conceptualised from the cross-case assertions. These four pressure points are social constructions that demonstrate from teachers' perspectives evidence of conflict between stakeholders at AUT during the technology adoption process. Social constructionist dialogic practices align with the necessity to improve relationships between stakeholders within AUT's technological system. Therefore, I have argued that pressure points may be addressed through dialogic practices. Within AUT's technological system, relationship building between teachers and stakeholders is key to transforming practice such as reimagining university teaching as technology-enabled learning.

In conclusion, my research has demonstrated that the implementation of technology-enabled learning is hindered by pressure points that originate at the macro or organisational level of AUT as well as within the meso level or workgroup settings. This

research has identified that although three of the pressure points, authoritative decision-making, pedagogical development and virtual space, demotivate teachers and impede the successful implementation of technology-enabled learning, they do not prevent teachers from adopting a technology. However, the pressure point senior leadership can prevent teachers from adopting technology. Studies that have investigated professional development in situated learning contexts tend to be positive about the potential for teachers to develop new knowledge and skills through the sharing of practice. However, my research has demonstrated that despite the implementation of a socially situated learning approach for teachers' technology adoption projects, the pressure point senior leaders can quash the potential for change.

These conclusions have implications for approaches to technology-related professional development at AUT. The pressure points have identified that a clear relationship exists between organisational factors and teachers' activities in workgroup settings. Therefore, determining the best approach to professional development is less effective when the pressure points have demonstrated that the adoption and diffusion of technology cannot be achieved by teachers and TALs alone. I conclude that the reimagining of university teaching as technology-enabled learning requires the full support of executive leadership and senior leadership teams. Yet, this is unlikely to be achieved if senior leaders do not take teachers' ambitions to transform their teaching practice into account when making decisions. Social constructionist dialogic practice demonstrates that conflict between stakeholders arises when their differing perspectives are not made visible or acknowledged. Therefore, I call for the senior leadership team to initiate a university-wide transformative dialogue on constructing university teaching as technology-enabled learning. The Pressure Point Framework that I have developed as a result of undertaking this research can support all stakeholders to begin this process.

Having undertaken this research, I have extended my understandings of technology adoption, and I have been able to do some self-reflection on my own practice as a learning and teaching advisor. Naturally what I've learnt about technology adoption at AUT will have an impact on how I work with teachers who are undertaking projects in workgroups and with individual teachers. In particular, the Pressure Point Framework will provide direction for working with both senior leaders and groups of teachers who are engaging in the adoption of technology process. For example, I recently began working with a department who is redesigning their undergraduate programme for a model of blended learning. The pressure points: authoritative decision making and senior leadership was a useful way of beginning the discussion with a Head of School, Head of

Department and Paper Leaders. Having a frank discussion about these findings derived from the perspectives of teachers at AUT made them aware of the importance of listening to their teachers and taking on board their ideas and concerns. Suggesting that teachers as well as these Senior leaders should be involved in the development of the vision for blended learning is key in moving forward in a positive manner and motivating teachers. Groups of teachers who teach on specific papers will be required to redesign their paper for a blended learning approach. Taking into account the pressure points: pedagogical development and virtual space, a focus can be placed on what teachers' view as important when redesigning their papers. Each Paper Leader and group of teachers can envision and redesign their paper collaboratively focusing on issues of concern to them, for example, student engagement and supporting teaching and learning strategies.

At an institutional level, my research has enabled me to have a greater input into CFLAT's strategic goals of supporting groups of teachers to adopt technology. I am now able to discuss with other people and groups I attend in the university how technology adoption works here from an informed perspective. Through my research, I have insights into why teachers are or are not motivated to adopt technology, and the issues they face when doing so. I am able to contribute to AUT groups that have a focus technology for educational purposes, in particular, a university wide group that is interested in pedagogical research focusing on technology for learning and teaching. Rogers (2003) diffusion of innovations theory was conceived as an organisational theory and lacks the level of the individual or the workgroup. Roger's (2003) created his diffusion of adoption curve at a meta level in organisations. I never intended to study technology adoption at AUT from the organisational level, instead, I have extended Rogers (2003) innovation-decision theory and have developed new knowledge about how it is applicable at the workgroup level in a university context. I have taken Roger's innovation-decision theory to a more fine-grained level and this is part of my contribution to the body of knowledge. Having undertaken this research, I am now able to inform technology adoption at AUT at an individual, workgroup and organisational level.

In the final chapter, I revisit the methodology and the Pressure Point Framework. Then I offer my contribution to theory and directions for future studies, and conclude with a final reflection on my research.

Chapter 9: Conclusions

This thesis has investigated factors that impede teachers from adopting and implementing technology-enabled learning when engaging in socially situated learning approaches to professional development. The impetus for this research was to investigate two recurring issues in the extant literature that impact on my practice as a teaching and learning advisor in the university's ADU: first, that teachers are viewed as reluctant to adopt technology and, second, that technology-related professional development has been ineffective in changing teachers' approaches to teaching. In this chapter, I begin by addressing the strengths and limitations of the methodological design. I revisit the impact of the pressure points on teachers adopting technology in workgroup settings through a discussion of my responses to the research questions. Next, I discuss the contribution my research makes to theory. I conclude with directions for future studies and a final reflection on my research.

Strengths and limitations of the methodological design

The design and implementation of this research was discussed in detail in chapter 3. Now I direct attention to the strengths and limitations of my methodology so that it may inform other researchers who wish to implement similar studies. During the restructure of CFLAT in 2010, the institutional workshop programme was replaced with socially situated learning approaches to professional development. My investigation has examined the impact of replacing the workshop programme with socially situated learning approaches to professional development. CFLAT advisors identified three opportunities for teachers to engage in formal technology adoption projects at AUT and these situated learning contexts were examined through a multiple case study of inquiry.

I focused the methodological design on gathering multiple teachers' perspectives, particularly as their voices are under-reported in the literature on technology adoption in higher education. Four case study narratives provided rich descriptions of teachers' perspectives for each of the research questions. The departmental workgroups in case 1 were led by TALs who made an authoritative decision to select technology for adoption. The teachers in case 2 joined one of a number of CFLAT advisor-led CoPs. The LTDF workgroup teachers in case 3 applied for and received grants to develop an innovative learning and teaching project supported by CFLAT. Case 4, the long-view teachers, provided contrasting perspectives to teachers in cases 1–3. This atypical case will be discussed in more detail in this section.

The number of participants selected for each case study was a limitation of this research. Taking into account the research questions and the amount of data they would generate, the number of case studies and the duration of this investigation, I deemed four participants appropriate for each case study. Merriam (2009) argues that as it is difficult to state how many participants should be interviewed in qualitative research, the sample size need only be adequate to answer the research questions. Nevertheless, the case study assertions would be strengthened with additional participants' perspectives.

The atypical case was a strength of the methodological design of this study. The long-view teachers in case 4 did not adopt technology in a workgroup setting. Instead, this was an atypical case consisting of four teachers who contributed their perspectives on adopting technology over a period of 10 years. The long-view teachers who adopted technology as individuals provided a clear contrast with teachers who adopted technology in workgroup settings. This case study identified the implications for teachers' access to professional development when the approach changed from a workshop programme to socially situated learning approaches. As the teachers in case 4 did not belong to any of the workgroup settings, they were situated outside of CFLAT's new approach to professional development. This atypical case revealed that teachers who were not part of situated learning groups at AUT indicated that they lacked access to professional development from the ADU.

I found the focus group method a valuable tool for identifying the differences and similarities teachers experienced in their workgroups. In total, 28 teachers volunteered to take part in focus groups and individual interviews. I ran two focus groups with participants selected from each of the four case study contexts. Being present during the focus group discussions, I could see how the purposive sampling worked to surface the differing attitudes and perspectives among teachers from the differing workgroup settings.

That the findings from this research are particular to AUT may be viewed as both a limitation and an advantage. The findings of this qualitative, multiple case study inquiry cannot be generalised; therefore, as Latchem (2014) argues, they are likely to have minimal influence on policymaking. However, quantitative macro level studies have been critiqued for not considering the local settings in which technology adoption occurs, and qualitative micro level studies have been critiqued for not taking account of organisational influences (Singh & Hardaker, 2014). This argument indicates that technology adoption studies that are generalisable also have limitations, and that particularised studies have advantages over generalised studies. When writing up

research, attention should be given to describing the setting where the case is examined as well as the case study contexts, so that researchers can determine the extent to which they can apply the findings to their own contexts and experiences (Merriam, 2009). Stake (1995) argues that researchers intuitively synthesise case study narratives with their current experiences in order to construct new understandings or naturalistic generalisations. Stake suggests that case study assertions may be examined to understand the case at hand, or they may be used to generalise to similar cases. I suggest that one way of strengthening findings from qualitative multiple case study research is for researchers to design and implement similar studies and methodologies. This would require researchers to be rigorous in describing and implementing the research design so that other researchers can develop similar investigations.

A key theory that influenced the development of the research questions and methodological design of this research was Rogers's (2003) innovation-decision process. In designing a qualitative approach to the investigation, I took into account Rogers's argument that innovation-decision studies lack qualitative perspectives, which are required for studying the impact of implementing a technology in practice. Through the development of research questions 1 and 4, this investigation has contributed to theories that Rogers has identified as under-researched in the higher education adoption and diffusion literature.

I have defined technology-enabled learning as the successful and therefore effective adoption of technology for university teaching practice. This thesis has investigated whether socially situated learning approaches to professional development overcomes barriers that impede teachers from adopting and implementing technology-enabled learning. The research question was: Does professional development in workgroup settings overcome barriers that impede teachers from implementing technology-enabled learning? The supporting research questions were:

1. How does the decision-making process motivate teachers to adopt technology?
2. What pedagogical knowledge do teachers develop about teaching with technology and how do they develop it?
3. What are teachers' approaches to teaching with technology?
4. Why do teachers reject or discontinue using technology?
5. What are the implications for approaches to professional development?

Through a social constructionist interpretation of the qualitative data, I have developed four case study narratives that provide rich descriptions of teachers' perspectives for each of the research questions. From the cross-case assertions I have conceptualised four pressure points that impede teachers from adopting and implementing technology-enabled learning in workgroup settings at AUT.

The central argument of this thesis is that a situated learning approach to professional development is unlikely to have a significant impact on encouraging teachers' uptake of technology-enabled learning if pressure points that constrain adoption projects are not anticipated, identified and addressed. A significant outcome of my research and contribution to adoption theory in higher education is the development of the Pressure Point Framework described in chapter 8. An original aspect of this research, which emerged from an examination of the four pressure points through a transformative social constructionist lens, is the notion that dialogic practice could support teachers to develop confidence in their capacity for change and to become autonomous, innovative university teachers.

This research has shown the value in underpinning this qualitative, multiple case study with a social constructionist paradigm. Social constructionist concepts are concerned with social change; therefore, they are an opportunity to consider alternative ways of transforming university teaching practice. Concerned with multiple approaches rather than single approaches, social constructionists suggest alternative avenues for change rather than making recommendations for best practice (Gergen, 2015). Therefore, drawing on the notion of social constructionist dialogic practice, I have offered alternative avenues for addressing the pressure points that were conceptualised from the cross-case assertions in this investigation. The dialogic practice concepts discussed in chapter 8 are transformative dialogue, engaged relationships, relational education and collective intelligence (Gergen, 2015). These dialogic concepts have been synthesised into the Pressure Point Framework.

The Pressure Point Framework

I have argued that socially situated learning approaches to professional development are unlikely to have a significant impact on encouraging teachers' implementation of technology-enabled learning if the pressure points that impede adoption projects are not explicitly addressed. The four pressure points were conceptualised from the cross-case assertions and provide the answers to questions 1–4. As illustrated in Table 6 in chapter 8, though some teachers experienced more than one pressure point, none experienced

each of the four pressure points. I have described the pressure points as authoritative decision-making, pedagogical development, virtual space and senior leadership. Each pressure point developed at a different stage of the innovation-decision process. In the previous chapter, I discussed four social constructionist dialogic practices that have the potential to address each pressure point. In the following sections, I draw together concepts from the Pressure Point Framework to address each of the research questions, and to identify my contribution to the literature on the adoption and diffusion of technology in higher education.

Authoritative decision-making

This pressure point responds to question 1: How does the decision-making process motivate teachers to adopt technology? This finding contributes to the few studies that have explored how and why decision-making occurs for teachers who adopt technology in workgroup settings.

This research identified that it was the type of decision-making that occurred within a workgroup that influenced teachers' motivation to adopt technology rather than the situated learning context itself. The case studies demonstrated that of the 12 workgroups in cases 1–3, only two workgroups engaged in collective decision-making. The teachers who engaged in collective and individual decision-making tended to do so for pedagogical reasons, and this was a motivating factor for them during the adoption process. The pressure point authoritative decision-making occurred when teachers felt left out of the decision-making process, leaving them feeling less motivated to continue with the project. This research has demonstrated that discord in the decision-making process can cause teachers to lose motivation to adopt technology during the project, making them reluctant to adopt technology in the future. I have suggested the concept of transformative dialogue as an approach to addressing this pressure point. The underpinning social processes of co-action and welcoming differences transform superficial dialogue into a space for teachers and decision makers to go beyond their differences to co-create new and mutually shared constructions of the decision-making process.

Pedagogical development

This pressure point addresses question 2: What pedagogical knowledge do teachers develop about teaching with technology and how do they develop it? This finding contributes to literature that has identified that technology-related professional development has been ineffective because it does not support teachers to change their

conceptions of and approaches to teaching with technology, and that there is an imbalance of technical skills training over pedagogical development.

Despite adopting technology in situated learning contexts, this research identified that teachers were not provided with satisfactory pedagogical development opportunities to support the implementation of technology-enabled learning, and that technical skills training was emphasised. The pressure point pedagogical development occurred because many of the teachers were not provided with opportunities to discuss their approaches to teaching with technology, instead there was a focus on technical skills development. Nor were some of the teachers supported to achieve their personal learning needs in the workgroup settings. A consequence of this pressure point was that teachers did not change their teaching approach to account for facilitating learning in virtual space. I have offered the concept of engaged relationships as one approach to addressing this pressure point. The social processes that encourage engaged relationships among workgroup members are those that develop pedagogical knowledge and motivation to support colleagues who are experiencing difficulties with technology. The underpinning social processes of developing knowledge, and reasoning with that knowledge to commit to a personal perspective on technology-enabled learning is the key to transforming the customary workgroup practice of sharing knowledge.

Virtual space

This pressure point addresses question 3: What are teachers' approaches to teaching with technology? This finding contributes to literature that has identified the need for further investigation into teachers' approaches to teaching with technology, and development of pedagogical strategies for virtual space.

This research identified that teachers who held teacher-focused approaches to teaching, did not develop pedagogically-determined strategies for teaching with technology, instead, they continued applying their current approaches to teaching with technology. The pressure point virtual space occurred because teachers did not consistently change their teaching approaches to account for learner-focused, pedagogically determined strategies that would support students to construct knowledge in virtual space. This research identified that if teachers are unable to consistently develop pedagogically-determined teaching strategies for technology integration, they may feel unconfident about teaching with technology and uncertain of their authority to direct students to use social media in the classroom. Consequently, teachers did not facilitate learning that encouraged students to engage in deep learning, through the collaborative construction

of knowledge in virtual space. An option for addressing this pressure point is the concept of relational education as an alternative to the traditional lecture method of teaching. The technological and social processes that underpin relational education are virtual space, teacher as facilitator and collaborative learning. The key to constructing knowledge in virtual space is the social processes that underpin relational education. These social processes do not align with the teacher-focused approaches to teaching; therefore, teachers should change how they view their role, and develop pedagogically determined strategies to accommodate students' co-construction of knowledge in virtual space.

Senior leadership

This pressure point responds to question 4: Why do teachers reject or discontinue using a technology? This finding contributes to the under-researched theory on discontinuance and rejection of technology in educational institutions, in particular, factors that influence teachers' reasons to reject or discontinue the use of technology in workgroup settings.

Despite teachers adopting technology in situated learning contexts, this research demonstrated that the actions of senior leadership, who did not have an allocated role in the workgroup projects, impeded their goals to adopt or continue teaching with technology. The pressure point senior leadership occurred for teachers when their goals for adopting or continuing to teach with technology were rejected or discontinued by senior leaders' decisions. Furthermore, this pressure point was strengthened because of inadequate relationship building and dialogue between senior leadership and teachers. This research demonstrated that teachers who were hindered from adopting technology by senior leadership tended to become despondent and sometimes resentful when they felt that their perspectives were not valued by senior leaders. Furthermore, some teachers became less motivated to undertake another adoption project because of the uncertainty of the outcome, and others became less inclined to upgrade their current technological skills. Moreover, senior leaders' decisions kept teachers confined within a traditional lecture model of teaching, which had negative implications for student engagement. Social constructionist dialogic practice supports relationship building; therefore, a potential option for addressing this pressure point is the notion of collective intelligence in an organisation. Collective intelligence provides a means for measuring good relationships that develop between senior leadership and teachers' workgroups at AUT. Collective intelligence is underpinned by the development of practices for good coordination across departments and faculties at the university. Practices for good coordination emphasise the collaboration and sharing of information about workgroup technology adoption projects, as well as the development of regular and mutually

respective dialogue between senior leadership and workgroups. As coordination increases across the university, the collective intelligence at AUT increases. Next, I discuss the contribution this research has made to theory.

Contribution to theory

My research has made a significant contribution to the theory on technology adoption in workgroup settings through the development of the Pressure Point Framework. The Pressure Point Framework is a synthesis of the pressure points conceptualised from the cross-case assertions in my research, Rogers's (2003) innovation-decision process and concepts related to the social constructionist notion of dialogic practice. The framework is significant as it places a much-needed focus on identifying and overcoming pressure points that occur during the innovation-decision process. The framework can assist TALs to plan strategies for addressing pressure points, in order to support teachers to progress confidently through the innovation-decision process to implement technology-enabled learning. The conceptualisation of the pressure points, Rogers's innovation-decision process and dialogic practice concepts were discussed in detail in chapter 8.

I have identified two limitations of this framework. First, the social constructionist notion of dialogic practice and related concepts suggested to address the pressure points identified in my research have not been investigated. Therefore, research that investigates how these concepts might be applied and evaluated for practicality and effectiveness within workgroup settings is required. Another limitation of this framework is the pressure point senior leadership. Because of contextual conditions, the decisions that senior leadership are likely to make in the future are unknown. An alternative suggestion is that this pressure point can only be addressed by senior leadership themselves. A better understanding of ways to address this pressure point may be determined by examining the perspectives of senior leadership in future research. In the meantime, however, senior leadership could gain a better understanding of the negative impact their decisions have on teachers' autonomy to innovative their teaching practice and students' learning experiences by reading the case study narratives.

A second key significance of my research is the focus on investigating technology adoption at the meso or workgroup level of analysis. The case study narratives and my Pressure Point Framework have contributed teachers' perspectives to practice and theoretical knowledge at the meso level of analysis, which is a new and emerging area of adoption and diffusion studies. The Pressure Point Framework that I developed as a result of this research has shown the value gained by investigating technology adoption from a

meso perspective. Singh and Hardaker (2014) propose that there are few empirical studies that explain adoption in relation to organisational influences and teachers' actions. Therefore, my research has demonstrated further significance and originality because the responses to the research questions uncovered a macro and meso level relationship that identified institutional influences on teachers who adopt technology in workgroup settings.

The pressure points finding supports an overall recommendation that technology adoption be focused on strengthening the learning that occurs in workgroup settings. The finding that pedagogical development in workgroup settings was unsatisfactory suggests that it may be too difficult to achieve in such a context. However, TALs cannot be solely responsible for all of the teaching-related activities teachers in workgroups require; instead, AUT as an institution should be responsible for teacher professional development. However, reinstating an institutional programme of workshops/seminars/courses in tandem with professional learning workgroups would strengthen access to and the delivery of diverse approaches to technology-related development.

The frame of my research was teachers' perspectives of the process of technology adoption at the meso or workgroup level of analysis at AUT. As I argued in chapter 2, Delgaty (2013) concludes that within the e-learning literature, there is a lack of information regarding the context in which studies are situated. Therefore by narrowing and identifying the frame for qualitative a case study inquiry, and describing the setting where the research takes place, my research has contributed to this gap. My original contribution to the body of knowledge – the Pressure Point Framework, has been developed within this specific frame. The pressure points contribute to the study in that they are empirically surfaced and represent academic teachers voice in particularised settings. Therefore, my research has focused on the experiences of practitioners and how academic developers can use the framework to address pressure points that arise for teachers who adopt technology in workgroup settings at AUT. The findings deepen the understanding of how technology adoption occurs for teachers who undertake the process in a workgroup setting within a higher education institution. My research has surfaced the concerns of teachers at AUT, the pressure points those of us in the academic development unit didn't know, but should know in order to undertake our work effectively. Therefore, the Pressure Point Framework is a significant finding for academic development at AUT. In conclusion, my research has identified the meso-level gap in the eLearning literature and is located at this fine grained level of adoption/diffusion. The

pressure point framework provides very real insights into the issues that teachers face when tackling technology adoption. Therefore, it provides new knowledge for academic developers/technology adoption leaders who are grappling with these issues when collaborating with teachers in workgroups at AUT and perhaps in similar institutions.

Directions for future studies

Further studies could be undertaken at the meso or workgroup level of analysis to explore the following issues raised in this research. A similar study could be undertaken to identify whether the pressure points exist in other institutions. In particular, the pressure points could benefit from being studied in more depth to examine the reasons why they occur. As discussed earlier, research that examines the benefits of dialogic practice to address the pressure points is recommended, as well as alternative methods for addressing them. An examination of senior leadership perspectives of technology adoption would be useful for addressing the pressure point senior leadership. However, a richer study could be undertaken to make a comparison of stakeholder views on technology adoption, that is, involving teachers, senior leadership, academic developers and TALs. Finally, an examination of how workgroups form, and what makes some supportive and others less so would be useful for those who assist teachers to adopt technology in workgroup settings.

Final reflection on my research

By undertaking this study, I learned that social constructionism was not only a research paradigm but a way of life. Social constructionist concepts offer the opportunity to consider alternative approaches to constructing one's world view. My thesis has transformed the way I think about my personal life, and my practice as a teaching and learning advisor. Increasingly, teachers are collaboratively working on projects rather than as individuals and this can cause dissension as adjustments are made. As a result of this research, I now have a set of social constructionist dialogic concepts to draw on as required.

Researcher bias is inherent in qualitative research and is a limitation of this investigation. When we view the world, we are likely to interpret it according to what we focus on the most; therefore, qualitative studies position the researcher as the instrument through which data is filtered (Guba & Lincoln, 1994). Stake (2010) argues that by declaring biases researchers are more likely to minimise the effects of subjectivity on their research. A social constructionist approach required multiple reflexive statements throughout this

thesis to make my biases and position as a researcher transparent. In the introduction chapter, I made explicit my interest and background pertaining to this research study. In the methodology chapter, I made explicit the potential biases I bring to this research. During the process of data analysis and write-up, I have on a number of occasions questioned whether I was imposing my own subjective understanding and perspective of technology-enabled learning, and approaches to professional development on the data. This could not be helped as I can only question my own perspectives when they are in agreement or conflict with the gathered data. Stake (2010) argues that biased reporting may be minimised by paying attention to better research design, more triangulation, checking of data gathering and analysis, and informing the reader of possible bias. Through a rigorous design and implementation of methodology, I attempted to minimise researcher bias. I have described in detail my processes for data gathering, analysis and writing of the case study narratives. I have been careful and rigorous in the way in which I analysed the data and portrayed teachers in the narratives. Triangulation consisted of member checking, multiple methods and multiple sources of data.

In writing this thesis, I have achieved my primary goal, which was to offer a new way of thinking about university teachers who have been portrayed in the literature as reluctant to adopt technology. To do this, I have written four richly descriptive narratives that privileged teachers' voices and brought to life their perspectives on technology adoption. The cross-case assertions derived from my research demonstrated that teachers in workgroup settings did not start out reluctant to adopt technology; instead, they faced pressure points that impeded their progress throughout the innovation-decision process. All of the teachers in this research began their adoption projects with enthusiasm; however, for some, the pressure points became so great that they became discouraged or reluctant to engage in further projects.

In this thesis, I have argued that socially situated learning approaches to professional development are less likely to have a significant impact on encouraging teachers' uptake of technology-enabled learning if pressure points that constrain adoption projects are not explicitly addressed. I have defined technology-enabled learning as the effective adoption of technology for university teaching practice. My research is significant as it advances the Pressure Point Framework as a means for developing social constructionist dialogic practices to address pressure points teachers may encounter as they progress through the innovation-decision process to implement technology-enabled learning. My contribution to the body of knowledge is the Pressure Point Framework, which will be useful for both teachers and TALs undertaking projects in workgroup settings. This research has raised

more questions than could be addressed. In doing so, it has opened up a space for further investigation into teachers' perspectives on the adoption and implementation of technology for university teaching in workgroup settings.

Glossary

The following terms have been used in my research.

Terms	Meaning of the term for this research
Academic development and professional development	For this research, the term academic development refers to the discipline and comprises academic development units and academic developers. Professional development refers to the nature of the programmes offered by academic development units and facilitated by academic developers within institutions of higher education.
Adoption	The stage in the innovation-decision process when a technology is selected and intended to be used by teachers for teaching and learning (Rogers, 2003; Singh & Hardaker, 2014).
Diffusion	The "structures, systems and processes higher education institutions employ to increase the adoption" (Singh & Hardacker, 2014) of technology-enabled learning.
Implementation	The stage in the innovation-decision process when teachers are using the technology for teaching and learning on a regular basis (Rogers, 2003).
Innovation-decision process	Explains the choices that individuals and groups make to adopt to adopt or reject an innovation. There are five stages in Rogers's (2003) innovation-decision process.
Multiple case study terms	**The following five multiple case study terms as defined by Stake (2006) are used in this research.**
The setting	The place where the case is investigated. In this research, Auckland University of Technology (AUT) in New Zealand.
The case	The activity under investigation. In this research, the activity being investigated is the technology adoption process. Therefore, the case is the technology adoption process at AUT.
Case studies	Settings that have a relationship to the case but are diverse in nature. Using the terms interchangeably, Stake calls these settings embedded cases, mini-cases, individual cases and case studies. In this research, case studies are the workgroup settings in which teachers undertake the process of technology adoption at AUT. They are called case studies. These case studies have been chosen to provide a better understanding of the case.
Case study assertions	Each case study's answers to the research questions. Stake describes assertions as the researcher's propositional generalisations. In this research, each case study's answers to the research questions are called assertions.
Cross-case assertions	The answers to the research questions resulting from a cross-case analysis of the four sets of case study assertions.

Terms	Meaning of the term for this research
	The cross-case assertions are also called findings. In this research, the findings relate to the case, that is, the technology adoption process at AUT.
Pressure points	The metaphor of pressure points describes sources or areas of difficulty where problems are likely to occur for teachers who adopt technology in workgroup settings at AUT.
Senior leadership	The leadership and management team at AUT comprise the senior leadership team, group directors, managers and team leaders, head of school and head of discipline/department, and are known as senior leadership or senior leaders (IBM, 2016). The senior leaders discussed in the pedagogical pressure point: senior leadership, held the designations head of school and head of department.
Situated learning contexts	Situated learning (Lave & Wenger, 1991) in a professional development context suggests that such contexts reflect the way in which knowledge is used in real world settings (Herrington et al., 2010). In my research, teachers who adopted technology in workgroups engaged in a socially situated learning approach to professional development at AUT.
Stakeholders	Stakeholders are individuals or groups of people at AUT who had input into workgroup adoption projects. They are senior leadership, technology adoption leaders (TALs), academic developers and teachers.
Technology	Rogers (2003) definition of technology was used to describe a technology that was adopted by a teacher for learning and teaching in this research. That is, Internet-based, and consisting of hardware and software components (Rogers, 2003). A technology such as a smartphone that connects to the Internet is constituted from many technological components, that is, hardware, software, and communications and storage devices. Therefore, many technologies comprise a single device, for example, hardware such as a laptop, smartphone or tablet; software such as the Blackboard learning management system (LMS) or social media; communications channels such as fibre optics or Wi-Fi; and storage such as hard drives and cloud computing.
Technology adoption leaders	In this research, academic developers or CFLAT advisors who facilitated workgroups are called technology adoption leaders. The senior leaders who facilitated workgroups in this research are called technology adoption leaders. This differentiates them from senior leaders who did not have an allocated role in the workgroups.
Technology-enabled learning	The effective adoption of technology for university teaching practice.

Terms	Meaning of the term for this research
Virtual space	"Virtual is, in the present context, functionally defined as "facilitated by networked computers" (Bell, 2008, p. 2). Space is used as a generic term to denote a platform or environment where people interact" and "learning relates to concepts and educational practices, such as task design, student participation and motivation, student acquisition of information, and learning outcome" (Sköld, 2012, p. 2).
Workgroup settings	The term workgroup settings describe groups of teachers who collaborated on adoption projects at AUT. Workgroups are socially and historically situated within a culture that has its own distinctive values and traditions of thought (M. Smith J., 1998; Trowler, 2008). Therefore, when teachers adopt a technology within a workgroup, their knowledge development and implementation of practice is co-constructed and embedded within a workplace context. The term workgroup describes groups of teachers who collaborate on a common project over a period of time, for example, a curriculum teaching team (Trowler, 2008) or small groups who are developing e-learning projects (Singh & Hardaker, 2014). Recent studies have used many terms to describe workgroups, for example, learning communities and communities of practice (King & Boyatt, 2015), departmental workgroups (Trowler, 2008) and disciplinary communities (Krause, 2012).

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Appendices

Appendix A: Ethics approval

AUT UNIVERSITY
TE WĀNANGA ARONUI O TAMAKI MAKAU RAU

AUTEC SECRETARIAT

12 March 2014

Jennie Billot
Faculty of Culture and Society

Dear Jennie

Re Ethics Application: **14/21 Technology adoption in a New Zealand university: Lecturers' perspectives.**

Thank you for providing evidence as requested, which satisfies the points raised by the AUT University Ethics Committee (AUTEC).

Your ethics application has been approved for three years until 12 March 2017.

As part of the ethics approval process, you are required to submit the following to AUTEC:

- A brief annual progress report using form EA2, which is available online through http://www.aut.ac.nz/researchethics. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 12 March 2017;
- A brief report on the status of the project using form EA3, which is available online through http://www.aut.ac.nz/researchethics. This report is to be submitted either when the approval expires on 12 March 2017 or on completion of the project.

It is a condition of approval that AUTEC is notified of any adverse events or if the research does not commence. AUTEC approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

AUTEC grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to obtain this. If your research is undertaken within a jurisdiction outside New Zealand, you will need to make the arrangements necessary to meet the legal and ethical requirements that apply there.

To enable us to provide you with efficient service, please use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at ethics@aut.ac.nz.

All the very best with your research,

Kate O'Connor
Executive Secretary
Auckland University of Technology Ethics Committee

Cc: Julia Hallas; Stanley Frielick

Auckland University of Technology Ethics Committee

WA505F Level 5 WA Building City Campus

Private Bag 92006 Auckland 1142 Ph: +64-9-921-9999 ext 8316 email ethics@aut.ac.nz

Appendix B: Tools

A Focus group and Interview guides

B Participant information sheets

C Consent forms

D Email invitations to participate

E Interview appointment schedule

Focus Group Guide

Thank you for agreeing to be interviewed for my PhD research. There are no right or wrong answers.

Opening	1. To help with transcribing, can you please say your name and the school or department you work in. 2. It would be helpful for transcribing if you could say your name when you speak, but don't worry if you forget.
Question 1 How does the decision-making process motivate teachers to adopt technology?	3. Think about the different kinds of technology that you have adopted. Can you tell us why you adopted them? 4. Have you ever adopted a technology as part of a team or group, rather than as an individual? Can you tell us what it was like? 5. Sometimes managers instruct groups of teachers to implement a technology into a programme, e.g., online marking or e-portfolios. What advice you give to a manager about how to work with a team of teachers to introduce a new technology for teaching?
Question 2 What pedagogical knowledge do teachers develop about teaching with technology and how do they develop it?	6. Can you tell us about your experiences of learning to use technology? 7. Please tell us how technology has changed the way you teach? 8. Can you tell us about some of the ways technology has had an impact on your freedom to teach the way you want?
Question 3 What are teachers' approaches to teaching with technology?	9. I'd like you to imagine yourself in the university in the year 2050. What is the role of technology in your teaching in this future?
Question 4 Why do teachers reject or discontinue using technology?	10. Think about a technology that you have been using for a long time. Please tell us why you keep using it? 11. Think about a technology that you have used for a period time, and then stopped using it. Can you pinpoint what it was that made you stop using it?
End questions / round robin	12. Is there anything else you want to tell us about using technology for teaching?

Interview Guide

Thank you for agreeing to be interviewed for my PhD research. There are no right or wrong answers. I am not trying to find out how many technologies you use, or how much you know about them. The purpose of this interview is to get your views on what it's like to select and use a technology for teaching at AUT. You may decline to answer any question. My research question is: what factors impede teachers in workgroup settings from adopting and implementing technology-enabled learning?

Introduction	I'm really interested in understanding the processes you go through when selecting and using a technology for teaching, as well as what you think about using technology for teaching. Don't worry if you can't answer all of the questions, some may not apply to you.
Question 1 How does the decision-making process motivate teachers to adopt technology?	1. What kind of decision-making process did you/the group engage in to select a technology for learning and teaching? (individual, collective, authoritative) 2. Can you remember what kinds of information, or people you / the group drew on to help make the decision about selecting a technology? 3. Can you remember what the main factors were in deciding which technology to choose? 4. What impact has the decision-making process had on your motivation or ability to use the technology for teaching? Or can you think of any aspects of the selection process that has had a positive or negative effect on your motivation to use it?
Question 2 What pedagogical knowledge do teachers develop about teaching with technology and how do they develop it?	5. Can you explain to me how you / your group went about learning to use the technology? 6. What kinds of problems did you / your group encounter in learning it? 7. What kinds of learning did you engage in to prepare yourself to each with the technology? Particularly in terms of learning and teaching strategies or pedagogy? 8. Looking back, is there anything you think could have been done differently to help you learn the technology or prepare you to teach with it?
Question 3 What are teachers' approaches to teaching with technology?	9. What do you like about teaching with technology? 10. What don't you like about teaching with technology? 11. How has your pedagogical approach to teaching changed as a result of using technology? 12. Has a technology ever conflicted with your personal beliefs about teaching? If so, how? 13. How would you change your teaching to accommodate the idea of teachers and students using mobile devices, for anywhere, anytime learning? 14. Have you changed the way you behave, or teach, in order to accommodate students using their mobile phones to record you in class or taking photos, etc.?

Question 4 Why do teachers reject or discontinue using technology?	15. Think about technologies you've used for a long time. Why do you keep using them? 16. Can you think of any undesirable or unanticipated consequences that have arisen as a result of using technology? What impact did it have on your use of technology? 17. Have you ever used a technology for a while and then rejected it? Why?
Closing questions	18. What role or responsibility do you think the university has in supporting your use of technology? 19. Is there anything else that you would like to tell me about using technology for teaching at AUT?

Participant Information Sheet

For Interviews

Date Information Sheet Produced:

12 March 2014

Project Title

Technology adoption in a New Zealand university: Lecturers' perspectives

An Invitation

My name is Julia Hallas and I am currently undertaking my Doctorate at AUT University. I would like to invite you to participate in a Focus Group for my PhD research. Participation in this research is voluntary, and you may withdraw from the research at any time during the data collection process.

I am a Senior Lecturer in the Centre for Learning and Teaching. You may have had a facilitator/participant, mentoring or consultancy relationship with me in the past. However my role in this study is as the primary researcher, and any previous relationship we have had will not advantage or disadvantage you if you take part in this study.

What is the purpose of this research?

The purpose of this research is to investigate lecturers' perspectives regarding the adoption of learning technologies for learning and teaching in higher education. Lecturers' perspectives are under-represented in the literature, resulting in an unclear picture of how they view educational technology practices. Therefore this study will provide an opportunity for lecturers to tell their stories of what it is like to adopt a technology for learning and teaching in a university. This research will result in a PhD thesis, journal articles, conference papers and presentations.

How was I identified and why am I being invited to participate in this research?

You have been selected to participate based on your experience of adopting a technology within a workplace context at AUT University. You have been selected because of one of the following reasons:

1. You adopted AUTonline after attending a voluntary professional development workshop and were interviewed by me for a research project in 2005; or
2. You adopted a learning technology after receiving an LTDF project; or
3. You adopted a learning technology while participating in a community of practice; or
4. You adopted a learning technology resulting from a workgroup initiative in your Department, School or Faculty.

Lecturers who are currently in a dependent relationship with the researcher will not be recruited.

What will happen in this research?

For this research, the first phase involves a focus group and the final phase consists of individual interviews. The data collected will only be used for research outputs resulting from this study.

Your role in this research is to be interviewed by me, and to verify the transcript of the interview.

You will be interviewed in a private room that you nominate. I will ask you questions about how you have adopted technologies for learning and teaching. The interview will be digitally recorded.

What are the discomforts and risks?

You may be concerned about the nature of the questions you will be asked.

How will these discomforts and risks be alleviated?

You will be given the question schedule for perusal before the interview. You may ask to have a question removed from the schedule before the interview. During the interview, you do not have to answer a question if you feel uncomfortable about it. You may stop and leave the interview at any stage.

What are the benefits?

By participating in this research, you will have an opportunity to share your views about teaching and technology, and contribute to the discussion about e-learning in higher education. The findings will contribute to the extant literature; inform practices relating to the adoption of learning technologies at AUT University, and any professional development that might be appropriate. Your valuable contribution to this study will enable me to complete a PhD qualification, publish journal articles and conference papers.

How will my privacy be protected?

During the period of this research, your Consent Form, contact details, discussions and data will be kept confidential. All data will be stored securely and disposed of through the AUT University document destruction service.

Your name will be used during the time of the interview and transcribing in order to ensure the data is matched and transcripts are sent to the correct participants for verification. Once verification has been completed, your name will be removed from the transcript and will be replaced with a code for analysis purposes.

The recording of the interview will be transcribed by the private research company, TranscribeMe. All transcripts are kept confidential.

What are the costs of participating in this research?

Participation will take approximately 1.0-1.5 hours. There are no direct financial costs for participating.

What opportunity do I have to consider this invitation?

Please take one week to read the Information Sheet and Consent Form, and to consider participating. If you have any questions, please contact me to discuss them, julia.hallas@aut.ac.nz, or phone 921 9999, x5785. After this time, I will contact you by phone or email to ascertain whether or not you wish to participate in the interview.

How do I agree to participate in this research?

Please complete the Consent Form and return it to me immediately, or prior to the commencement of the focus group interview.

I know that you are very busy and I appreciate you taking the time to participate in this research.

Will I receive feedback on the results of this research?

I would be pleased to send you a summary of the results of this research. If you would like a copy, please tick the designated circle and write your address information on the Consent Form.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Dr Jennie Billot, jennie.billot@aut.ac.nz, phone 921 9999 x5785.

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTEC, Kate O'Connor, *ethics@aut.ac.nz*, 921 9999 ext 6038.

Whom do I contact for further information about this research?

Researcher Contact Details:

Julia Hallas, Primary Researcher, Centre for Learning & Teaching, PVC – Learning and Teaching.

Phone: 921 9999 x5785, Email: julia.hallas@aut.ac.nz, Office: WO1020d

Project Supervisor Contact Details:

Dr Jennie Billot, Post-graduate Research Education Leader, University Postgraduate Centre

Phone: 921 9999 x9694, Email: jennie.billot@aut.ac.nz

Approved by the Auckland University of Technology Ethics Committee on *12 March 2014*, AUTEC Reference number *14/21*

Consent Form

For Interviews

Project title: ***Technology adoption in a New Zealand university: Lecturers' perspectives***

Project Supervisor: ***Dr Jennie Billot***

Researcher: ***Julia Hallas***

- ○ I have read and understood the information provided about this research project in the Information Sheet dated 12 March 2014.
- ○ I have had an opportunity to ask questions and to have them answered.
- ○ I understand that the interview will recorded and transcribed by TranscribeMe.
- ○ I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- ○ If I withdraw, I understand that all relevant information including tapes and transcripts, or parts thereof, will be destroyed.
- ○ I agree to take part in this research.
- ○ I wish to receive a copy of the report from the research (please tick one):
  Yes○ No○

Participant's signature:

Participant's name:

Participant's Contact Details (if appropriate):

Date:

Approved by the Auckland University of Technology Ethics Committee on 12 March 2014 AUTEC Reference number 14/21

Note: The Participant should retain a copy of this form

Invitation to participate in a focus group

Dear

I would like to invite you to take part in my PhD research study, which is investigating AUT lecturers' perspectives of using technology for teaching in the university.

I am conducting two focus groups of up to six participants each first, and later in phase 2, individual interviews. One focus group will be held on the North Campus and the other on the City Campus. If you would like to **participate in a focus group**, please email me by **Tuesday 20 May 2014.** I estimate that it will take approximately 1-1.5 hours.

Your perceptions about implementing and using learning technologies for teaching are important. Lecturers' perspectives on learning technologies are lacking in the literature, and as a result, are not well represented in policies and programmes. By participating in this research, you will have an opportunity to share your views about teaching and technology, and to contribute to the discussion about e-learning in higher education. Technology may be defined as AUTonline, online marking, iPad, smartphone, Google+, Facebook, video conferencing, webinars, videos, e-portfolios etc.

While I am very keen to receive your input, I know that you are busy, so thank you for your consideration, and no worries if you can't participate.

Kind regards, Julia

If you would like to find out more about participating, please read the attached Information sheet and Consent Form and/or contact:
Julia Hallas, Primary Researcher
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Phone: 921 9999 x5785, Email: julia.hallas@aut.ac.nz, Office: WO1020d

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Approved by the Auckland University of Technology Ethics Committee on 12 March 2014, AUTEC Reference number 14/21.

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Invitation to participate in a focus group

Dear

In 2005 you kindly agreed to be interviewed by me for my research into Flexible Learning in Tertiary Education. Can you believe it has been nearly 10 years? I would like to interview you once more, as you have been a long-term user of learning technologies for teaching. Your long-term experience and perceptions would be invaluable.

I would like to invite you to take part in my PhD research study, which is investigating AUT lecturers' perspectives of using technology for teaching at the University.

I am conducting two focus groups of up to six participants each. One focus group will be held on the North Campus and the other on the City Campus. If you would like to **participate in a focus group**, please email me by **Tuesday 20 May 2014**. I estimate that it will take approximately 1-1.5 hours.

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Approved by the Auckland University of Technology Ethics Committee on 12 March 2014, AUTEC Reference number 14/21.

Invitation to participate in an interview

Dear

I would like to invite you to take part in my PhD research study, investigating AUT lecturers' perspectives of using technology for teaching at the University.

Your role will be to **participate in an individual, semi-structured interview** with me. The interview will take approximately 1-1.5 hours, and will be conducted in a room you nominate. The interview would take place in semester 2, 2014.

Your perceptions about implementing and using learning technologies for teaching are important. Lecturers' perspectives on learning technologies are lacking in the literature, and as a result, are not well represented in policies and programmes. By participating in this research, you will have an opportunity to share your views about teaching and technology, and to contribute to the discussion about e-learning in higher education. Technology may be defined as AUTonline, online marking, iPad, smartphone, Google+, Facebook, video conferencing, webinars, videos, e-portfolios etc.

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Dr Jennie Billot, Post-graduate Research Education Leader, University Postgraduate Centre
Phone: 921 9999 x9694, Email: jennie.billot@aut.ac.nz

Approved by the Auckland University of Technology Ethics Committee on 12 March 2014, AUTEC Reference number 14/21.

Interview appointment schedule

Interview Schedule - October - December 2014													
Case	Name removed	Campus	Pseudonym1	Pseudonym2	Mail code	Date	Time	Room	Appointment accepted	Interview complete	Consent form	Uploaded to TranscribeMe	Transcribed
1 Departmental		City	Green	Tane	B-3	Oct-6	2.30-2.30 pm	WO1027	yes	yes	yes	yes	yes
1 Departmental		North	Black	Macie	A-14	Oct-8	11.45-12.45 pm	AE109	yes	yes	yes	yes	yes
1 Departmental		North	Blue	Rosie	A-4	Oct-8	1.15-2.15 pm	AE109	yes	yes	yes	yes	yes
1 Departmental		City	Pink	Veda	USA	Oct-29	11-12 noon	Skype	yes	yes	email	yes	yes
2 CoP		City	Green	Gala	D-63	Oct-16	10.00-11.00 am	WG1227	yes	yes	yes	yes	yes
2 CoP		City	Black	Albert	D-63	Nov-12	10-11 am	WO1027	yes	yes	yes	yes	yes
2 CoP		North	Blue	Tammy	A-9	Oct-23	9.30-10.30 am	AE109	yes	yes	yes	yes	yes
2 CoP		North	Pink	Aroha	A-9	Nov-5	9-10 am	AE109	yes	yes	yes	yes	yes
3 Funded		City	Green	Heidi	D-71	Oct-28	10-11 am	WO1027	yes	yes	yes	yes	yes
3 Funded		North	Black	Jack	A-9	Oct-23	11-12 noon	AE109	yes	yes	yes	yes	yes
3 Funded		City	Pink	Jane	C-41	Dec-10	11-12 noon	WE519	yes	yes	yes	yes	yes
3 Funded		City	Blue	Akela	D-71	Nov-11	9.30-10.30 am	WT136	yes	yes	yes	yes	yes
4 Workshop		City	Green	Omar	MB	Oct-20	12.15-1.15 pm	WO1027	yes	yes	yes	yes	yes
4 Workshop		North	Black	Moana	A-25	Oct-20	8.45-9.45 am	AF422	yes	yes	yes	yes	yes
4 Workshop		North	Blue	Dale	A-5	Oct-30	11-11.30 am	AG132	yes	yes	yes	yes	yes
4 Workshop		City	Pink	Poppy	D-75	Oct-21	3.15-4.15 pm	WT136	yes	yes	yes	yes	yes

Appendix C: Focus group data analysis and themes

Focus group analysis

Question responses

Question 1: How does the decision-making process motivate teachers to adopt technology?

1.1 Think about the different kinds of technology that you have adopted. Can you tell us why you adopted them?

Teachers adopt technology to:

- improve their learning and teaching strategies
- to provide students who are off-campus with access to education using an online mode
- improve on the technology they are currently using

Two or less participants:

- their personal use of technology influenced their teaching
- to improve assessment processes / online marking

1.2 Have you ever adopted a technology as part of a team or group, rather than as an individual? Can you tell us what it was like?

Adopting technology as a group:

- Reasons for adopting as a team not always clear
- How decision-making happened in teams was unclear
- Technology failures often occur

Two or less participants:

- What the team learns about technology
- Training and IT decisions by managers

1.3 What advice you give to a manager about how to work with a team of teachers to introduce a new technology for teaching?

Discussion was diverse and focused on:

- Differing ways managers should support the team
- What teachers want from managers

Two or less participants:

- Better training and IT decisions should be made by managers

Question 2: What pedagogical knowledge do teachers develop about teaching with technology and how do they develop it?

2.1 Can you tell us about your experiences of learning to use technology?

Teachers engaged in:

- Formal training courses - positives and negatives
- Video training
- Program manual and help menu
- Just in time training
- Were self-taught
- Feelings about learning to use technology
- Transfer of skills between technologies

Two or less participants:

- Had control issues around the use of technology

2.2 Please tell us how technology has changed the way you teach?

Teachers discussed:

- Feelings of power
- Philosophy of teaching
- Technology changes teaching processes
- Changing mode of delivery
- Student engagement
- Lesson planning

Two or less participants:

- No change to teaching

2.3 Can you tell us about some of the ways technology has had an impact on your freedom to teach the way you want?

Teachers discussed:

- Resisting when being told to use technology
- Unreliability of technology
- Difficulties in communicating with students through technology
- Communicating with students via social media
- Students video recording Teachers in lectures
- Flexibility with work and hours
- Responding to emails

Two or less participants:

- Online marking

Question 3: What are teachers' approaches to teaching with technology?

3.1 *I'd like you to imagine yourself in the university in the year 2050. What is the role of technology in your teaching in this future?*

Teachers discussed:

- Access to devices
- IT support systems
- Mobility
- Modes or learning
- Teaching spaces
- Training
- The role of technology
- Perceptions about the impact of technology on students

Question 4: Why do teachers reject or discontinue using technology?

4.1 Think about a technology that you have been using for a long time. Please tell us why you keep using it?

Teachers discussed:

- The change process
- Online marking
- Reliability of technology

Two or less participants:

- Staff resistance
- Health reasons

4.2 Think about a technology that you have used for a period of time, and then stopped using it. Can you pinpoint was it was that made you stop using it?

Teachers discussed:

- Being unaware of the alternatives
- Organisational standards of software

Two or less participants:

- Reliability

Is there anything else you would like to tell us about teaching with technology?

Teachers discussed:

- Changing role of the university and teachers
- Impact of AUT on teachers' perspectives of technology
- Philosophy of technology

Focus group themes

Themes conceptualised from question responses

Adoption

Reasons for initial adoption, continuance, and discontinuing to use learning technologies

- Reasons for adoption differed for each workgroup setting*
- I had this positive / neutral experience when adopting technology
- I had these challenges when adopting technology
- If you want me to adopt a technology, tell me why
- Why I continue to use a technology
- Why I stopped using a technology

* responses showed how the sampling caused differentiation in responses.

Training

The pros and cons of methods of training, difficulties with learning, vision of ideal training

This is how I've learned to use technology:

- Formal workshops
- Just in time training
- Online videos
- Manuals
- Help menu
- Self-taught
- I experienced difficulties learning to use technology

Teaching

Changes in my philosophy of teaching, the role of the teacher, approaches to teaching

- My changing philosophy of teaching
- The role of the lecturer is changing
- My approach to teaching has changed

Technology

Questioning the philosophy of technology, the role of technology in learning and teaching, and getting the balance right

- Questioning the philosophy of technology
- Questioning the role of technology in learning and teaching
- Technology facilitates collaborative approaches to teaching
- Technology is beneficial for learning, but get the balance right

How we work

Changes in teaching and workspaces, working hours and reliance on technology

- My teaching space has changed
- My working day has expanded to 24/7
- I am mobile, I can work or teach from anywhere at any time.
- Our work is reliant on the technology working

Unknown territory

Anxiousness around technology, social media and being recorded

- I don't know why or how to use social media like Facebook with students
- I am uncomfortable with students recording me in lectures
- What I don't know about technology makes me anxious / frightened

Note: Notion of anxiousness needs further exploration to see if this is warranted. Search words in the transcript. Look for excerpts that relate to this.